

QLOCATE Technical Data Sheet

Features

- Iridium SBD
- GPS/GLONASS positioning
- Requires only one antenna
- Low power consumption
- Small form factor
- Global operating capability
- No SIM card
- Incorporate into an OEM solution
- RoHS compliant
- SAE J1455 / SAE J1939

Applications

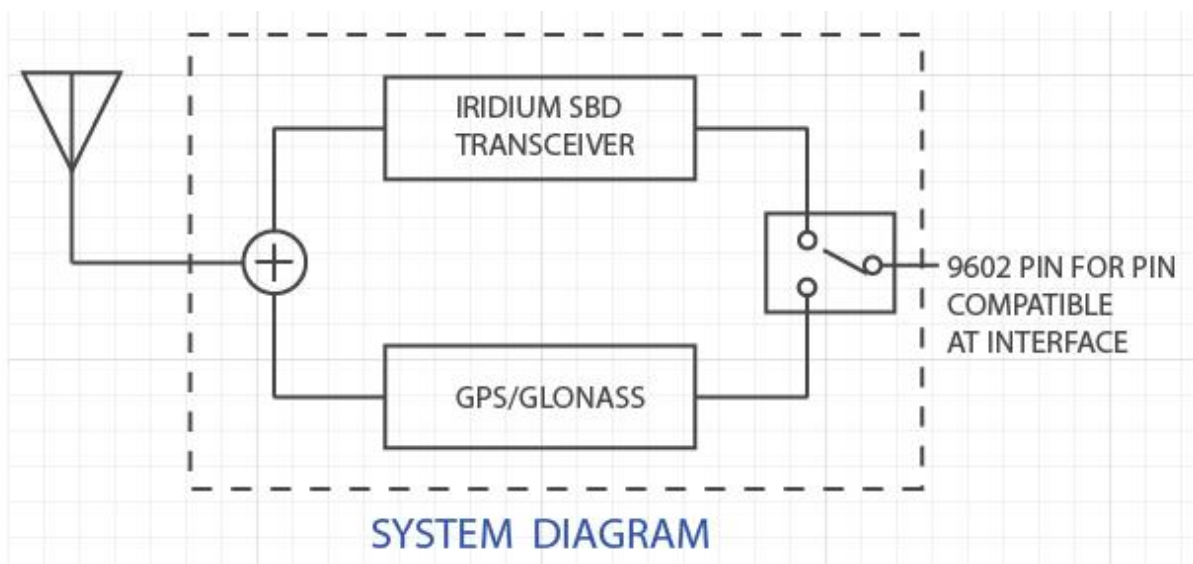
- Fixed and moving asset tracking / monitoring
- Heavy equipment

Product description

The QUAKE QLOCATE™ is an Iridium Short Burst Data (SBD) transceiver integrated with GPS/GLONASS. It is an efficient, satellite add-on solution that allows effortless connection to Iridium's satellite network. The QLOCATE can switch smoothly between satellite and GPS mode.

A unique feature of the QLOCATE is its built-in, state-of-the-art GPS/GLONASS receiver that allows system integrators to use a single, dual-mode, L-Band antenna for both GPS/GLONASS and Iridium SBD. This eliminates the need for a second antenna and for external global positioning modules.

The QLOCATE's simple installation and integration make it optimal for any developer who is facing an accelerated time-to-market requirement.



Revision History

Date	Rev	ECO	Description
Jun 2014	X1	1187	Preliminary release of the Technical Data Sheet.
Jul 2014	X2	1212	<p>Second preliminary release of the Technical Data Sheet.</p> <ul style="list-style-type: none"> • In section 3 - Input/Output interfaces: <ul style="list-style-type: none"> - Modified section 3.1 - Interface connector - Added sections 3.1.1, 3.2, 3.3, 3.4 - Added Figure 3-1 and Figure 3-2: Typical supply current profile - Enhanced section 3.1.3 and Table 3-3 • Added section 4 • Updated Table 5-2: Certifications • In section 6 - Technical drawings: <ul style="list-style-type: none"> - Added Figure 6-1 - Updated Figure 6-2: QLOCATE dimensions (2) • Added section 7.1.1 - Mounting • Modified section 8 - AT Command Set Description • Modified Pin 5 info in sections 2.1.2.1, 2.1.3, 7.2.1, 7.2.2 and in Table 3-1
Nov 2014	A	1341	<ul style="list-style-type: none"> • Added hot surface warning to section 7.1.1 - Mounting
Mar 2015	B	1425	<ul style="list-style-type: none"> • Updated the FCC, IC and CE numbers in section 5.2 - Certifications. • Added the Declaration of Conformity to section 5.3.

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1 Introduction



Note: The information in this document is subject to change.

1.1 Scope

This data sheet contains a description of the operation, specifications and characteristics of the QUAKE™ QLOCATE, which is an Iridium Short Burst Data (SBD) transceiver integrated with GPS/GLONASS.

1.2 Iridium

Iridium's network is a global satellite data solution, with complete coverage of the earth (including continental, ocean, and Polar Regions). Iridium delivers low latency, essential communications services to and from remote areas where no other form of communication is available. The Iridium constellation of 66 low-earth orbiting (LEO) satellites operates as a fully meshed network. It is one of the largest commercial satellite constellations in the world. The Iridium service is ideally suited for industries such as maritime, aviation, government, emergency/humanitarian services, mining, forestry, oil and gas, heavy equipment, transportation and utilities.

1.3 Short Burst Data (SBD)

Iridium Short Burst Data (SBD) Service is an efficient network protocol designed for shorter-sized data messages that can be economically sent via Iridium Circuit Switched Data Services. SBD uses a proprietary network protocol to transfer data messages to and from the remote terminal. Currently, the QLOCATE supports only Iridium's SBD service.

It is possible to send Mobile Originated (MO-SBD) and Mobile Terminated (MT-SBD) messages.

Message sizes for:

- MO-SBD are between 0 and 340 bytes;
- MT-SBD are between 1 and 270 bytes.



Note: 0-byte messages are referred to as "mailbox checks."

1.4 Related documents

QUAKE

QUAKE documentation can be obtained from the *Downloads* tab of QUAKE's website or by [contacting QUAKE Customer Support](#).

Iridium

The following Iridium documentation may be helpful:

- [1] Iridium SBD Developer's Guide (QUAKE P/N: 4000-0713)
- [2] Iridium ISU AT Command Set (QUAKE P/N: REF-IRI-001)

GPS

The following GPS documentation may be helpful:

- [3] u-blox 7 Receiver Description (incl. Protocol version 14.00) (GPS.G7-SW-12001-B)

Department of Defense (DoD)

- [4] MIL-STD-810E DoD Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

1.5 Evaluation Kits

QLOCATE Evaluation Kits are available from QUAKE. They include: the QLOCATE modem, the data cable, all documentation, and air time. Contact your QUAKE sales representative for more details.

