



XI-202 IRIDIUM SATELLITE RELAY

Integrators Manual

Version 1.2
May 2014

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VERSION HISTORY

Version	Date	Description
1.0	January 2014	Original document
1.1	February 2014	Added command structure for sending messages to another SBD device.
1.2	May 2014	Clarified/corrected commands for sending messages to another SBD device

GENERAL DESCRIPTION

The XI202 Iridium Relay unit is designed to relay bidirectional RS232 level data over the Iridium Satellite network. The XI202 also comes equipped with a GPS Receiver module. It will transmit its GPS location, as well as status and health messages to a remote user over the Iridium Satellite Network, at user defined intervals.

The primary application for the XI-202 relay is to act as a communications transceiver for an external device. It is also able to act a command and control unit for other XI-202 relay devices, creating a domino control effect.

The XI-202 Relay is available as a weather tight enclosed device or as an electronics package for Original Equipment Manufacturers (OEM).

DEVICE PREPARATION

SETTING UP YOUR IRIDIUM ACCOUNT

The XI202 Relay comes equipped with a 9602 Iridium SBD Transceiver which makes use of the Iridium satellite system's (www.iridium.com) Short Burst Data (SBD) service. This service is a global, two-way, real-time, email-based data delivery service that has a maximum outbound (from beacon) message size of 340 bytes and a maximum inbound (to beacon) message size of 270 bytes.

XI202 Relay end users/integrators must set up an approved data delivery account with their preferred service provider. Xeos is an Iridium VAR and can provide Iridium service if you wish. Using our web form is a quick and easy way to setup service. It can be found at www.xeostech.com and selecting Iridium Service from the Product menu.

Setting up service requires the International Mobile Equipment Identity (IMEI) number. Each 9602 modem has a unique IMEI number that must be registered with the preferred service provider. Xeos will make these numbers available as product is delivered.

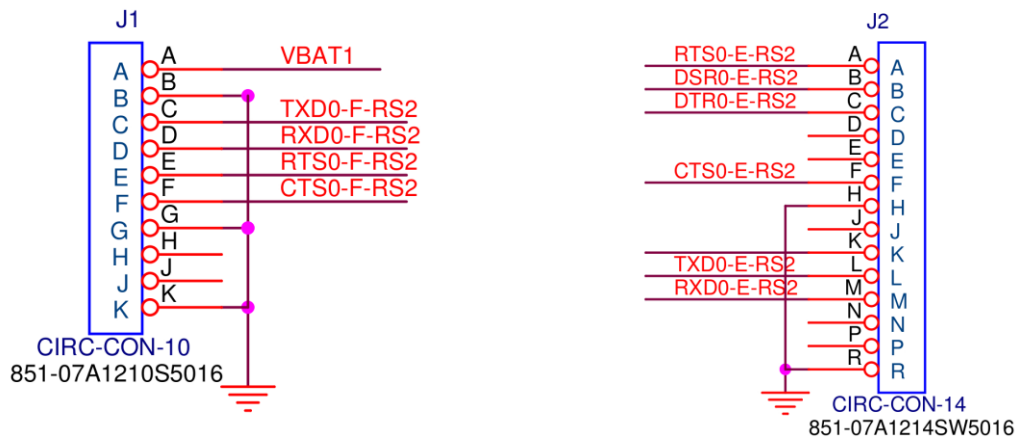
Each IMEI number is capable of being associated with up to five (5) unique email addresses. This may vary between service providers. When registering your IMEI number, please provide the service provider with the temporary Xeos testing account email address. This account is: **xeostesting@gmail.com**. Setting up this email address allows for better technical support during the initial learning period for the product. Once service is activated, please notify the technical support team.

While any email application can be used to send and receive messages to the XI202 Relay, Xeos Online is the easiest way to manage and monitor multiple XI202 Relay devices. The messages contain a lot of information and Xeos Online presents the information in a "readable" format and displays it on street level maps.

