



**ISBD-1 / ISBD-1-B /
ISBD-1-O / ISBD-1-N**

OPERATIONS & MAINTENANCE MANUAL

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1. Introduction

The *Iridium* satellite constellation consists of 66 low earth orbit (LEO) satellites operating as a full mesh network with multiple spare backups. It is the largest commercial satellite constellation in the world. The constellation is owned and operated by *Iridium Communications Inc.* It provides data and voice coverage spanning the **entire** surface of the earth.

Sutron's ISBD-1 is an Iridium Short Burst Data transceiver. The product operates on the Iridium network to provide two way communications with remote stations anywhere in the world. Whether in the middle of the ocean or the top of the remotest mountain, the ISBD-1 can provide you with data how and when you want it. Iridium SBD is a low cost service perfect for sending small amounts of data to and from remote stations. Typical SBD messages range in size from 10 to 200 bytes. Iridium can also send longer messages by splitting the long message into multiple shorter messages. Iridium has a low cost charge per byte making it affordable to add communications to most any remote station.

Each Iridium transceiver can be configured to provide data to up to 5 destinations via e-mail or directIP. This allows the central collection of data from stations located anywhere in the world. One of those destinations can be Sutron's own hosting center called SutronWIN. When a customer uses SutronWIN, Sutron handles all the work to receive process, store, and display the data. Sutron offers SBD services both with and without SutronWIN support.

The ISBD-1 has been integrated into many Sutron loggers including the Monitor, 8310 and Xpert. The integration includes control of the transmission schedule and data formatting. The integration includes diagnostics for making test transmissions and receiving messages. With its small size, Iridium can fit inside most any product. Sutron also offers a variety of antenna and cabling to use with the ISBD-1.

This document will guide the user through the steps to install and use the *ISBD-1* with Sutron data loggers, as well as provide some troubleshooting when problems occur.

Features

- Pole to Pole global coverage
- SBD (Short Burst Data) communications protocol
- Fully integrated into many Sutron loggers
- Data delivered via e-mail or direct IP
- Low cost data plans available from Sutron
- Web hosting available from Sutron
- Multiple power input options via a 2-pin power connector or a single RS-232 port for data and power
- GPS feed through connector for shared antenna
- LEDs to indicate idle, standby and network connectivity status.
- Two-way communications – collect data and make remote changes
- Small equipment size – fits in tight spaces
- Small antennas – easy to conceal

2. Quick Start

Unpacking

Remove the ISBD-1 / ISBD-1-B / ISBD-1-O / ISBD-1-N unit from the shipping container and visually inspect the unit for signs of damage during shipment. Report any such damage to the factory immediately to ensure a prompt response and resolution. Retain one shipping container in the event a factory return is necessary.

Please note that if a return is required, a return material authorization (RMA) number is required. To get this RMA number, call the Sutron Customer Service Department at 703 406 2800.

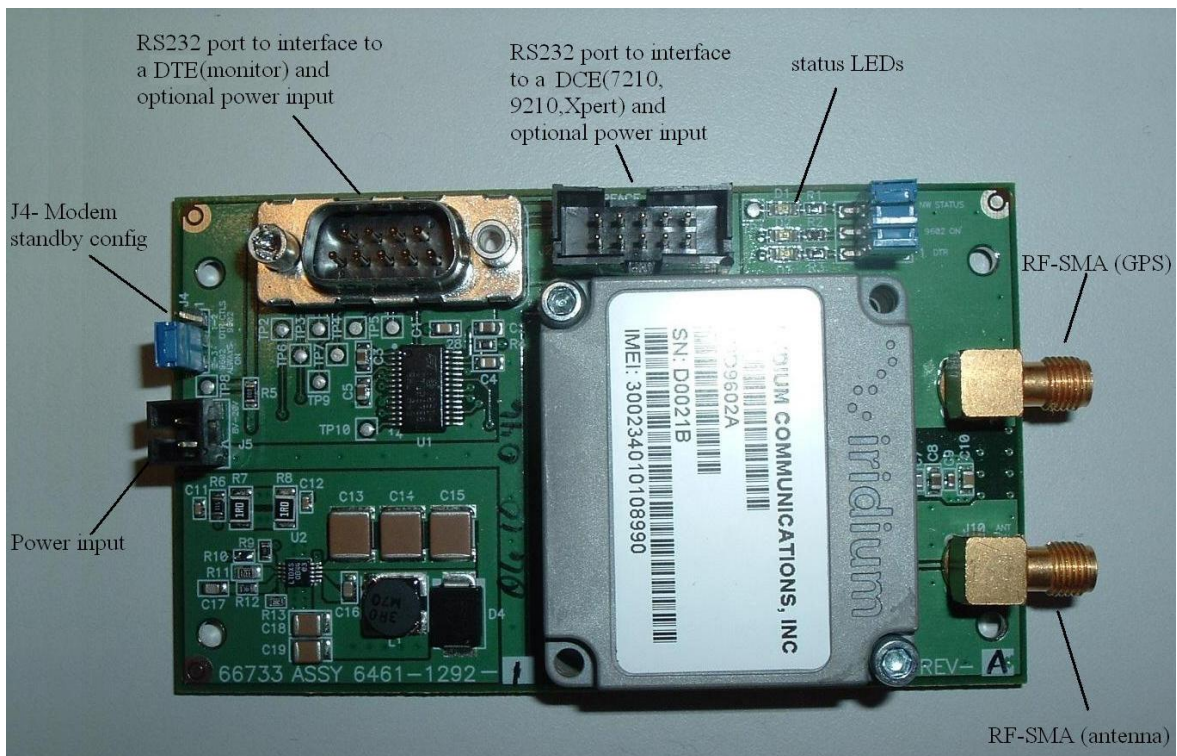


Figure 1- Interior showing all relevant parts.

Hardware description

This section describes the various connections for power input, Standby mode configuration and data communication with the modem.

Power

The modem requires a dc power supply in the range of 8-20v for proper functioning. Power can be applied either to pin # 2 of the 2-pin power input connector or pin # 9 of the DB9 connector or pin # 8 of the shrouded 2x5 connector. The pin configurations for different power input options are illustrated in figure 2. . If the modem is powered by the 9210/ Xpert/ 8310 through the DB9 connector please ensure that the jumper settings on the data logger are appropriately configured to output 12v.

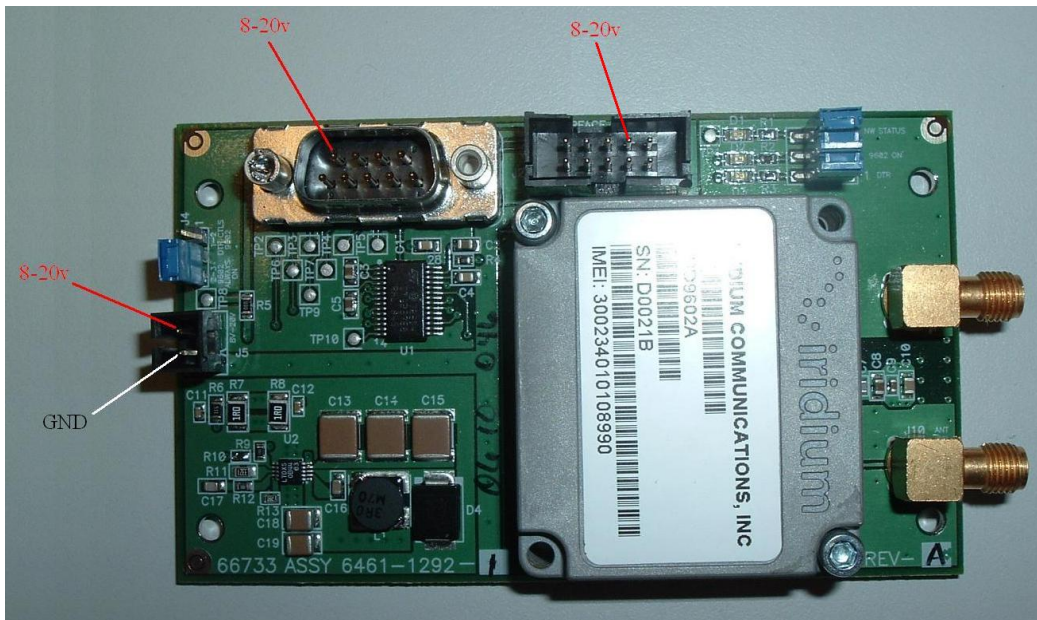


Figure 2 – Power Input Options

RS232 Connection

The transceiver interfaces with the outside world using the standard RS232 protocol. A standard DB9 (Figure 3) connector is provided for interfacing with DTE devices like a PC, SDR or Monitor.