1.6 Contacting QUAKE

Quake Global, Inc.
4933 Paramount Dr
San Diego, CA 92123

Phone: (858)-277-7290
Fax: (858) 277-7259

Website: www.quakeglobal.com
Submit a Customer Support Ticket: <http://quakeglobal.com/support/>
Email: customersupport@quakeglobal.com

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2 Communications

Table 2-1: Communication networks

Communication Network	Parameter	Units	Comments
Iridium Short Burst Data (IRI SBD)			
<u>Message Size</u>			
Modem Originated (TX)	1 / 340	Bytes MIN / MAX	
Modem Terminated (RX)	270	Bytes MAX	
<u>Transmit</u>			
Frequency	1616 / 1626.5	MHz MIN / MAX	
Power	32	dBm Typical	
<u>Receive</u>			
Frequency	1616 / 1626.5	MHz MIN / MAX	
Sensitivity	-113	dBm	1X10-2 BER
GPS			
Satellite channels	50	channels	
Time-To-First-Fix (TTFF)			Depending on antenna and signal strength.
From cold start	38	seconds	Unobstructed view of the sky.
Sensitivity			
Tracking	-160	dBm	
Acquisition	-146	dBm	
Accuracy	2.5	meters	
Raw location data update (NMEA))	1	second	
GLONASS			
Satellite channels	72	channels	
Time-To-First-Fix (TTFF)			Depending on antenna and signal strength. All satellites at -130 dBm
From cold start	27	seconds	Unobstructed view of the sky.
Sensitivity			Demonstrated with good external LNA.
Tracking	-164	dBm	
Acquisition	-159	dBm	
Accuracy	2	meters	
Raw location data update (NMEA))	1	seconds	
Antenna			
Satellite/GPS	50	Ohms	These specifications reflect QLOCATE's design for use with a passive antenna.
Gain	3	dBm	<ul style="list-style-type: none"> Iridium specifies an antenna with 3dBi Gain, RHCP polarization, 50 Ω nominal impedance and 1.5:1 VSWR. Several vendors have patch antennas that will meet this specification, and are certified by Iridium to operate on their network.
Cable loss	3	dBm MAX	<ul style="list-style-type: none"> If the user's design requires use of an active antenna for the GPS, the design of their application will require additional circuitry.

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2.1 Operating modes

2.1.1 Power OFF

The QLOCATE is no longer functional when input power is removed.

2.1.2 Power ON

The QLOCATE is ON when input voltage to the modem is applied.

2.1.2.1 RF Receive/Idle

The QLOCATE alternates between the idle state and receiving receive bursts.

In Receive mode:

The RF and digital signal processor portions of the modem are active, and GPS is not active.

In Idle mode:

The required input power along with the assertion of the ON/OFF signal (Pin 5) must not be present; GPS will be active.

2.1.2.2 Transmit

The QLOCATE is sending an outgoing SBD message. The QLOCATE may also query the Iridium system in a search for incoming messages (see [AT Command Set manual](#) for sequence and commands and section [8 - AT Command Set Description](#)).

2.1.3 Switch from Iridium to GPS/GLONASS

The QLOCATE alternates between Iridium and GPS/GLONASS. To enter GPS/GLONASS mode, the required input power along with the ON/OFF signal (Pin 5) must be low. The NMEA data will subsequently be sent to the Rx port.

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3 Input/Output interfaces

3.1 Interface connector

The QLOCATE has a 20 pin interface connector. The pinout is shown in [Table 3-1](#) and the limits for the digital signals are listed in [Table 3-2](#). The connector contains several supply grounds; all supply and supply grounds must be connected to the power supply to ensure that the current on any one pin is limited. Cross-talk is reduced through the use of multiple signal grounds.

The interface connector provides the following connections to the QLOCATE:

- DC power supply input
- Power on/off control
- Serial data interface
- Network available output
- Supply power indicator output

3.1.1 Type

The connector on the QLOCATE is a Samtec low-profile header connector, part number FTSH-110-01-L-DV. This connector makes a stackable board-to-board configuration possible, enabling connection to the host system motherboard. A suitable motherboard female socket that matches this connector is the SAMTEC header, part number CLP-110-02-L-D. See the Samtec website at: <http://www.samtec.com> for more information on this connector.



Note:

Ensure that all power pins and ground pins are connected externally.

3.1.2 Electrical specifications

Table 3-1: Interface connector pin allocation

Pin	Signal Name	Sig Dir (WRT the QLOCATE)	Signal Function	Signal Level
1	EXT_PWR	Input	Supply	+5V \pm 0.5V
2	EXT_PWR	Input	Supply	+5V \pm 0.5V
3	EXT_GND	Input	Supply return	0V
4	EXT_GND	Input	Supply return	0V
5	ON/OFF	Input	On/Off control input (On=IRI, Off= GPS)	Analog On: \geq 2.0V Off: \leq 0.5V
6	DF_S_TX (Pin 5=On) GPS_TX (Pin 5=Off)	Input	Data port, serial data input	3.3V Digital
7	DF_S_RX (Pin 5=On) GPS_RX (Pin 5=Off)	Output	Data port, serial data output	3.3V Digital

Pin	Signal Name	Sig Dir (WRT the QLOCATE)	Signal Function	Signal Level
8	SIG_GND	Input	Signal ground	0V
9	DF_DCD	Output	Data port, Data Carrier Detect	3.3V Digital
10	DF_DSR	Output	Data port, Data Set Ready	3.3V Digital
11	DF_CTS	Output	Data port, Clear-to-Send	3.3V Digital
12	DF_RI	Output	Data port, Ring Indicator	3.3V Digital
13	DF_RTS	Input	Data port, Request-to-Send	3.3V Digital
14	DF_DTR	Input	Data port, Data Terminal Ready	3.3V Digital
15	SIG_GND	Input	Signal ground	0V
16	Reserved			
17	Reserved			
18	SIG_GND	Input	Signal ground	0V
19	NETWORK AVAILABLE	Output	Signals when the QLOCATE can see an available satellite network	3.3V Digital Available = high Not available = low
20	SUPPLY_OUT	Output	Supply power indicator output	+3.3V 5mA maximum

Table 3-2: Limits for 3.3V digital signals

Parameter	Symbol	Min	Max	Unit
Input High Voltage	V _{IH}	2.0	5.5	V
Input Low Voltage	V _{IL}	-0.3	0.8	V
Output High Voltage	V _{OH}	2.4		V
Output Low Voltage	V _{OL}		0.4	V
Low Level Output Current	I _{OL}		4.4	mA
High Level Output Current	I _{OH}		5.5	mA