You are now ready to test the XI202 Relay modem.

MAKING THE CONNECTION

The front panel of the XI202 Relay has 5 connectors to connect to various devices. The USB (USBMini) is used as a diagnostic I/O port for the device. The user can set various settings on the device through this port, as well as receive diagnostic output. It is also where the device will accept firmware upgrades. The TNC and SMA connectors are for the supplied Iridium and GPS antenna respectively. These antennas must be installed in a location with a clear, unobstructed view of the sky. The 10 pin circular Sourieu connector contains the power connections, as well as serial port 2. The 14 pin circular Sourieu connector contains the serial port 1 connections. Here are the pinouts for the two connectors:



The power leads (J1A J1B) are connected to the red(+) and black() flying leads on the supplied cable. They require a DC power supply of 9V (minimum) to 22V (maximum). The supplied cables also include two DE9 connectors for RS232 level data.

DEVICE CONFIGURATION

All of the settings on the XI202 relay can be configured either by connecting the USB diagnostic port to a serial port terminal, or by sending configuration commands from a remote location over the Iridium Satellite Network.

USB DIAGNOSTIC PORT

To connect to the USB diagnostic port, you will first need to download a driver for the Silicon Labs CP2102 USB chip contained in the unit. The driver can be found here:

<http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>

After downloading and installing the driver, connect the supplied USBmini cable between the XI202 and your computer. Your computer should assign the XI202 a COM port number, that will show up as "Silicon Labs....." under ports in the Windows Device Manager.

To communicate with the XI202 you will need a serial port terminal program. We recommend uCon, it can be found here: http://www.umonfw.com/releases/ucon_install.exe

The port settings for the XI202 are:

Baud Rate: 57.6K
Data Bits: 8
Parity: None
Stop Bits: 1
All flow control disabled.

After connecting to the device with your terminal, you can issue a “\$h” to return a list of available commands on the device. This document will review only the commands necessary for proper device configuration.

CONFIGURATION COMMANDS

The only settings the end user will likely need to configure are

- the GPS Interval Time
- Iridium Message Check Timer
- Status Message Time
- Serial Port Used
- Serial Port Baud Rate

To retrieve a table of the current settings, issue the following command:

\$settings 2

TIMER INTERVALS

There are 3 timer intervals that can be configured by the end user:

GPS TIMER INTERVAL

GPS interval timer is how often the unit will attempt to attain its current GPS position and store it in memory. This timer can range from 5 minutes to 1 day. The default is 1 hour. To change this timer, issue the following command:

\$cfg tGPS *interval*

The variable *interval* is the new timer interval, expressed in days, hours, or minutes. For example, 3 hours would be entered as 3h. This command accepts “m” as minutes, “h” as hours and “d” as days.

To configure the GPS timer to gather a position every 10 minutes, issue the following command:

\$cfg tGPS 10m

IRIDIUM MESSAGE CHECK TIMER

The Iridium message check timer is how often the unit will connect to the Iridium Satellite Network to check for new incoming messages. During the same call, the GPS positions stored in memory will be transmitted. Therefore it is recommended that the GPS interval timer is set to a smaller interval, or the same interval, as that of the Iridium Message Check Timer. This timer can range from 5 minutes to 1 day. The default is 1 hour.

Following the same format as above, the Iridium message check timer can be changed by issuing the following command:

\$cfg tIRD *interval*

The variable *interval* is the new timer interval, expressed in days, hours, or minutes. For example, 3 hours would be entered as *3h*. This command accepts “m” as minutes, “h” as hours and “d” as days.

To configure the Iridium Message Check timer to transmit every 30 minutes, issue the following command:

\$cfg tIRD 30m

STATUS MESSAGE TIMER

The status message timer determines how often the unit will send out a message containing the status and health of the XI202 Relay. The message contains:

- the battery voltage
- temperature (internal)
- maximum GPS SNR value
- number of GPS satellites in view
- GPS statistics
- Iridium Statistics
- Total data received by the device from the RS232 ports

This timer can range from 30 minutes to 2 days. The default is 6 hours.