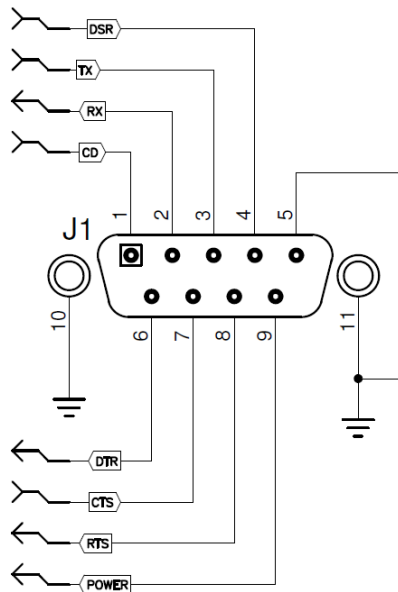


Figure 3: DB9 connector pin out

Alternately the transceiver can directly interface with a DCE ([9210](#), [XPert](#), [8310](#)) via the 2x5 shrouded connector (Figure 4).

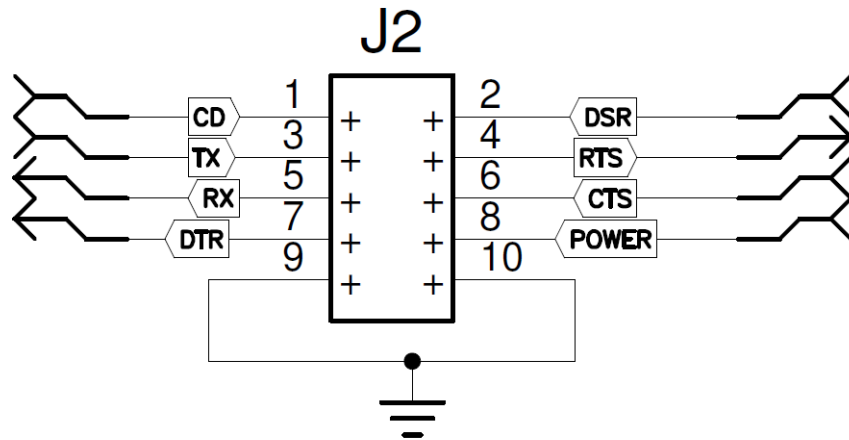


Figure 4 – 2x5 Shrouded connector pin out

Figure 5 shows a cable adapter (Sutron part # 6411-1524-1) that can be used to interface with a 9210/Xpert or 8310.



Figure 5 – Cable adapter to interface with a 9210/Xpert/8310

Standby Mode jumper

Jumper J4 can be used to configure the modem to enter *standby* mode whenever DTR is not asserted or always stay ON regardless of the status of the DTR pin.

Jumper position	Description
1-2	DTR controls modem active/standby mode. Use this option only if DTR is will be asserted by the Host.
2-3	The modem never enters standby regardless of status of DTR

When in standby mode the modem is not associated with the Iridium network and draws about 1mA current. The red LED will be ON to indicate that the modem is in standby mode. In standby mode, the modem will not receive or respond to any commands send over the RS232 port or be able to receive rings or messages from the Iridium network. For all practical purposes the modem can be considered to be powered OFF in the standby mode. However the GPS bypass option will still be available in standby mode. Please refer to the [Iridium 9602 SBD](#)

[Transceiver Developer's Guide](#) for a detailed description of this functionality. If the host is not configured or capable of asserting DTR, pins 2-3 of the jumper should be shorted.

Status LEDs

Three LEDs have been provided to provide an easy and quick indication of the modem status. The following table provides a description of the LEDs and their description.

	Description
Red (Standby Indicator)	Modem is in standby mode.
Orange (9602 ON)	The modem is in the active mode and is actively trying to join or has joined the Iridium network. The Green LED will give more information about the actual network status.
Green (Network Stat)	The modem has successfully joined the network and is ready for transmission and reception

Either the RED or the Orange LED will always be ON at anytime regardless of any setting/s or status etc. Both LEDs can never be ON at the same time, as one indicates standby status while the other indicates active status. If neither is ON please check the power input connections.

Antenna

Two RF-SMA connectors have been provided. An Iridium-band antenna should be connected to the connector labeled 'ANT'. The antenna should have the following characteristics.

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

The second RF connector labeled 'GPS' is a pass-through connection from the antenna path and is provided for GPS receivers who wish to share the main Antenna. The transceiver will activate the GPS pass-through path if it detects a DC voltage (greater than 1.2v) on the centre pin of the GPS connector. The path loss is approximately 3dB in the receive direction from the ANT to GPS. The output return loss is about -8dB. The GPS path is available if the transceiver is in the standby mode. The GPS connector can be left un-terminated if not used.

Activation

The Iridium modem must be activated with Sutron and the Iridium system before it can be used. Before activating a modem, you will need to have a service agreement in place with Sutron. In the service agreement, you agree to be responsible for any charges incurred by the modem and also acknowledge that there is no service guarantee. When you activate a modem, you will need to provide the following information:

- Type of plan: Obyte plan or 12KB plan
- Delivery options: (e-mail address, directIP, SUTRONWIN)

Ring alerts:yes

Once you activate the modem, you will be responsible for the monthly charge and any additional data charges.

Setup

Connect the transceiver as indicated above. Ensure that the Standby mode jumper mode is consistent with the host's hardware / operation and that the antenna connector is snugly tightened. Also ensure that unit is powered either by the host through a RS232 port or through the 2-pin external power connector. The default baud rate for communication is 19200 bps.

After turning on the power either the Red or the Orange LED should be ON. Once the host asserts DTR the Red LED should be OFF and the Orange LED should be ON. The Green LED will be OFF while the transceiver attempts to join the Iridium Network. Once the transceiver has successfully joined the network the Green LED will be ON to indicate that the transceiver is ready to send and receive SBD messages.

Testing communication

Connect the transceiver to one of the COM ports of the data logger (9210, Xpert, 8310). Use a terminal tool like hyper-terminal (default = 115200 baud, 8 data bits, No Parity, 1 stop bit, no hardware handshaking.) to communicate with the data-logger. Once connected to the logger will display a prompt **\Flash Disk>** to indicate that it is ready. All commands must be terminated with a carriage return character (Enter Key). Send a command **"Passthru COM2:19200"** to bypass all commands to directly to the transceiver. Please not if using a different COM port use the appropriate COM port number in the **Passthru** command. The logger should respond with **"Passthru operation has begun (press ESC ESC ESC to abort)"** to indicate that it has successfully initiated bypass mode. Sequentially issue command the commands from the table below

Command	Response	Notes
AT	OK	If the transceiver does not respond, ensure that the orange LED is ON else DTR is not being asserted by the host.
AT+CSQ	+CSQ:<rsqi>	If rssi = 0, check antenna connection, move to an open space with unblocking view of the sky.
AT+SBDREG?	+SBDREG:<status>	status: 0 - Detached 1 - Not registered 2 - Registered 3 - Registration denied 4 - Unknown
AT+SBDWT=Test Sutron Iridium	OK	Test message written to internal buffer
AT+SBDIX	+SBDIX:<MO_status>,<MOMSN>,<MTstatus>,<MTMSN>,<MT length>,<MT queued>	MO_status: 0 - message transferred successfully. 1 - Message transferred successfully, but the message in the queue was too big to be transferred.