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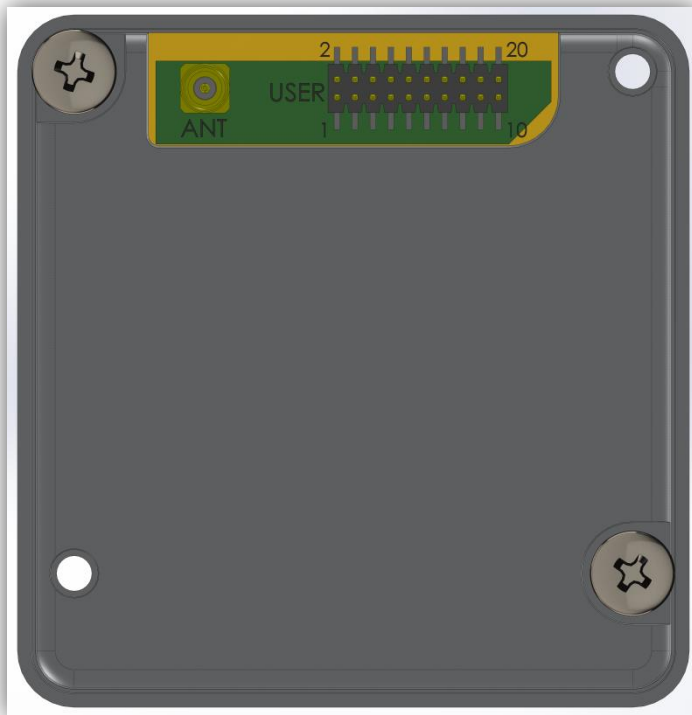


Figure 3-1: Interface connector pin number designation (from below module)

3.1.3 Power consumption

Power consumption is dependent on the mode in which the QLOCATE is operating. The amount of time the QLOCATE spends in any of its modes will determine the overall current draw.

The current draw specifications detailed in [Table 3-3](#) apply to DC power measured at the QLOCATE's interface connector input and not at the output of the power supply. If the power supply cables are excessively long a voltage drop can occur that is sufficient to cause the voltage to be out of specification at the physical power supply input to the QLOCATE.

Table 3-3: Current draw (5 VDC)

Supply Input Voltage	Value		Notes
Range	5.0 DC \pm 0.5V		
Ripple	< 40 mV pp		
Mode	Current Draw		
	Average	Peak	
Receive/Idle	45 mA	195 mA	
Transmit	190 mA	1.5 A	
SBD message transfer <ul style="list-style-type: none"> • current • power 	190 mA \leq 1.0 W		The average current draw will vary depending on the view of the satellite from the antenna.
GPS/GLONASS	45 mA		

High current drive is required during transmissions.

- The typical transmit burst is 8.3 ms (and repeats every 90 ms).
- The typical receive burst is up to 4.5 seconds.

The following must be guaranteed by the external power supply:

- The supply voltage droop over for a 8.3ms burst of 1.5A current should not be more than 0.2 V.
- The in-rush current should be limited to a maximum of 4 Amps
- The power source shall provide for over current protection in case of device malfunction.
- The supply noise should be less than the limits in the following profile:
 - 100 mVpp from 0 to 50 kHz
 - 5 mVpp at 1 MHz measured in 50 kHz bandwidth
 - 10 mVpp at 1 MHz measured in 1MHz bandwidth
 - 5 mVpp above 5 MHz measured in 1 MHz bandwidth.



Note:

In-rush limit refers to the impedance of the modem, which is very low when it is unpowered. When power is supplied from an unlimited supply, the instantaneous current can exceed 4 Amps which can cause damage to the modem. This can be limited in several ways, included using a supply that cannot provide more than 4 Amps instantaneously; or providing some series inductance/resistance to the supply lead.

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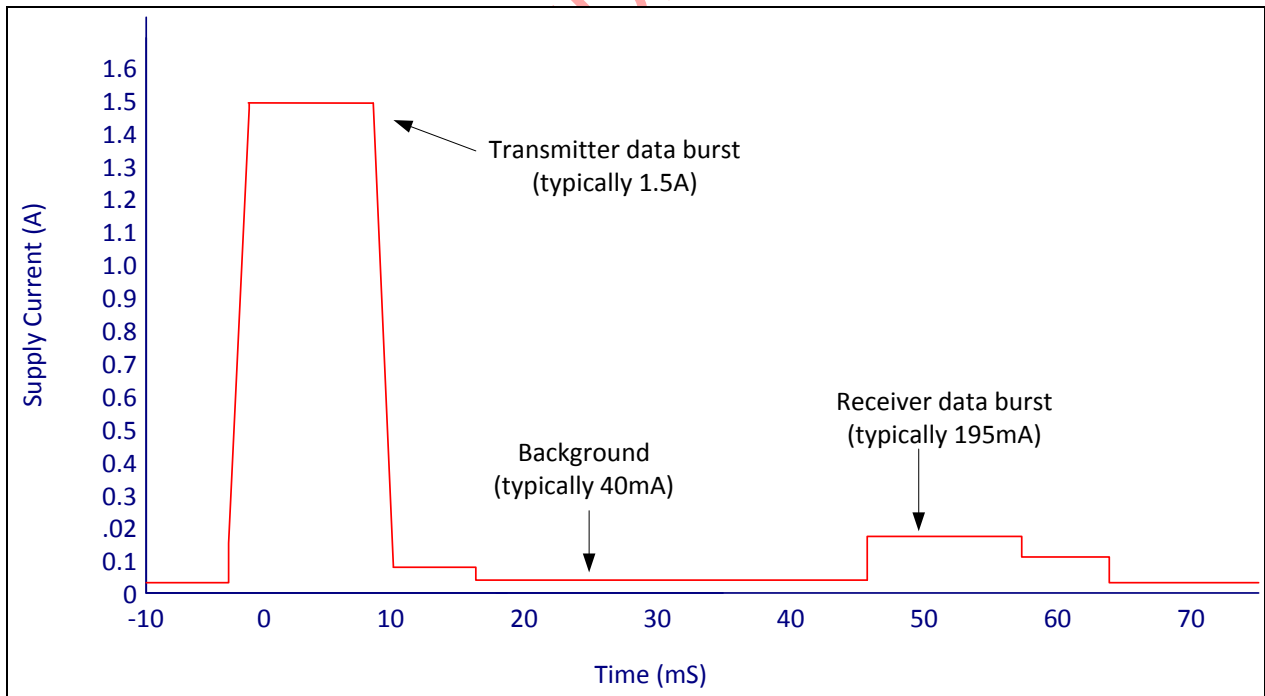


Figure 3-2: Typical supply current profile

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3.2 Serial data interface

The serial data interface is an RS-232 9-wire interface at 3.3V digital signal levels (LVTTTL) over which the QLOCATE and the customer solution transfer commands, responses, and SBD message data. In using this interface, the QLOCATE behaves as a DCE (Data Communication Equipment), and the customer solution behaves as a DTE (Data Terminal Equipment).