Following the same format as the other timer commands, the status message timer can be changed by issuing the following command:

\$cfg tStat *interval*

The variable *interval* is the new timer interval, expressed in days, hours, or minutes. For example, 3 hours would be entered as *3h*. This command accepts “m” as minutes, “h” as hours and “d” as days.

To configure the Status Message timer to transmit every 12 hours, issue the following command:

\$cfg tStat 12h

SERIAL PORT CONFIGURATION

There are two main configurations the end user may want to define for the two serial ports. Only one serial port can be active to accept input and output data, at any one point in time. To configure which serial port is active issue the following command:

\$cfg serPort *number*

The variable *number* refers to the ID of the serial port being activated. The serial ports are labeled 1 and 2.

The speed of the serial port can also be configured. It defaults to 19.2K baud. To change the baud rate issue the following command:

\$cfg baud *speed*

The range of possible baud rates is 4000-115800 baud. The recommended speed is 57,600 K. The command for changing the baud rate to 57,600 k is:

\$cfg baud 57600

Note that the OEM version does not have an enclosure and specified serial ports. Serial ports correspond to the labeled DB9 connectors on the board.

REMOTE CONFIGURATION

All configurable settings can also be configured from a remote location over the Iridium Satellite Network. To send a command over the Iridium satellite network, compose a plain text file with a ".sbd" extension. In the file, type the command, the same way as you would if you were communicating through the USB diagnostic port. The command must be followed by a blank empty line in the file. An example SBD file can be found here:

<https://www.xeostech.com/sites/default/files/example.sbd>

Compose an email to be sent to "data@sbd.iridium.com" with the subject line containing only the 15 digit IMEI of the device. The body of the email is ignored. Send the created SBD file as an attachment to this email. The XI202 will receive this command file at its next Iridium Check Interval.

If you would like to retrieve the current settings table from a remote location, it is recommended that you use the "\$settings" command as opposed to the "\$settings 2" command used when communicating via USB. The "\$settings" command will return a more condensed version of the current device settings.

Using Iridium SBD Direct IP to communicate with the device is beyond the scope of this document.

For information on how to use the Xeos Online platform for sending commands or Direct IP connection, please contact activations@xeostech.com.

SERIAL RELAY

After the device is configured to your specifications, you can now use it to relay data to and from a connected RS232 device over the Iridium Satellite Network.

MOBILE ORIGINATED MESSAGES

CONFIGURING THE RS232 DEVICE

To send MO (Mobile Originated) data from the connected RS232 device via the XI-202 Relay, connect a device to the active serial port on the XI202. If you are not sure which port is active, return to the configuration section and designate an active port.

The XI202 Relay's serial ports are powered down when there is nothing connected to the serial ports. Please wait at least 100ms after connecting the RS232 peripheral before beginning to send a data stream. As a power conservation technique, power off the RS232 peripheral's serial port to trigger the XI202 to shut off its own serial port.

When configuring the RS232 device, make sure that the output from the device is properly configured. The data stream must begin with two opening angle brackets (<<) and end with two closing angle brackets (>>) anything outside the brackets will be ignored.

For example:

<<"This is a stream of data">>

DATA STREAM PARAMETERS

The upper limit on size of the data stream is 1000 Bytes by default. This can be configured to up to 5000 Bytes by issuing the following command on the diagnostic port:

\$cfg holdMax 5000

Any data streams larger than 330 Bytes will be broken up and sent in separate subsequent SBD messages.

MESSAGE FORMAT

Each SBD message will have a 10 byte starting line added by the XI202.

"DevData<CR><LF>"

After the XI202 Relay receives the ">>" characters from the RS232 port, it will send out the message(s) immediately.