		<p>2 - Message transferred successfully, but the requested Location Update was not accepted.</p> <p>3..4 - Reserved, but indicate session success if used.</p> <p>5..8 - Reserved, but indicate session failure if used.</p> <p>10 - Gateway reported that the call did not complete in the allowed time.</p> <p>11 - Message queue at the Gateway is full.</p> <p>12 - Message has too many segments.</p> <p>13 - Gateway reported that the session did not complete.</p> <p>14 - Invalid segment size.</p> <p>15 - Access is denied.</p>
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3. Troubleshooting and Maintenance

Troubleshooting

The following checklist will help in troubleshooting problems:

Problem	Possible Cause
Red LED always ON	Standby jumper configured to enter standby mode when DTR is not asserted and DTR is de-asserted. Ensure that host asserts DTR or move jumper to always ON position.
Green LED is OFF / blinking.	Ensure that the transceiver is not in standby mode, Check Antenna connection. Ensure that the antenna has unobstructed view of the sky.
No response from transceiver	Ensure that transceiver is not in standby mode (Red LED should be OFF). Ensure that correct baud rate is set and that the correct connector (DB9 or 2x5 shrouded) is being used.

Maintenance

Maintenance of the unit should be performed at regular intervals which are dependent upon the conditions of use. Typical maintenance for the unit consists of checking the wiring to make sure it is not corroded or frayed and examining the unit to ensure that there is no physical damage.

APPENDIX A SPECIFICATIONS

Mechanical

Dimensions	4.00" x 2.35" with mounting holes 1.7"x3.625"
Weight	80gms
RS232 Connector	DB9 M (DCE) and 2x5 Shrouded, 0.1 inch spacing
Antenna Connector	SMA Female
Power Connector	pin 9 of RS232 or 2 pin molex
Enclosure	optional

Electrical

Input Voltage	8v-20VDC @0.6amp max
Power Consumption @12v	Avg During Tx - 130 mA Idle (Connected to Network) - 29 mA Standby - 1mA
Status LED	Red - Standby Yellow - Connecting Green - Connected to Network

Iridium Transceiver

FCCID	TBD
Frequency	1618 to 1626.5MHz
SBD Mobile Originated	340 bytes max
SBD Mobile Terminated	270 bytes max

Environmental

Operating Temperature	-40 to +60°C
Operating Humidity	<75% RH

Ordering Information

<u>Transceiver</u>	
ISBD-1	Iridium [®] SBD TX/RX, no enclosure
ISBD-1-B	ISBD-1 with panel bracket
ISBD-1-O	ISBD-1 with non-NEMA enclosure
ISBD-1-N	ISBD-1 with NEMA enclosure (available 2011)

<u>Iridium Service</u>	
ISBD.SACT	Station Activation
ISBD0K.1	OK bytes SBD per month, 1 month
SBD12K.1	12K bytes SBD per month, 1 month
ISBD12K.12	12K bytes SBD per month, 12 months
ISBD0K.1WIN	OK bytes SBD per month, 1 month with SutronWIN data hosting
ISBD12K.1WIN	12K bytes SBD per month, 1 month with SutronWIN data hosting
ISBD12K.12WIN	12K bytes SBD per month, 12 months with SutronWIN data hosting
ISBD.XB1024	Charge for 1024 bytes SBD over allotted amount
ISBD.MC	Mailbox checks when not transmitting data (1 free per day)

<u>Iridium Accessory Equipment</u>	
1291-1031-T-G	Iridium Helix Antenna, TNC, Green
Iridium Helix Antenna, TNC, Green	Iridium Helix Antenna, TNC, White
1291-1032-T-W	1291-1032-T-W
LL400-15-S-T	LL400-15-S-T
LL400-15-S-T	LL400-15-S-T
LL400-15-S-T	LL400-15-S-T
LL400-15-S-T	LL400-15-S-T
LL400-20-N-T	Antenna Cable, LL400, 20 feet, N-TNC
6411-1524-1	DB9-Male to 2x5 Header adapter cable.

APPENDIX B

SUTRON CUSTOMER SERVICE POLICY

Dear Customer:

Thank you for making the important decision to purchase Sutron equipment. All Sutron equipment is manufactured and tested to the highest quality standards as set by Sutron's Quality Assurance Department. Our Customer Service Representatives have years of experience with equipment, systems, and services. They are electronic technicians with field and applications experience, not just with a technical background.

Customer Phone Support

Customer Service Representatives routinely handle a wide variety of questions every day. If questions arise, please feel free to contact me or one of the Customer Service Representatives. We are available from 8:00 am to 5:00 pm Monday through Friday and will be happy to take your call.

We can answer most sensor and interface questions on the first call. If we cannot quickly answer a question on an interface, we will work with you until we find a solution.

Sometimes a problem is application related. Although we pride ourselves on handling 95% of application related questions over the phone, we maintain constant contact with our Integrated Systems Division and Engineering Division for additional assistance.

Introductory Training

Training is an important part of the Sutron Customer Service philosophy. The Sutron training policy is simple---If you buy Sutron equipment, you get Sutron training! Without the proper training, you cannot take advantage of the benefits and advantages that Sutron equipment provides. We often supply on-site introductory training at your facility for no charge. You provide the classroom, students, equipment, and coffee---we'll provide the instructor.

On-Site Visits

Of course not all problems can be fixed over the phone. Sometimes a customer needs an on-site technician to identify site related problems or troubleshoot a network. Sutron can provide these services at a reasonable cost. Call for details. If you would like to learn more about Sutron products email sales@sutron.com

Thanks again for your order,

Paul Delisi
Customer Service Manager
Sutron Corporation

APPENDIX C

COMMERCIAL WARRANTY POLICY

Sutron Manufactured Equipment

THE SUTRON CORPORATION WARRANTS that the equipment manufactured by its manufacturing division shall conform to applicable specifications and shall remain free from defects in workmanship and material for a period ending two years from the date of shipment from Sutron's plant.

Sutron's obligation under this Warranty shall be limited to repair at the factory (22400 Davis Drive, Sterling, VA 20164), or at its option, replacement of defective product. In no event shall Sutron be responsible for incidental or consequential damages, whether or not foreseeable or whether or not Sutron has knowledge of the possibility of such damages. This warranty shall not apply to products that have been damaged through negligence, accident, misuse, or acts of nature such as floods, fires, earthquakes, lightning strikes, etc.

Sutron's liability, whether in contract or in tort, arising out of warranties or representations, instructions or defects from any cause, shall be limited exclusively to repair or replacement parts under the aforesaid conditions.

Sutron requires the return of the defective electronic products or parts to the factory to establish claim under this warranty. The customer shall prepay transportation charges to the factory. Sutron shall pay transportation for the return of the repaired equipment to the customer when the validity of the damage claim has been established. Otherwise, Sutron will prepay shipment and bill the customer. All shipments shall be accomplished by best-way surface freight. Sutron shall in no event assume any responsibility for repairs or alterations made other than by Sutron. Any products repaired or replaced under this warranty will be warranted for the balance of the warranty period or for a period of 90 days from the repair shipment date, whichever is greater. Products repaired at cost will be warranted for 90 days from the date of shipment.

Non- Sutron Manufactured Equipment

The above Warranty applies only to products manufactured by Sutron. Equipment provided, but not manufactured by Sutron, is warranted and will be repaired to the extent of and according to the current terms and conditions of the respective equipment manufacturers.

Repair And Return Policy

Sutron maintains a repair department at the factory, 22400 Davis Drive, Sterling, VA 20164. Turn around time normally ranges from 10-30 days after Sutron receives equipment for repair. **Call Customer Service at (703) 406-2800 for a Return Material Authorization (RMA) number.** Return the defective equipment to the factory, transportation charges paid.

Extended Warranty and On-Site Maintenance

Extended warranty and on-site maintenance contracts are available. Price quotations may be obtained from Sutron customer service representatives.

APPENDIX D

AT COMMAND REFERENCE

D AT Command Set Description

This section specifies the AT Commands supported by the Transceiver. Informative examples are presented in Section 8. The ISBD-1 is compatible with all previous Iridium transceivers with the exception of +CCLK. The +CCLK command is still supported but the value returned is now the Iridium system time while the 9601 returned its internal “real time clock” time. A new AT command has been added for the ISBD-1, +SBDGW and it returns the default gateway on which the modem is programmed to operate.

The ISBD-1 is configured and operated through the use of AT commands. Only AT Commands that are relevant to the ISBD-1 are included. AT Commands related to functionality of the 9522 and 9522A LBTs are not included. Note that Commands may be modified, removed or added and that you should not rely on this document as a definitive statement of the functionality of the commercial ISBD-1 Transceiver. This document will be periodically updated to reflect the addition, deletion or modification of AT Commands. Product Developers should also consult the software release notes for the version of software that is physically loaded on the ISBD-1 used in applications under development. Such release notes are made available to authorized Iridium VARs and VAMs on the Iridium Developer Extranet. It is the responsibility of Product Developers to check compatibility of applications software with the AT Commands on all ISBD-1s used for both development and commercial deployments.