- If RS-232 voltage levels are needed, the customer solution must include an LVTTTL/RS-232 level-shifter.
- Autobaud is not supported. The baud rate can be set via the AT+IPR command. The default rate is 19200 bps.

The QLOCATE's serial interface supports the control signaling of a 9-wire interface by default for those host applications that require it. However, the interface can also be configured for 3-wire operation – in which only transmit, receive and ground signals are used – with no detriment to functionality/performance.

See the [ISU AT Command Set](#) for more information.

3.3 Network Available output

Network Available is a digital output that can notify an application that the QLOCATE has visibility to the Iridium satellite network. This feature is helpful when the movement of the QLOCATE reduces the amount of time that it has a clear line of sight to the satellite. If the customer solution includes this logic output in the application decision logic, battery life can be preserved by thereby reducing the number of attempted transmissions.

Network Available means only that the QLOCATE can successfully receive the Ring Channel (namely, it has an Iridium satellite in view). It is not a guarantee that a message can be successfully sent. The Network Available state is evaluated every time the Ring Channel is received, which is typically every 4 seconds if the Ring Channel is visible. If the Ring Channel is not currently visible, the update time can take as long as 2 minutes, depending on how long the lack of satellite visibility existed. The update time varies because the QLOCATE attempts to conserve power by increasing the Ring Channel search interval as long as the satellites are not in view. Every time a ring search fails, the time to wait is increased and eventually limits at 120 seconds.

If Network Available is currently off, the customer solution may still attempt an SBDI[X] session. This will force the QLOCATE to look for the Ring Channel immediately and, upon finding it, to attempt to send the message. In this case, Network Available will not come on immediately. The Network Available does not turn on while in a +SBDI session. It will, however, turn on 4 seconds later due to the assumption that the Ring Channel is present. After the SBD session completes, the QLOCATE performs a new Ring Channel search, at the end of which Network Available is turned on. This can take between 4 and 12 seconds.

The wait time between search windows is reset to 4 seconds every time a search succeeds. Otherwise, it continues to increase. Therefore, if the +SBDI attempt fails to find the Ring Channel, the search window does not reset to 4 seconds.



Note:

The behavior of +CIEV:1 is identical to that of the Network Available output.

3.4 DC supply indicator output

A DC supply indicator signal is provided which could be used directly for driving an LED to provide a visible indication that the QLOCATE's supply is on. Alternatively, the output signal could be used in application logic to determine whether the internal transceiver power supply is on.

4 RF interface

4.1 Connector types

When mating to the QLOCATE RF connector, use MMCX male connectors from SAMTEC, part number MMCXP-P-H-ST-TH1. This is a thru hole printed circuit mount connector with the correct mechanical spacing to allow the QLOCATE to fit flush on the motherboard.

Additional information can be found at: <http://www.samtec.com>.

4.2 ANT connector

The main RF connector for the QLOCATE is the antenna connector. This provides the RF connection between the QLOCATE and the host system motherboard.



Note:

For safety reasons, the RF connector on the QLOCATE is intended for an inter-board connection to the host system motherboard and should not be directly connected to an external antenna cable or cable distribution system. Paragraph 7.3 of EN60950-1:2006 safety standard requires that users are protected against high voltages that might appear on these cables. This can be achieved either by inserting a high-voltage isolating capacitor in series with the signal or by grounding the shield of the coaxial cable. The MMCX connectors have limited voltage capacity; therefore, protection needs to be provided on the developer's motherboard. Developers are encouraged to review the EN60950-1:2006 standard for additional details.

4.2.1 Antenna characteristics

The QLOCATE should be connected to an Iridium-band antenna with the following antenna connector characteristics in [Table 4-1](#).

Table 4-1: Antenna characteristics

Parameter	Value
Impedance	50 Ohms nominal
Gain (maximum)	3dBi
Polarization	RHCP
VSWR (maximum operational)	1.5 : 1

4.3 RF interface specifications

The RF interface requirements for the QLOCATE are summarized in [Table 4-2](#) below.

Table 4-2: General RF parameters

Parameter	Value
Frequency range	1616 MHz to 1626.5 MHz
Duplexing method	TDD (Time Domain Duplex)
Input/Output impedance	50Ω
Multiplexing method	TDMA/FDMA

4.4 Radio characteristics

[Table 4-3](#) contains radio characteristics of the QLOCATE.

Table 4-3: Radio characteristics

Parameter	Value
Average power during a transmit slot (max)	1.6 W
Receiver sensitivity (typical level at module connector)	-117dBm
Max cable loss permitted	3dB
Link Margin – Downlink	13dB

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5 Ratings and certifications

5.1 Ratings

Table 5-1: Environmental ratings

Parameter	Rating
Operating temperature	-40C to +85C
Storage temperature	-40C to +85C
Low pressure	Up to 4 hours at 15000 ft elevation pressure
Humidity	<p>Relative humidity range of 0% to 95% non-condensing at 65C</p> <p>MIL SPEC 810E, Method 507.3 with test conditions.</p> <p>Procedure I, Cycle 2 Procedure 1 simulates natural environmental cycles. It is conducted on test items which are open to a frequently ventilated environment, Cycle 2 set temperature at 24 deg C constant with humidity maintained at 95% minimum.</p> <p>Test Duration: 15 Cycles (15 days)</p>
Cyclic humidity	Temperature/Cyclic Humidity Test, 5 days at -10C to 65C at 85% relative humidity
Thermal shock	-40C to 85C (30 minutes at each temp, 10 cycles)
Mechanical shock	<p>20G, saw tooth profile, over an 11 msec period. (Three positive and three negative shocks in each of three mutually perpendicular axes.)</p> <p>SAEJ1455 shock requirements and those in MIL-STD-810E.</p>
Vibration	<p>20 Hz to 2 KHz, 8 Grms vibration profile in each of three mutually perpendicular axes, 1 hour per axis,</p> <p>10 Hz to 150 HZ, 0.5 g square/Hz vibration profile in each of three mutually perpendicular axes, 1 hour per axis.</p> <p>10 Hz to 150 HZ, 0.05 g²/Hz vibration, 16 hours on each of three orthogonal axes</p> <p>5 Hz to 20 Hz , 0.05 g²/hz, and from 20 to 150 Hz, -3 dB/octave, 1 hour each axes. Vibration requirements in MIL-STD-810E.</p> <p>SAEJ1455 vibration requirements</p>