For example, the RS232 sends out << SENSOR1:1231.23MHZ SENSOR2:3132.22MHZ SENSOR3:1231C
HISTORICALDATA:1231.22,34231,23132.22,536374.32,12315754564,231321,23344,27658695.534,664,342,6869796,34343,2
3.12342,3432,33432,6464,575664.342 11-11-201300:22:44 >>.

The total bytes is 241 so it can all fit in one message. The message will be structured as:

DevData<CR><LF>

**SENSOR1:1231.23MHZ SENSOR2:3132.22MHZ SENSOR3:1231C
HISTORICALDATA:1231.22,34231,23132.22,536374.32,12315754564,231321,23344,27658695.534,664
,342,6869796,34343,23.12342,3432,33432,6464,575664.342 11-11-201300:22:44**

As soon as the stream ends, as verified by the >> at the end, the Iridium modem is triggered to send the message.

SEND COMMANDS TO ANOTHER SBD DEVICE

The XI-202 Relay is also able to send commands directly to another XI-202 Relay. This is accomplished using the Iridium account and destination addresses.

To set up communication with another relay, the Iridium account of the first XI-202 Relay (A) must have as one of its destination addresses the IMEI (unique identifier for the SBD Iridium modem) of the secondary device (B). Please ensure your service provider includes the 15 digit IMEI under type SBD Device. If Xeos is your service provider, please send the request to activations@xeostech.com.

When messages are sent to relay B, they are sent to all destination addresses **including** relay B so there is no need to include the IMEI or other address information in the message. Direct IP destinations such as Xeos Online will disregard the configuration messages.

The message is constructed as follows:

<< *command to be sent* >>

The << command indicates a message to be sent. The variable, *command to be sent* is where you insert the information or command you want to send to the secondary XI-202 relay. The command is closed with >>.

For example:

<< \$cfg tGPS 10h>>

In this case, the next time the secondary device (B) is scheduled to check for incoming messages, the following message will be read and used to reconfigure itself:

\$cfg tGPS 10h

MOBILE TERMINATED MESSAGES

SEND COMMANDS TO CONNECTED PERIPHERAL VIA IRIDIUM

To send a data stream to the connected RS232 peripheral via email, compose a SBD file with the first line reading:

\$OutPort

All subsequent lines after this will be sent to the connected RS232 peripheral. There is no need for opening or closing characters. Each SBD message file has a 260 Byte limit. You can download an example SBD message here:

<https://www.xeostech.com/sites/default/files/Example2.sbd>

After the SBD file is created, send it as an email attachment to data@sbd.iridium.com with the subject line containing only the 15 digit IMEI number.

SEND COMMANDS TO CONNECTED PERIPHERAL VIA USB

The **\$OutPort** command can also be issued on the USB diagnostic port. Compose the command as follows:

\$OutPort

SENSOR1:ON

SENSOR2:OFF

SENSOR3:ON

Italicized text is only sample data to be sent. The information in italics is sent without processing over the active serial port to the RS232 device. There is no maximum byte size for messages sent via USB connection.

TEST BUTTON AND LED BEHAVIOR

When the XI202 is powered on, it will begin flashing the LEDs as described below. The LEDs will turn off by themselves after 10 minutes.

To begin the test phase, press the test button for less than one second. To reset the test status, hold the test button for longer than 1 second.

Power LED		
Behaviour	GPS Status	Iridium Status
OFF	OFF	OFF
Blink Green	OFF	ON
Blink Blue	ON	OFF
Blink Blue & Green	ON	ON
DAS LED		
Behaviour	Data Received	Data Sent
Flash Yellow	NO	NO
Green with short yellow flash	YES	NO
Solid Green	YES	YES
SAT LED		
Behaviour	GPS	Iridium
Yellow	No test done	No test done
Short double blink – Blue	Test in progress	--
Short double blink – Green	--	Test in Progress
Solid Blue	Pass test	--
Solid Green	--	Pass Test
Solid Red	FAIL	FAIL