Product Developers should also consult the “Iridium Short Burst Data Service Developers Guide” in addition to the Commands stated herein. That guide provides significant additional information that will aid in Product Developers understanding of the Iridium system.

D.1 *AT – Attention Code*

This is the prefix for all commands except A/. When entered on its own, the ISBD-1 will respond OK.

D.2 *A/ - Repeat Last Command*

Repeat the last command issued to the ISBD-1 unless the power was interrupted or the unit is reset. A/ is not followed by <CR>.

D.3 *En – Echo*

Echo command characters.

- 0 Characters are not echoed to the DTE.
- 1 Characters are echoed to the DTE (default).

D.4 *In – Identification*

Requests the ISBD-1 to display information about itself.

- 0 "2400" (for compatibility only)
- 1 "0000" (for compatibility only)
- 2 "OK" (for compatibility only)
- 3 "XXXXXXXX" (Software revision level)
- 4 "IRIDIUM 9600 Family" (Product description)
- 5 "8816" (for compatibility only)
- 6 "XXX" (Factory identity)
- 7 "XXXXXXXX" (Hardware specification)

D.5 Qn – Quiet Mode

Control ISBD-1 responses.

- 0 ISBD-1 responses are sent to the DTE (default).
- 1 ISBD-1 responses are NOT sent to the DTE.

D.6 Vn – Verbose Mode

Set the response format of the ISBD-1, which may be either numeric or textual.

- 0 Numeric responses.
- 1 Textual responses (default).

D.7 Zn – Soft Reset

Reset the ISBD-1's data port to a user-stored configuration that has been previously stored using &Wn.

- 0 Restores user configuration 0.
- 1 Restores user configuration 1.

D.8 &Dn – DTR Option

Set the ISBD-1 reaction to the DTR signal.

- 0 DTR is ignored. A DTR signal input is not needed when set to &D0.
- 1-3 DTR must be ON. If DTR transitions from ON to OFF, the data port will be locked after approximately 10 seconds to enter the UART test mode. The data port will resume when DTR is restored to ON. There is no distinction between settings 1-3. (Default is 2)

D.9 &Fn – Restore Factory Settings

Recall factory default configuration without resetting the data port.

- 0 Recall factory default 0.

D.10 &Kn – Flow Control

Select the flow control method between the ISBD-1 and DTE. Flow control is only applied to the transfer of SBD message data; it does not apply to AT commands and their responses.

- 0 Disables flow control.
- 3 Enables RTS/CTS flow control (default).

D.11 &V – View Active and Stored Configuration

View the current active configuration and stored profiles.

D.12 &Wn – Store Active Configuration

Store the active profile in non-volatile memory. This is used to store user configurations for later use.

- 0 Store current (active) configuration as profile 0.
- 1 Store current (active) configuration as profile 1.

D.13 &Yn – Designate Default Reset Profile

Select profile for use after power-up.

- 0 Select profile 0 (default).
- 1 Select profile 1.

D.14 %R – Display Registers

Display all the S-registers in the system.

D.15 *F – Flush to EEPROM

Flush all pending writes to EEPROM, shut down the radio, and prepare the ISBD-1 to be powered down. The command returns OK upon completion, at which point it is safe to remove the power without losing non-volatile data.

Note: This command stops the ISBD-1 from responding to any more commands, but does not actually power it down. The only way to power down the ISBD-1 is for the FA to remove the power or to de-assert the on/off control line.

Note: After an SBD session, the new SBD MOMSN is always flushed to EEPROM before the +SBDI result is issued.

D.16 *Rn – Radio Activity

Control radio activity.

- 0 Disable radio activity.
- 1 Enable radio activity (default).

- ▶ While the radio is disabled:
- ▶ SBD sessions can not be initiated; they will fail immediately.
- ▶ No SBD Automatic Notifications will be issued for automatic-MT messages.
- ▶ No registration, i.e. location updates will be performed.

- ▶ The baseband circuitry is still active and the ISBD-1 still accepts AT commands.

This command allows the FA to reduce detectable emissions from the RF circuitry during the idle periods between SBD sessions, and also provides some, limited, power saving in cases where it may be inconvenient for the FA to power down the ISBD-1.

D.17 +CCLK – Real time clock

Exec Command: +CCLK

Query the ISBD-1 for Iridium system time if available.

D.18 +CGMI – Manufacturer Identification

Exec Command: +CGMI

Query the ISBD-1 manufacturer.

D.19 +CGMM – Model Identification

Exec Command: +CGMM

Query the ISBD-1 model.

D.20 +CGMR – Revision

Exec Command: +CGMR

Query the ISBD-1 revision.

D.21 +CGSN – Serial Number

Exec Command: +CGSN

Query the ISBD-1 IMEI.

D.22 +CIER – Indicator Event Reporting

Set Command: +CIER=[<mode>[,<sigind>[,<svcind>]]]

The set command enables or disables sending of the +CIEV unsolicited result code from the ISBD-1 to the DTE in case of indicator state changes. <mode> controls the processing of the +CIEV unsolicited result codes.

<mode>:

- 0 Disable indicator event reporting; do not send +CIEV unsolicited result codes to the DTE; buffer the most recent indicator event for each indicator in the ISBD-1 (default).
- 1 Enable indicator event reporting; buffer the most recent +CIEV unsolicited result code for each indicator when the data port is reserved (e.g. in SBD data mode) and flush them to the DTE after reservation; otherwise forward them directly to the DTE.

<sigind>:

Control reporting of "signal quality" indicator changes:

- 0 No "signal quality" indicator reporting.
- 1 Enable "signal quality" indicator reporting using result code
+CIEV:0,<rssi>
where <rssi> is:
 - 0 Equivalent to 0 bars on the signal strength indicator
 - 1 Equivalent to 1 bars on the signal strength indicator
 - 2 Equivalent to 2 bars on the signal strength indicator
 - 3 Equivalent to 3 bars on the signal strength indicator
 - 4 Equivalent to 4 bars on the signal strength indicator
 - 5 Equivalent to 5 bars on the signal strength indicator

The reported signal strength is the same value that would be returned by the +CSQ command. When enabled, the signal quality indicator is reported only when the signal strength changes.

<svcind>:

Control reporting of "service availability" indicator changes:

- 0 No "service availability" indicator reporting.
- 1 Enable "service availability" indicator reporting using result code
+CIEV:1,<value>
where <value> is:
 - 0 Network service is currently unavailable.
 - 1 Network service is available.

Network service availability is equivalent to a signal strength greater than 0. The service availability indicator provides a way for the FA to wait until the ISBD-1 can start an SBD session without receiving continual notifications of changes in signal strength.

Read Command: +CIER?

Query the current indicator event reporting settings. The response is of the form:

+CIER:<mode>,<sigind>,<svcind>,<antind>

Where <antind> is not used and is included for compatibility only.

Test Command: +CIER=?

List the supported settings. The response is in the form:

+CIER:(supported <mode>s),(supported <sigind>s),(supported <svcind>s)
,(supported <antind>s)

Note: In <mode> 1, the DTE may miss some indicator state changes if they occur while the data port is reserved. However, the buffering mechanism ensures that the *most recent* change for each indicator during reservation will be flushed to the DTE after reservation; thus the DTE is always made aware of the latest state of each indicator.

Note: The DTE may initiate an SBD session even if service is unavailable; in this case, the ISBD-1 makes an immediate search for the network and, if successful, starts the SBD session, otherwise the SBD session fails.

D.23 **+CRIS – Ring Indication Status**

Exec Command: +CRIS

Query the ring indication status, returning the reason for the most recent assertion of the Ring Indicator. The response contains separate indications for telephony and SBD ring indications.

The response is in the form:

+CRIS:<tri>,<sri>

where <tri> indicates the telephony ring indication status (for compatibility):

0 No telephony ring alert received.

and <sri> indicates the SBD ring indication status:

0 No SBD Ring Alert received.

1 SBD Ring Alert received.

Note: The <tri> response is included for compatibility with 9522A applications. The results in the <tri> response should be ignored for ISBD-1 applications. For the ISBD-1 only the <sri> response should be evaluated.