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5.2 Certifications

Table 5-2: Certifications

Regulatory Approval	Tests			Rating / /Notes
	Radio	EMC	Electrical/ Mechanical/ Operational/ Safety	
Iridium SBD				Iridium Network Certification
FCC	FCC CFR47 parts 2, 15, and 25	EN61000-4-2 : 1995/A2 : 2001 Part 4.2 EN61000-4-3 : 2002 Part 4.3 EN61000-4-4 : 2004 EN61000-4-6 : 1996/A1 : 2001 Part 4.6 EN55022:2006		FCC ID: PB5QLOCATE See * <u>FCC note</u> below.
Industry Canada	Industry Canada RSS170 Iss. 1, Rev 1, November 6, 1999			IC: 4650A-QLOCATE See ** <u>Industry Canada note</u> below.
CE	ETSI EN 301 441 V1.1.1 (2000-05)	ETSI EN301 489-1 V1.8.1(2008-04) ETSI EN 301 489-20 V1.2.1(2002-11)	EN60950-1:2006 Part 1	0168

* FCC note

FCC Part 15 Class B - Radio Frequency Interference (RFI) (FCC 15.105)

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Unauthorized Changes

QUAKE has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains FCC ID: PB5QLOCATE or Contains transmitter module FCC ID: PB5QLOCATE

**** Industry Canada note**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

RF Exposure

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that necessary for successful communication.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below: 3.0 dBi. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Unauthorized Changes

QUAKE has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains IC: 4650A-QLOCATE or Contains transmitter module IC: 4650A-QLOCATE

French translation:

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

QUAKE n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installée de façon à garder une distance minimale de 20 centimètres entre la

source de rayonnements et votre corps. Gain de l'antenne doit être ci-dessous: 3.0 dBi. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit:

Contains IC: 4650A-QLOCATE or Contains transmitter module IC: 4650A-QLOCATE

**Note:**

The QLOCATE complies with the standards for Radio Emissions Compliance, Electromagnetic Compatibility, and AC Safety in the United States, European Union and Canada, for host systems that provide safe connections to power supply and external antenna or a cable distribution system.

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5.3 Declaration of Conformity

DECLARATION OF CONFORMITY

We, **Quake Global, Inc. (previously Quake Wireless, Inc. up to January 2001)**
of **4933 Paramount Drive**
San Diego, CA 92123, USA

declare under our sole responsibility that the product

QLOCATE, part numbers 1158-5000 and 1158-5001

to which this declaration relates, is in conformity with the following standards and/or other normative documents:

Article 3.1(a): Safety testing against EN/IEC60950-1

Article 3.1(a): RF Exposure calculation against EN 62311

Article 3.1(b): EMC testing against EN 301 489-1 referencing EN 301 489-20

Clause 9.2: RF Electromagnetic Field 80MHz – 2.7GHz:

Clause 9.3: Electrostatic Discharge (Non Contact):

Article 3.2 (Spectrum Usage): Iridium RF testing against EN 301 441:

Clauses 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5.1, 4.2.5.2, 4.2.5.3, 4.2.5.4.1, 4.2.5.4.2, 4.2.6 & 4.2.7 in the Iridium satellite 1.6MHz frequency band.

Article 3.2(Spectrum Usage): GPS/GLONASS radiated emissions against EN 300 440

FCC 47CFR Part 15B / IC RSS-GEN (ICES-003) Radiated emissions only.

FCC 47CFR Part 25 / IC RSS-170 Iridium RF testing

FCC 47CFR Part 2.1091 / IC RSS-102 MPE RF Exposure calculation on 1.6GHz Iridium transmitter.

Directive 2011/65/EC, RoHS2

We hereby declare that all essential radio test suites have been carried out and that the above named product is in conformity with all the essential requirements of Directive 1999/5/EC.

The conformity assessment procedure referred to in Article 10 and detailed in Annex [IV] of Directive 1999/5/EC has been followed with the involvement of the following Notified Body:

TUV SUD BABT TCB
Octagon House, Segensworth Road,
Fareham, Hampshire,
PO15 5RL

Identification mark: **0168**

The technical documentation relevant to the above equipment will be held at:

Quake Global, Inc.
4933 Paramount Drive
San Diego, CA 92123 USA

Andrew Singgih
Director, Quality Assurance

Signed: February 25, 2015

6 Technical drawings

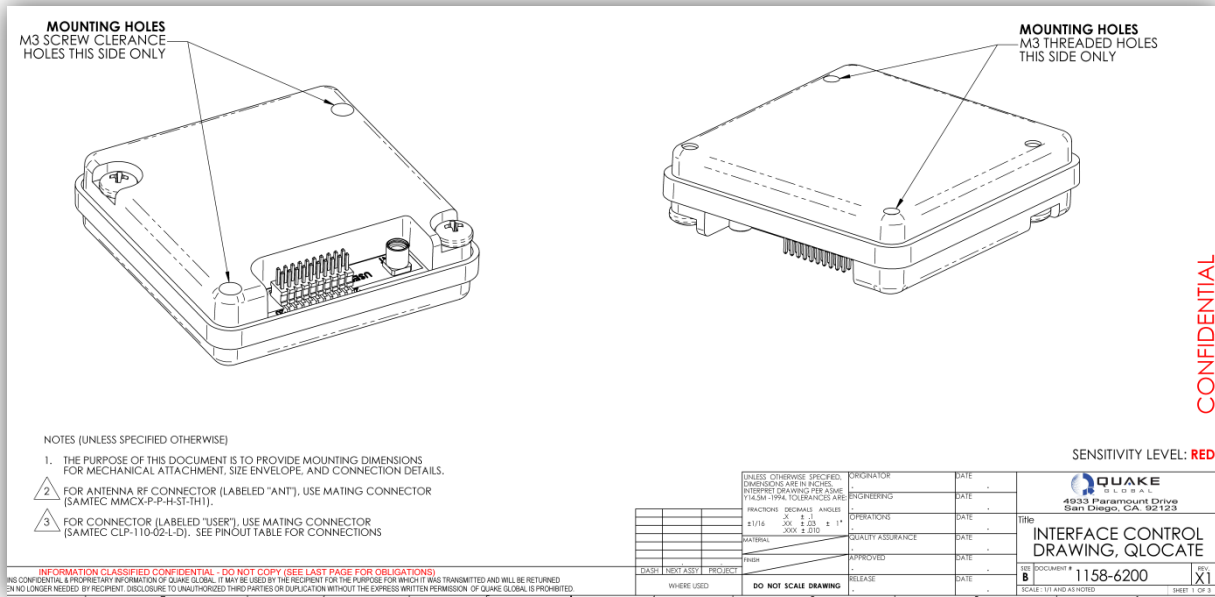


Figure 6-1: QLOCATE dimensions (1)

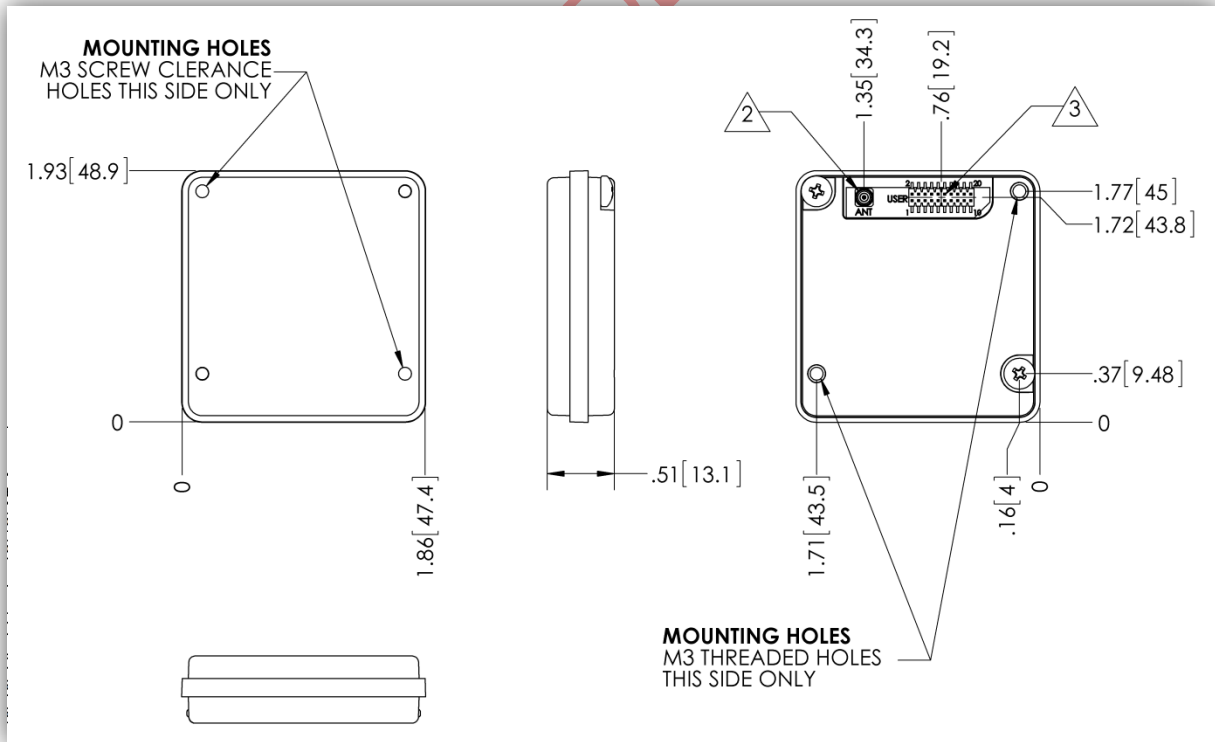


Figure 6-2: QLOCATE dimensions (2)

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Table 6-1: QLOCATE dimensions

Weight	.08 lbs. (0.036 kg)
Size	1.92" x 1.86" x .51" (48.76mm x 47.24 x 12.95)

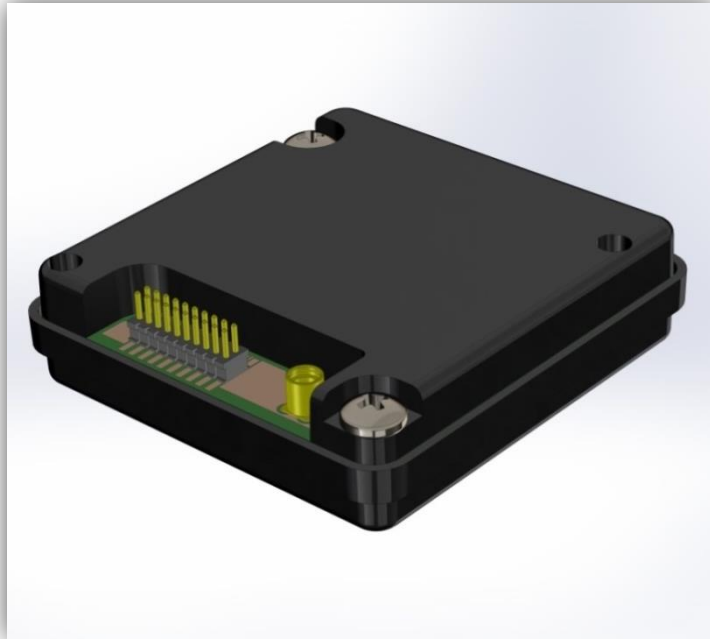


Figure 6-3: QLOCATE

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7 Operation

7.1 Installation recommendations

- It is best to connect the UBATT (-) to chassis ground rather than to the (-) battery terminal.
- The input voltage range is: 5 ± 0.5 VDC.
- In order to protect wires installed within the engine compartment or along the undercarriage, ensure that all wires are wrapped with wire loom.

7.1.1 Mounting

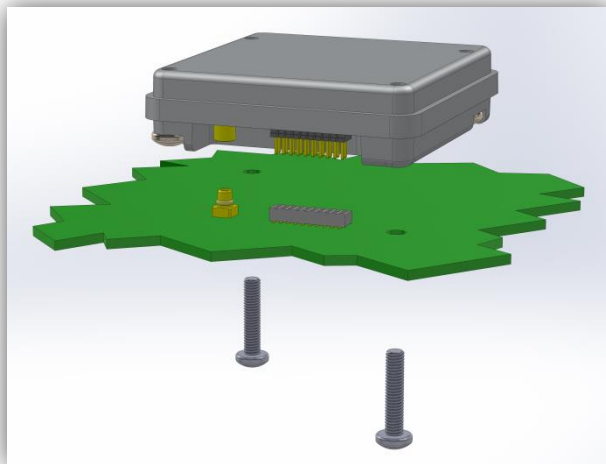


Figure 7-1: QLOCATE mounting example

Mounting notes:

1. The example of a host system motherboard footprint in [Figure 7-1](#) is shown for illustrative purposes only. The host system may require a different PCB layout or mechanical arrangement.
2. The QLOCATE is designed to be incorporated within a host system. It is therefore important that the antenna or cable distribution system that feeds the host system be terminated in a robust RF connector that is suitable for the end-application.
3. Safety isolation requirements for external antennas or cable distribution systems should also be taken into account when designing the motherboard. A suitably safe design for the RF connections should be incorporated into the host system motherboard, ideally using a chassis-bonded ground connection to the antenna cable shield.
4. The surface below the modem should be a conductive ground plane to ensure that the modem bonds to the motherboard ground system, thereby reducing the possibility of radiated emissions. This also requires that the mounting screws be properly tightened to 7 pound-inches of torque.