D.24 **+CSQ – Signal Quality**

Exec Command: +CSQ[F]

Execution command returns the received signal strength indication <rssi> from the ISBD-1. Response is in the form:

+CSQ:<rssi>

where:

<rssi>:

0 Equivalent to 0 numbers displayed on the signal strength indicator.

1 Equivalent to 1 number displayed on the signal strength indicator.

2 Equivalent to 2 numbers displayed on the signal strength indicator.

3 Equivalent to 3 numbers displayed on the signal strength indicator.

- 4 Equivalent to 4 numbers displayed on the signal strength indicator.
- 5 Equivalent to 5 numbers displayed on the signal strength indicator.

Test Command: +CSQ=?

List the supported signal strength indications. The response is in the form:

+CSQ:(supported <rssi>s)

Each number represents about 2 dB improvement in link margin over the previous value. A reading of 0 is at or below the minimum receiver sensitivity level. A reading of 1 indicates about 2 db of link margin. A reading of 5 indicates 10 dB or more link margin. These are not calibrated output and provides relative information about the units receive signal, and not an absolute receiver level or even a calibrated signal to noise ratio.

Note: A signal strength response may not be immediately available, but will usually be received within two seconds of issuing the command. If the ISBD-1 is in the process of acquiring the system, a delay in response of up to 50 seconds may be experienced.

Note: The +CSQF form of the command returns immediately, reporting the last known calculated signal strength. Note that the signal strength returned by this command could be different from the current actual signal strength if the +CSQ form is used. This form is included for Product Developer application compatibility as it provides a Fast response

D.25 +CULK – Unlock

Exec Command: +CULK=<unlock key>

Unlock the Transceiver after it has been locked by the Gateway. The unlock key must be obtained by contacting Iridium's customer support.

<unlock key>:

0000000000000000 .. FFFFFFFFFFFFFFFF
A string of 16 hexadecimal digits.

While the Transceiver is locked, it is unable to perform any SBD sessions. Any attempts to start a session will return an error code indicating that the Transceiver is locked.

Command Response:

+CULK:<status>

where:

<status> indicates the lock status of the Transceiver following the unlock attempt:

- 0 Unlocked – Transceiver is not locked and is permitted to perform SBD sessions.
- 1 Locked – Transceiver is locked and unable to perform SBD sessions. It must be unlocked by supplying the correct unlock key to the +CULK command.
- 2 Permanently locked – Transceiver is locked and unable to perform SBD sessions. It cannot be unlocked and must be returned to the supplier.

Read Command: +CULK?

Query the current lock status of the Transceiver. The response is of the form:

+CULK:<status>

<status>:

- 0 Unlocked
- 1 Locked
- 2 Permanently locked

D.26 +GMI – Manufacturer Identification

Exec Command: +CGMI

Query the ISBD-1 manufacturer.

D.27 +GMM – Model Identification

Exec Command: +CGMM

Query the ISBD-1 model.

D.28 +GMR – Revision

Exec Command: +CGMR

Query the ISBD-1 revision.

D.29 +GSN – Serial Number

Exec Command: +CGSN

Query the ISBD-1 IMEI.

D.30 +IPR – Fixed DTE Rate

Set Command: +IPR=<rate>

Set the data rate at which the ISBD-1 will accept commands. The change in data rate takes into effect after the result code (e.g., OK) is received by the DTE.

where:

<rate>:

- 1 600 bps
- 2 1200 bps
- 3 2400 bps
- 4 4800 bps
- 5 9600 bps
- 6 19200 bps (default)
- 7 38400 bps

- 8 57600 bps
- 9 115200 bps

Read Command: +IPR?

Query the current data rate. The response is in the form:

+IPR:<rate>

Test Command: +IPR=?

List the supported data rates. The response is in the form:

+IPR:(supported <rate> settings)

D.31 +SBDWB – Short Burst Data: Write Binary Data to the ISU

Exec Command: +SBDWB=<SBD message length>

This command is used to transfer a binary SBD message from the DTE to the single mobile originated buffer in the ISBD-1. The mobile originated buffer can contain only one message at any one time.

- ▶ Once the command is entered, and the message length is acceptable, the ISBD-1 will indicate to the DTE that it is prepared to receive the message by sending the ASCII encoded string "READY<CR><LF>" (hex 52 45 41 44 59 0D 0A) to the DTE.
- ▶ The <SBD message length> parameter represents the length, in bytes, of the SBD message not including the mandatory two-byte checksum.
- ▶ The maximum mobile originated SBD message length is specified at 340 bytes. The minimum mobile originated SBD message length is 1 byte. If the <SBD message length> parameter is out of range, the ISBD-1 issues response 3 (see below).
- ▶ Once the DTE receives the READY indication from the ISBD-1, the SBD message must be sent from the DTE formatted as follows: **{binary SBD message} + {2-byte checksum}**
- ▶ The checksum is the least significant 2-bytes of the summation of the entire SBD message. The high order byte must be sent first. For example if the DTE were to send the word "hello" encoded in ASCII to the ISBD-1 the binary stream would be hex 68 65 6c 6c 6f 02 14.
- ▶ The mobile originated buffer will be empty upon power-up.
- ▶ If any data is currently in the mobile originated buffer, it will be overwritten.

Command Response:

- 0 SBD message successfully written to the ISBD-1.
- 1 SBD message write timeout. An insufficient number of bytes were transferred to ISBD-1 during the transfer period of 60 seconds.
- 2 SBD message checksum sent from DTE does not match the checksum calculated by the ISBD-1.

- 3 SBD message size is not correct. The maximum mobile originated SBD message length is 340 bytes. The minimum mobile originated SBD message length is 1 byte.

D.32 **+SBDRB – Short Burst Data: Read Binary Data from the Module**

Exec Command: +SBDRB

This command is used to transfer a binary SBD message from the single mobile terminated buffer in the ISBD-1 to the DTE. The mobile terminated buffer can contain only one message at any one time.

- ▶ The SBD message is transferred formatted as follows: **{2-byte message length} + {binary SBD message} + {2-byte checksum}**
- ▶ The {2-byte message length} field represents the length, in bytes, of the SBD message not including the length field or the mandatory two-byte checksum. The high order byte will be sent first.
- ▶ The maximum mobile terminated SBD message length is length is specified at 270 bytes (and may be increased following actual performance testing).
- ▶ The checksum is the least significant 2-bytes of the summation of the entire SBD message. The high order byte will be sent first. For example if the ISBD-1 were to send the word “hello” encoded in ASCII to the DTE the binary stream would be hex 00 05 68 65 6c 6c 6f 02 14.
- ▶ If there is no mobile terminated SBD message waiting to be retrieved from the ISBD-1, the message length and checksum fields will be zero.
- ▶ The mobile terminated message buffer will be empty upon power-up.

Command Response:

There are no response codes generated by the ISBD-1 for this command.

D.33 **+SBDWT – Short Burst Data: Write a Text Message to the Module**

Exec Command: +SBDWT[=<text message>]

This command is used to transfer a text SBD message from the DTE to the single mobile originated buffer in the ISBD-1.

The text message may be entered on the command line:

- ▶ For example, “AT+SBDWT=hello”.
- ▶ The length of <text message> is limited to 120 characters. This is due to the length limit on the AT command line interface.
- ▶ The message is terminated when a carriage return is entered.

Alternatively, the text message may be entered separately:

- ▶ Upon entering the command “AT+SBDWT”, the ISBD-1 will indicate to the DTE that it is prepared to receive the message by sending the string “READY<CR><LF>” (hex 52 45 41 44 59 0D 0A) to the DTE.
- ▶ Once the DTE receives the READY indication, the text message must be sent, terminated by a carriage return.
- ▶ The length of the text message entered in this way is limited only by maximum mobile-originated SBD message length of 340 bytes.
- ▶ The mobile originated buffer will be empty upon power-up.
- ▶ If any data is currently in the mobile originated buffer, it will be overwritten.

Command Response:

For the “AT+SBDWT” form:

- 0 SBD message successfully written to the ISBD-1.
- 1 SBD message write timeout. An insufficient number of bytes were transferred to ISBD-1 during the transfer period of 60 seconds.