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- The modem is to be installed in a “service access only” area not accessible by untrained personnel and must be protected from inadvertent contact.

WARNING
HOT SURFACE
DO NOT TOUCH



Warning

Although the modem dissipates very little power, its use in ambient temperatures in excess of 60 deg C will make the caseworks notably hot.

7.2 Basic operation

The QLOCATE contains both a GPS module and an Iridium satellite module. Only one module is utilized at a time. Pin 5 is the line that controls which module is being used.

7.2.1 Iridium satellite

When there is potential on Pin 5 (3.3V), the Iridium module is utilized. The default baud rate for the Iridium module is 19200. From a terminal window set at 19200, basic AT commands can be used to control the module. Section [8.1 - Example: Send and receive a message](#) outlines the steps to power on and send or retrieve a message.

7.2.2 GPS

When there is no potential on Pin 5 (0V), the GPS module will be utilized rather than the Iridium module. The default baud rate for the GPS module is 9600. Through a terminal window the GPS NMEA strings can be seen. The module automatically starts a GPS read to acquire a fix when utilized.

```

$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30
$GPGLL,,,,,V,N*64
$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30
$GPGSV,1,1,01,32,,,28*73
$GPGLL,,,,,V,N*64
$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30
$GPGLL,,,,,V,N*64
$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30
$GPGLL,,,,,V,N*64
$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30
$GPGLL,,,,,V,N*64

```

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The structure of the NMEA messages is shown below in [Figure 7-2](#) and [Figure 7-3](#).

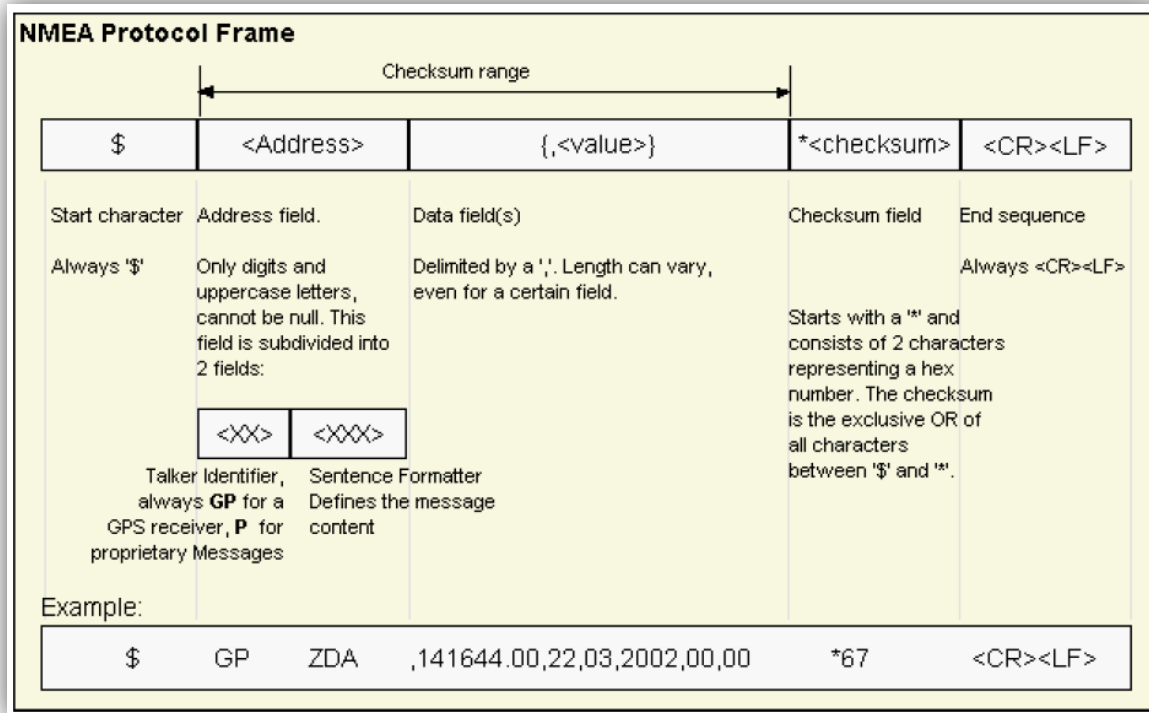


Figure 7-2: NMEA message structure (1)

Message Structure:

```
$xxDTM, datum, subDatum, lat, NS, lon, EW, alt, refDatum*cs<CR><LF>
```

Example:

```
$GPDTM, W84, , 0.0, N, 0.0, E, 0.0, W84*6F
$GPDTM, 999, , 0.08, N, 0.07, E, -47.7, W84*1C
```

Field No.	Name	Unit	Format	Example	Description
0	xxDTM	-	string	\$GPDTM	DTM Message ID (xx = current Talker ID)
1	datum	-	string	W84	Local datum code: W84 = WGS84, 999 = user defined
2	subDatum	-	string	-	A null field
3	lat	min	numeric	0.08	Offset in Latitude
4	NS	-	character	S	North/South indicator
5	lon	min	numeric	0.07	Offset in Longitude
6	EW	-	character	E	East/West indicator
7	alt	m	numeric	-2.8	Offset in altitude
8	refDatum	-	string	W84	Reference datum code (always W84 = WGS 84)
9	cs	-	hexadecimal	*67	Checksum
10	<CR><LF>	-	character	-	Carriage return and line feed

Figure 7-3: NMEA message structure (2)

8 AT Command Set Description

The QLOCATE is configured and operated through the use of AT commands. See the [ISU AT Command Set](#) for the full set of AT commands and responses. See also the [Iridium SBD Developer's Guide](#) for information on how SBD operates on the Iridium system.

8.1 Example: Send and receive a message

1. Power up the FA; it will attempt a registration.
2. Upon successful registration, a message check is performed to see if any MT messages are queued; 2 messages are found.
3. The first 90-byte message is sent and then retrieved from the MT buffer.
4. The second 90-byte message is sent and then retrieved from the MT buffer.

To SSD (from FA)	To FA (from SSD)	Description
		Apply power to the SBD Subscriber Device (SSD)
		Wait for DSR to become asserted
AT+SBDREG?		Query the SSD registration status
	+SBDREG:0	SSD is detached, i.e. un-registered
AT+SBDREG		Tell the SSD to register for ring alerts
	+SBDREG:2,0	SSD is now registered
AT+SBDSX		The Field Application software running on the DTE (FA) initiates extended status check (values updated during +SBDREG session).
	+SBDSX: 0,23,0,-1,0,2	SSD indicates that no ring alert is present but that 2 messages are queued at the Gateway SBD Subsystem (GSS). (The ring alert value will only change to 1 if ring alerts are enabled and a message is received at the GSS while the modem is powered on and registered)
AT+SBDIX		FA initiates an SBD session to download message
	+SBDIX:0,23,1,237,90,1	SSD informs FA that a 90-byte message was successfully received with MTMSN 237, and that one additional MT message is queued at the GSS
AT+SBDRB		FA retrieves the received message from the SSD
	<binary transfer>	
AT+SBDD1		Clear the MT message buffer.
	0	
AT+SBDIX		FA initiates an SBD session to download the additional message
	+SBDIX:0,24,1,238,90,0	SSD informs FA that a 90-byte message was successfully received with MTMSN 238, and that no additional MT messages are queued at the GSS
AT+SBDRB		FA retrieves the received message from the SSD
	<binary transfer>	
AT+SBDD1		Clear the MT message buffer
	0	

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9 Modem software update

The following is required in order to load new Iridium software into the modem:

- A Windows-based PC with a serial/COM port.
- Power supply (5 ±.5V).
- The correct version of the Iridium Upgrade Tool, which will load the software for the Q9602 SBD Transceiver. This file can be obtained either from the *Downloads* page of the www.quakeglobal.com website (listed as [9602 Iridium Firmware Update](#)), or by [contacting Customer Support](#).



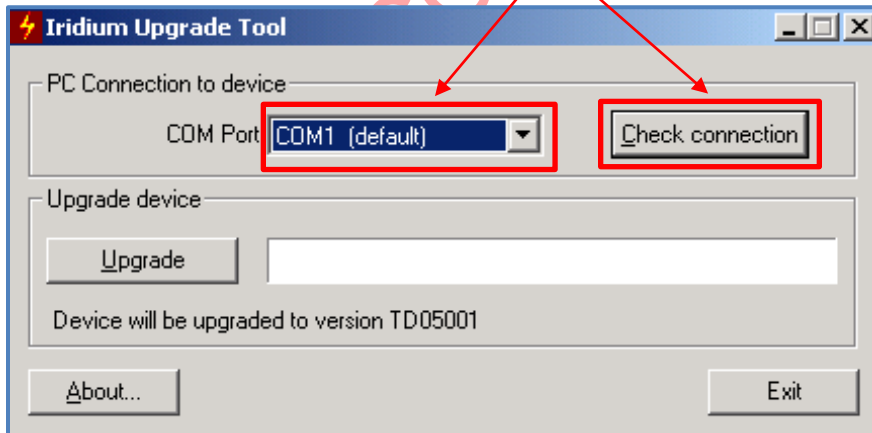
Note:

The software version that will be flashed into the SBD Transceiver is indicated by either “TAxxxxx” or “TDxxxxx” in the tool’s file name.

Example: “UpgradeTool_TD06002.exe”, where “TD06002” indicates the software version.


To reflash the modem:

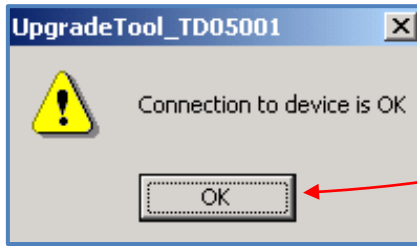
1. Connect the QLOCATE to the computer’s COM port.
2. Connect the QLOCATE power leads from the interface cable to the power supply.
3. Apply power to the QLOCATE.
4. Ensure pin 6 (ON/OFF signal line) is connected to a power source greater than 2VDC.
5. Establish a serial connection between the PC and the QLOCATE.
6. Execute the `UpgradeTool_TXxxxxxx.exe` file.
 - a. Choose the appropriate COM port.
 - b. Click .



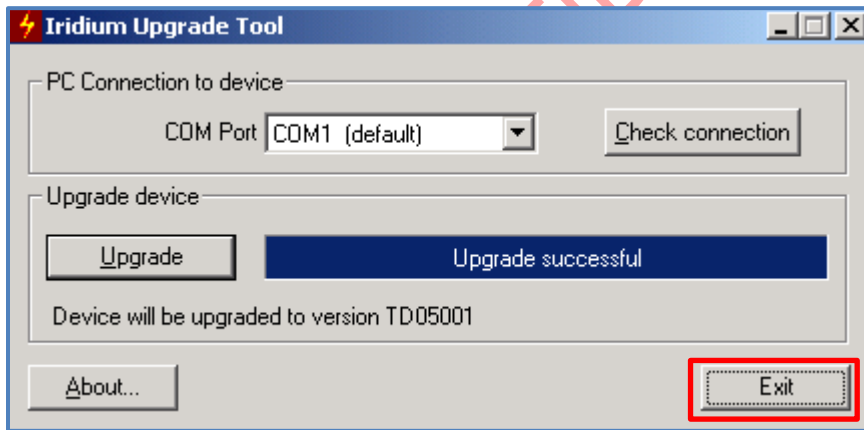
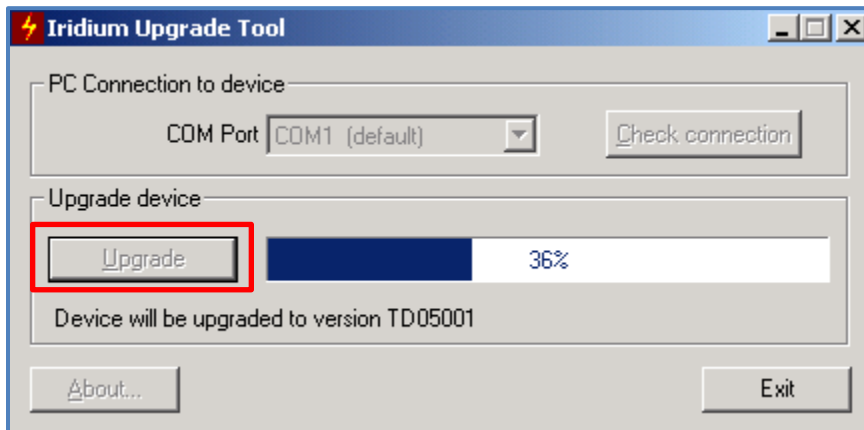
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7. The following window should appear. If a failure message appears, recheck the connections, power-cycle and try again. Click .



8. Click . Progress will be indicated as shown in the following two figures.



9. After the download completes (around 2 minutes), click .



Note:

It is not necessary to close and re-launch the Upgrade Tool if re-flashing additional devices.

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10 Appendix A – Glossary of terms

DTE	Data Terminal Equipment
FA	The Field Application software running on the DTE.
GSS	Gateway SBD Subsystem
MO	Mobile Originated (Iridium network) – messages that are sent from the modem.
MT	Mobile Terminated (Iridium network) – messages that are sent to the modem.
N/C	No Connect
SBD	Short Burst Data
SSD	SBD Subscriber Device

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