For the “AT+SBDWT=<text message>” form:

- OK: SBD message successfully stored in mobile originated buffer.
- ERROR: An error occurred storing SBD message in mobile originated buffer.

D.34 +SBDRT – Short Burst Data: Read a Text Message from the Module

Exec Command: +SBDRT

This command is used to transfer a text SBD message from the single mobile terminated buffer in the ISBD-1 to the DTE. This command is similar to +SBDARB but does not provide a length indicator or checksum. The intent of this command is to provide a human friendly interface to SBD for demonstrations and application development. It is expected that most usage of SBD will be with binary messages.

- ▶ Once the command is entered, the SBD message in the mobile terminated buffer is sent out of the port.
- ▶ This command is similar to +SBDARB except no length or checksum will be provided.
- ▶ The maximum mobile terminated SBD message length is 270 bytes.
- ▶ The mobile terminated message buffer will be empty upon power-up.

Command Response:

+SBDRT:<CR> {mobile terminated buffer}

D.35 +SBDI – Short Burst Data: Initiate an SBD Session

Note: The +SBDI command is provided for backwards compatibility with existing FAs which do not use SBD Automatic Notification functionality. For SBD calls invoked with this command:

- ▶ The SBD Session Type is fixed at type 0 – MO call.
- ▶ The SBD Delivery Short Code will be the value specified by the +SBDDSC command.
- ▶ The Detach/Attach flag is fixed at the Detach setting.
- ▶ The Location Update flag is fixed at the No Update setting.

FAs requiring SBD Automatic Notification functionality should use the extended +SBDIX command.

Exec Command: +SBDI

This command initiates an SBD session between the ISBD-1 and the GSS. If there is a message in the mobile originated buffer it will be transferred to the GSS. Similarly if there is one or more messages queued at the GSS the oldest will be transferred to the ISBD-1 and placed into the mobile terminated buffer.

- ▶ The message, if any, in the mobile originated buffer will be sent from the ISBD-1 to the GSS.
- ▶ If there is a MT-SBD message queued at the GSS it will be transferred to the ISBD-1 and placed into the mobile terminated buffer.

Command Response:

+SBDI:<MO status>,<MOMSN>,<MT status>,<MTMSN>,<MT length>,<MT queued>

where:

<MO status>:

MO session status provides an indication of the disposition of the mobile originated transaction. The field can take on the following values:

- 0 No SBD message to send from the ISBD-1.
- 1 SBD message successfully sent from the ISBD-1 to the GSS.
- 2 An error occurred while attempting to send SBD message from ISBD-1 to GSS.

<MOMSN>:

The Mobile Originated Message Sequence Number (MOMSN) is a value assigned by the ISBD-1 when sending a mobile-originated message to the GSS. This value is incremented each time an SBD session is successfully completed between the ISBD-1 to the GSS. This wrap around counter can range from 0 to 65535.

<MT status>:

The MT status provides an indication of the disposition of the mobile terminated transaction. The field can take on the following values:

- 0 No SBD message to receive from the GSS.
- 1 SBD message successfully received from the GSS.
- 2 An error occurred while attempting to perform a mailbox check or receive a message from the GSS.

<MTMSN>:

The Mobile Terminated Message Sequence Number (MTMSN) is assigned by the GSS when sending a message to the ISBD-1. This value is indeterminate if the field <MT status> is zero. This wrap around counter can range from 0 to 65535.

<MT length>:

The MT length is the length in bytes of the mobile terminated SBD message received from the GSS. If no message was received, this field will be zero.

<MT queued>:

MT queued is a count of mobile terminated SBD messages waiting at the GSS to be transferred to the ISBD-1.

D.36 **+SBDDDET – Short Burst Data: Detach**

Exec Command: +SBDDDET

Initiates an SBD session to stop sending SBD Ring Alerts to the Transceiver from the Gateway (detach).

Command Response:

+SBDDDET:<status>,<error>

where:

<status>:

- 0 Detach successfully performed
- 1 An error occurred while attempting the detach

<error>:

Gateway-reported values

- 0 No error.
- 1..4 Reserved, but indicate success if used.
- 5..14 Reserved, but indicate failure if used.
- 15 Access is denied.

Transceiver-reported values

- 16 Transceiver has been locked and may not make SBD calls (see +CULK command).
- 17 Gateway not responding (local session timeout).
- 18 Connection lost (RF drop).
- 19..31 Reserved, but indicate failure if used.
- 32 No network service, unable to initiate call.
- 33 Antenna fault, unable to initiate call.
- 34 Radio is disabled, unable to initiate call (see *Rn command).
- 35 Transceiver is busy, unable to initiate call (typically performing auto-registration).
- 36.. Reserved, but indicate failure if used.

This command instructs the GSS to stop sending SBD Ring Alerts (detach) for the calling Transceiver. Successful completion of the detach command implies that the GSS has performed the requested detach action and the Transceiver will no longer receive any notifications of queued MT Messages from the GSS. This session does not transfer any MO or MT messages.

Note: A user can send an MO-SBD message and request a detach at the same time by using the +SBDI command. The +SBDI command always requests a detach.

D.37 +SBDDSC – Short Burst Data: Delivery Short Code

Set Command: +SBDDSC=<dsc>

Set the Delivery Short Code (DSC), which provides some additional options for control of MT messages. This is an 8-bit value providing the ability to set individual fields. Value 0x80 (hexadecimal) sets the most significant bit. Value 0x01 sets the least significant bit. Flag values can be added together to achieve a combination of settings. Some fields may be “locked” when the Transceiver is in a special mode (e.g. Autoregistration locks the flag values 0x80 and 0x40).

<dsc>:

0x00 to 0xFF DSC to be used for subsequent uploaded messages (0x00 is default)

0x80 Hold MT message delivery

0x40 Leave MT message in queue after delivery

Read Command: +SBDDSC?

Query the current Delivery Short Code. The response is of the form:

+SBDDSC:<dsc>

D.38 +SBDIX – Short Burst Data: Initiate an SBD Session Extended

Note: The +SBDIX command must be used in place of the +SBDI command for FAs wishing to make use of SBD Automatic Notification functionality.

Exec Command: +SBDIX[A][=<location>]

This command initiates an SBD session between the ISBD-1 and the GSS, setting the SBD Session Type according to the type of command +SBDIX or +SBDIXA, Delivery Short Code according to the value specified by the +SBDDSC command, and the type of location according to whether the optional location value is provided. If there is a message in the mobile originated buffer it will be transferred to the GSS. Similarly if there is one or more MT messages queued at the GSS the oldest will be transferred to the ISBD-1 and placed into the mobile terminated buffer.

- ▶ The message, if any, in the mobile originated buffer will be sent from the ISBD-1 to the GSS.
- ▶ If there is a MT message queued at the GSS it will be transferred to the ISBD-1 and placed into the mobile terminated buffer.
- ▶ This command will always attempt an SBD Network Registration, consisting of attach and location update, during the SBD session in order to support SBD Automatic Notification. If this is not desired, the +SBDI command should be used.
- ▶ The FA should append an „A” to the command, i.e. +SBDIXA, when the SBD session is in response to SBD Ring Alert. If this option is not used, more than one SBD Ring Alert may be received.

<location> has format:

[+|-]DDMM.MMM,[+|-]dddmm.mmm

where:

DD	Degrees latitude (00-89)
MM	Minutes latitude (00-59)
MMM	Thousandths of minutes latitude (000-999)
ddd	Degrees longitude (000-179)
mm	Minutes longitude (00-59)
mmm	Thousandths of minutes longitude (000-999)

The optional sign indicators specify latitude North (+) or South (-), and longitude East (+) or West (-). If omitted, the default is +.

For example,

AT+SBDIX=5212.483,-00007.350

corresponds to 52 degrees 12.483 minutes North, 0 degrees 7.35 minutes West.

Note: The <location> feature is a future capability and has not been implemented.

Command Response:

+SBDIX:<MO status>,<MOMSN>,<MT status>,<MTMSN>,<MT length>,<MT queued>

where:

<MO status>:

MO session status provides an indication of the disposition of the mobile originated transaction. The field can take on the following values:

Gateway-reported values

- 0 MO message, if any, transferred successfully.
- 1 MO message, if any, transferred successfully, but the MT message in the queue was too big to be transferred.
- 2 MO message, if any, transferred successfully, but the requested Location Update was not accepted.
- 3..4 Reserved, but indicate MO session success if used.
- 5..8 Reserved, but indicate MO session failure if used.
- 10 Gateway reported that the call did not complete in the allowed time.
- 11 MO message queue at the Gateway is full.
- 12 MO message has too many segments.
- 13 Gateway reported that the session did not complete.
- 14 Invalid segment size.
- 15 Access is denied.

Transceiver-reported values

- 16 Transceiver has been locked and may not make SBD calls (see +CULK command).
- 17 Gateway not responding (local session timeout).
- 18 Connection lost (RF drop).
- 19..31 Reserved, but indicate MO session failure if used.
- 32 No network service, unable to initiate call.
- 33 Antenna fault, unable to initiate call.
- 34 Radio is disabled, unable to initiate call (see *Rn command).
- 35 Transceiver is busy, unable to initiate call (typically performing auto-registration).
- 36.. Reserved, but indicate failure if used.

<MOMSN>:

The Mobile Originated Message Sequence Number (MOMSN) is a value assigned by the ISBD-1 when sending a mobile-originated message to the GSS. This value is incremented each time an SBD session is successfully completed between the ISBD-1 to the GSS. This wrap around counter can range from 0 to 65535.

<MT status>:

The MT status provides an indication of the disposition of the mobile terminated transaction. The field can take on the following values:

- 0 No MT SBD message to receive from the Gateway.
- 1 MT SBD message successfully received from the Gateway.
- 2 An error occurred while attempting to perform a mailbox check or receive a message from the Gateway.

<MTMSN>:

The Mobile Terminated Message Sequence Number (MTMSN) is assigned by the GSS when forwarding a message to the ISBD-1. This value is indeterminate if the field <MT status> is zero. This wrap around counter can range from 0 to 65535.

<MT length>:

The MT length is the length in bytes of the mobile terminated SBD message received from the GSS. If no message was received, this field will be zero.

<MT queued>:

MT queued is a count of mobile terminated SBD messages waiting at the GSS to be transferred to the ISBD-1.

D.39 +SBDMTA – Short Burst Data: Mobile-Terminated Alert

Set Command: +SBDMTA=<mode>

Enable or disable the ISU to listen for SBD Ring Alerts.

<mode>:

- 0 Disable SBD Ring Alert indication
- 1 Enable SBD Ring Alert ring indication (default)

When SBD Ring Alert indication is enabled, the ISBD-1 asserts the RI line and issues the unsolicited result code SBDRING when an SBD Ring Alert is received.

Read Command: +SBDMTA?

Query the current ring indication mode. The response is of the form:

+SBDMTA:<mode>

Test Command: +SBDMTA=?

List the supported mode settings. The response is of the form:

+SBDMTA:(supported <mode> settings)

Note: There are a number of required steps in both the ISU and the GSS in order to successfully enable SBD Automatic Notifications. Consult the SBD Developers Guide section on Automatic Notifications for Mobile Terminated Messages.

D.40 +SBDREG – Short Burst Data: Network Registration

Exec Command: +SBDREG[=<location>]

Triggers an SBD session to perform a manual SBD Network Registration.

This command initiates an SBD session to perform a manual SBD Network Registration, consisting of an attach and location update. The session type will be set to 2 – registration. This session does not transfer any MO or MT message(s).

Note: The Transceiver restricts the number of manual and automatic registrations to one every 3 minutes. Successive attempts within 3 minutes will return an error code indicating that the FA should try later (see error 36 below).

Note: A user can send an MO SBD message and perform a SBD Network Registration at the same time by using the +SBDIX command. The +SBDIX command always performs a SBD Network Registration attempt and should be used for an application requiring SBD Automatic Notification. The +SBDI command never includes an SBD Network registration and should be used for an application that does not require SBD Automatic Notification.

Note: If you are not using MT-SBD messages there is no requirement or benefit to using this command.

<location> has format:

[+|-]DDMM.MMM,[+|-]dddmm.mmm

where:

DD	Degrees latitude (00-89)
MM	Minutes latitude (00-59)
MMM	Thousandths of minutes latitude (000-999)
ddd	Degrees longitude (000-179)
mm	Minutes longitude (00-59)
mmm	Thousandths of minutes longitude (000-999)

The optional sign indicators specify latitude North (+) or South (-), and longitude East (+) or West (-). If omitted, the default is +.

For example,

AT+SBDIX=5212.483,-00007.350

corresponds to 52 degrees 12.483 minutes North, 0 degrees 7.35 minutes West.

Note: The <location> feature is a future capability and has not been implemented.

Command Response:

+SBDREG:<status>,<reg err>

where:

<status> indicates the resulting registration status of the Transceiver:

- 0 Detached – Transceiver is detached as a result of a successful +SBDEET or +SBDI command.
- 1 Not registered – Transceiver is attached but has not provided a good location since it was last detached.
- 2 Registered – Transceiver is attached with a good location. Note that this may be the case even when the most recent attempt did not provide a good location.
- 3 Registration denied – The gateway is denying service to the Transceiver.

<reg err>:

Gateway-reported values

- 0 No error.
- 2 Session completed but the requested Location Update was not accepted.
- 3..14 Reserved, but indicate Location Update failure if used.
- 15 Access is denied.

Transceiver-reported values

- 16 Transceiver has been locked and may not make SBD calls (see +CULK command).
- 17 Gateway not responding (local session timeout).
- 18 Connection lost (RF drop).
- 19..31 Reserved, but indicate failure if used.
- 32 No network service, unable to initiate call.
- 33 Antenna fault, unable to initiate call.
- 34 Radio is disabled, unable to initiate call (see *Rn command).
- 35 Transceiver is busy, unable to initiate call (typically performing auto-registration).
- 36 Try later, must wait 3 minutes since last registration.
- 37.. Reserved, but indicate failure if used.

Read Command: +SBDREG?

Query the current SBD registration status of the Transceiver. The response is of the form:

+SBDREG:<status>

<status>:

- 0 Detached
- 1 Not registered
- 2 Registered
- 3 Registration denied
- 4 Unknown

The SBD Network Registration status is stored in Transceiver non-volatile memory, and can therefore be queried by the FA after powering up. Note that if the Transceiver is powered off and then moved any significant distance (> 150Kilometers) that the location information will be incorrect when the Transceiver is subsequently powered on. It is recommended that Product Developers initiate a SBD Network Registration following power on if the application is using Mobile Terminated Messages in conjunction with SBD Ring Alerts.

Note: There are a number of required steps in both the ISU and the GSS in order to successfully enable SBD Automatic Notifications. Consult the SBD Developers Guide section on Automatic Notifications for Mobile Terminated Messages.

D.41 **+SBDAREG – Short Burst Data: Automatic Registration**

Set Command: +SBDAREG=<mode>

Set the Transceiver's automatic SBD Network Registration mode.

<mode>:

- 0 Disable Automatic SBD Network Registration (default)
- 1 Set the Automatic SBD Network Registration mode to "Automatic"
- 2 Set the Automatic SBD Network Registration mode to "Ask"

When Automatic SBD Network Registration is enabled, mode 1 or 2, the Transceiver monitors its current location and triggers an Automatic SBD Network Registration when it determines that the Transceiver has moved sufficiently far away from its last registered location. Note that Automatic SBD Network Registration runs only while the Transceiver is attached to the gateway, i.e. the registration status is "Not registered" or "Registered".

A registration status is "Not registered" when the modem has not yet attempted communications with the gateway. The registration status is "Registered" when (1) the device has been provisioned and (2) is ready to communicate and (3) if the Ring Alert has been configured then the application will get notification of messages waiting for subscriber terminated delivery. If a registration is denied the device is prohibited from communications on the network (most likely a provisioning issue.) If in a detached state

the unit will not receive ring alerts. This may be due to unknown location at the gateway or because the unit has been reconfigured to not receive alerts.

Automatic SBD Network Registration may only be used with system-provided location. If the FA is providing its own location (e.g. GPS) and the FA should use the manual SBD Network Registration command, +SBDREG.

Upon triggering in mode 1, "Automatic", the Transceiver autonomously initiates an SBD session in order to perform a SBD Network Registration with the updated location of the Transceiver, with the session type set to 3 – auto-registration. This session does not transfer any MO or MT messages.

Upon triggering in mode 2, "Ask", the Transceiver reports to the FA that it should register with the system because the Transceiver location has changed (see <event> below); it is then the responsibility of the FA to register via +SBDREG or +SBDIX. +SBDIX allows the FA to register while including an MO message and/or retrieving an MT message that is pending at the Gateway.

When auto-registration is enabled, mode 1 or 2, the Transceiver reports relevant events to the FA by issuing an unsolicited result code +AREG:<event>,<reg error>.

<event>:

- 0 Suggest FA makes a registration attempt (mode 2 only)
- 1 Auto-registration has been performed successfully (mode 1 only)
- 2 Auto-registration has failed and will be retried after a delay (mode 1 only)

<reg error>:

Gateway-reported values

- 0 No error.
- 2 Session completed but the requested Location Update was not accepted.
- 3..14 Reserved, but indicate Location Update failure if used.
- 15 Access is denied.

Transceiver-reported values

- 16 Transceiver has been locked and may not make SBD calls (see +CULK command).
- 17 Gateway not responding (local session timeout).
- 18 Connection lost (RF drop).
- 19..31 Reserved, but indicate failure if used.
- 32 No network service, unable to initiate call.
- 33 Antenna fault, unable to initiate call.

- 34 Radio is disabled, unable to initiate call (see *Rn command).
- 35 Transceiver is busy, unable to initiate call (typically performing auto-registration).
- 36 Try later, must wait 3 minutes since last registration.
- 37.. Reserved, but indicate failure if used.

Read Command: +SBDAREG?

Query the current automatic MT registration mode. The response is of the form:

+SBDAREG:<mode>

Test Command: +SBDAREG=?

List the supported mode settings. The response is of the form:

+SBDAREG:(supported <mode> settings)

Note: There are a number of required steps in both the ISU and the GSS in order to successfully enable SBD Automatic Notifications. Consult the SBD Developers Guide section on Automatic Notifications for Mobile Terminated Messages.

D.42 +SBDD – Short Burst Data: Clear SBD Message Buffer(s)

Exec Command: +SBDD<Delete type>

This command is used to clear the mobile originated buffer, mobile terminated buffer or both.

- ▶ The <Delete type> parameter identifies which buffers are cleared.

- 0 Clear the mobile originated buffer.
- 1 Clear the mobile terminated buffer.
- 2 Clear both the mobile originated and mobile terminated buffers.

- ▶ Using this command or power cycling the ISBD-1 are the only means by which both buffers are cleared.
- ▶ The mobile terminated buffer will be cleared when an SBD session is initiated.
- ▶ Sending a message from the ISBD-1 to the ESS does not clear the mobile originated buffer.
- ▶ Reading a message from the ISBD-1 does not clear the mobile terminated buffer.

Command Response:

- 0 Buffer(s) cleared successfully.
- 1 An error occurred while clearing the buffer(s).

D.43 +SBDC – Short Burst Data: Clear SBD MOMSN

Exec Command: +SBDC

This command will clear (set to 0) the mobile originated message sequence number (MOMSN) stored in the ISBD-1.

The MOMSN is maintained even after power cycle.

Command Response:

- | | |
|---|---------------------------------------------|
| 0 | The MOMSN was cleared successfully. |
| 1 | An error occurred while clearing the MOMSN. |

D.44 +SBDS – Short Burst Data: Status

Exec Command: +SBDS

This command returns current state of the mobile originated and mobile terminated buffers.

Command Response:

+SBDS:<MO flag>,<MOMSN>,<MT flag>,<MTMSN>

where:

<MO flag>:

The MO flag indicates the existence of a message in the mobile originated buffer. The response from the ISBD-1 is one of the following numeric codes:

- | | |
|---|----------------------------------------|
| 0 | No message in mobile originated buffer |
| 1 | Message in mobile originated buffer |

<MOMSN>:

The MOMSN identifies the sequence number that will be used during the next mobile originated SBD session.

<MT Flag>:

The MT flag indicates the existence of a message in the mobile terminated buffer. The response from the ISBD-1 is one of the following numeric codes:

- | | |
|---|----------------------------------------|
| 0 | No message in mobile terminated buffer |
| 1 | Message in mobile terminated buffer |

<MTMSN>:

The MTMSN identifies the sequence number that was used in the most recent mobile terminated SBD session. This value will be -1 if there is nothing in the mobile terminated buffer.

D.45 **+SBDSX - Short Burst Data: Status Extended**

Exec Command: +SBDSX

This command returns current state of the mobile originated and mobile terminated buffers, and the SBD ring alert status.

Command Response:

+SBDSX: <MO flag>, <MOMSN>, <MT flag>, <MTMSN>, <RA flag>, <msg waiting>

where:

<MO flag>:

The MO flag indicates the existence of a message in the mobile originated buffer. The response from the ISU is one of the following numeric codes:

- 0 No message in mobile originated buffer.
- 1 Message in mobile originated buffer.

<MOMSN>:

The MOMSN identifies the sequence number that will be used during the next mobile originated SBD session.

<MT Flag>:

The MT flag indicates the existence of a message in the mobile terminated buffer. The response from the ISU is one of the following numeric codes:

- 0 No message in mobile terminated buffer.
- 1 Message in mobile terminated buffer.

<MTMSN>:

The MTMSN identifies the sequence number that was used in the most recent mobile terminated SBD session. This value will be -1 if there is nothing in the mobile terminated buffer.

<RA flag>:

The RA flag indicates whether an SBD Ring Alert has been received and still needs to be answered.

- 0 No SBD ring alert.
- 1 SBD ring alert has been received and needs to be answered.

Note: The RA flag is set whenever the ISU receives an SBD Ring Alert; this happens even if the +SBDMTA setting specifies that SBD ring indications are disabled.

The RA flag is cleared only on successful completion of an SBD mailbox check, i.e. an SBD session invoked with +SBDI[X[A]] in which the returned MT status indicates that no error occurred.

The value of the RA flag is stored in non-volatile memory so it is preserved across power cycling of the ISU.

<msg waiting>:

The message waiting flag indicates how many SBD Mobile Terminated messages are currently queued at the gateway awaiting collection by the ISU. This flag is updated after every SBD session, including +SBDI, +SBDIX, +SBDIXA, and +SBDREG.

D.46 +SBDTC – Short Burst Data: Transfer MO Buffer to MT Buffer

Exec Command: +SBDTC

This command will transfer the contents of the mobile originated buffer to the mobile terminated buffer. Product Developers of DTE can use this command to test reading and writing to the ISBD-1 without actually initiating SBD sessions with the ESS.

Command Response:

The command produces a response of the form “SBDTC: Outbound SBD copied to Inbound SBD: size = <size>” followed by “OK”, where:

<size>: The length of the message in bytes.

D.47 +SBDGW – Short Burst Data: Gateway

Exec Command: +SBDGW

This command will read back the Iridium gateway that the Short Burst Data messages are being sent to.

Command Response:

The command produces a response of the form “SBDGW: <Gateway>”

Where <Gateway> is either EMSS or non-EMSS.

D.48 -MSSTM – Request System Time

Exec Command: -MSSTM

Query the latest system time received from the network. The response is the form:

-MSSTM:<system_time>

<system_time> can take one of the following forms:

no network service The ISBD-1 has not yet received system time from the network.

XXXXXXXX Where XXXXXXXX is the current Iridium system time available from the network. The system time as received through the Iridium Air Interface, is a 32 bit integer count of the number of 90 millisecond intervals that have elapsed since the epoch. The return value is formatted as an ASCII hexadecimal number. The counter will rollover approximately every 12 years.

Iridium system time epoch: Mar 8, 2007, 03:50:35 (GMT):

Iridium system time source: The system time is available and valid only after the ISBD-1 has found the network and has received the Iridium system time from the network. Once the time is received, the ISBD-1 uses its internal clock to increment the counter. In addition, at least every 8 hours, or on location update or other event that requires re-registration, the ISBD-1 will obtain a new system time from the network.

Time localization: None. The system time value is always expressed in GMT time.

Resolution and accuracy: The resolution of the system time is one Iridium frame tick, or 90 ms. Accuracy as measured by the difference between the time reported and the actual time it is sent out the ISBD-1 serial port should not exceed 4 frame ticks (.36 seconds) and in most cases will be one frame tick (.09 seconds) or less.