APPENDIX 1 – COMMAND INDEX

Command	Variables	Description	Sample
\$h	N/A	Returns list of available commands	\$h
\$settings length	Length – expressed as a number <i>Null</i> – if not included, sends the condensed version 2 – Full report	Returns current settings	\$settings 2 <i>Sends a complete report of all settings and their values</i>
\$cfg tGPS interval	Interval – expressed in days, hours, or minutes Min – 5 minutes (5m) Max – 1 day (1d) Default: 1h	Changes GPS timer interval to take GPS positions on the new interval	\$cfg tGPS 5h <i>Take GPS position every 5 hrs.</i>
\$cfg tIRD interval	Interval – expressed in days, hours, or minutes Min – 5 minutes (5m) Max – 1 day (1d) Default: 1h	Changes Iridium Message Check Timer to initiate call to Iridium satellite system to check for incoming messages and send out position information on the new interval	\$cfg tIRD 12h <i>Check for messages & transmit GPS every 12 hours.</i>
\$cfg tStat interval	Interval – expressed in days, hours, or minutes Min – 30 minutes (30m) Max – 2 days (2d) Default: 6h	Changes the Status Message Timer to transmit a Status of Health message on the new interval	\$cfg tStat 1d <i>Send a Status of Health message every 1 day</i>
\$cfg serPort number	Number – 1 or 2 as per the label on the serial port intended to be active.	Changes the active serial port to the number identified in the command	\$cfg serPort 2 <i>Activates serial port number 2</i>
\$cfg baud speed	Speed – expressed in KB Min: 4000 Max: 115800 Default: 19200	Changes the baud rate of the serial port communications	\$cfg baud 57600 <i>Recommended speed – changes baud rate to 57600.</i>
<<data>>	Indicates data to be sent via Iridium	Designates information as data to be sent out via Iridium.	N/A
\$cfg holdMax number	Number – corresponds to the maximum size of a data stream, expressed in bytes Max: 5000 bytes (5000) Default: 1000	Defines the maximum data stream size to be transmitted.	\$cfg holdMax 3000 <i>Defines maximum data stream as 3000 bytes which would be broken into approx. 9 messages</i>
\$OutPort command	Command – data or instructions to be sent to the serial port (and its RS232 device) Max: Via Iridium, 260 bytes	Indicates all following bytes to be sent to active serial port.	N/A
<< command>>	Command – command to be sent to second XI-202 relay Max: Via Iridium, 260 bytes	Indicates to be sent via Iridium to the second XI-202 Relay identified as a destination address on the Iridium account.	<<\$cfgSerPort2>> <i>Sends a message via Iridium to the second XI-202 Relay telling it to activate serial port number 2.</i>

APPENDIX 2 - WARRANTY, SUPPORT AND LIMITED LIABILITY

Xeos Technologies Inc. warrants the XI-202 Relay to be free of defects in material or manufacturing for a period of one year following delivery. Liability is limited to repair or replacement of the defective part and will be done free of charge.

LIMITED WARRANTY: Xeos Technologies Inc. warrants that the product will perform substantially in accordance with the accompanying written materials for a period of one year from the date of receipt.

CUSTOMER REMEDIES: Xeos Technologies Inc. entire liability and your exclusive remedy shall be at Xeos Technologies Inc. option, either (a) return of the price paid or (b) repair or replacement of the product that does not meet Xeos Technologies Inc. Limited Warranty and that is returned to Xeos Technologies Inc. with a copy of your receipt. This Limited Warranty is void if failure of the product has resulted from accident, abuse, or misapplication. Any replacement product will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer.

NO OTHER WARRANTIES: Xeos Technologies Inc. disclaims all other warranties, either express or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the product or the accompanying written materials. This limited warranty gives you specific legal rights. You may have others, which vary from state to state.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES: In no event shall Xeos Technologies Inc. or its suppliers be liable for any damages whatsoever (including, without limitation, damages for loss of equipment, for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of the use of or inability to use this

Xeos Technologies Inc. product, even if Xeos Technologies Inc. has been advised of the possibility of such damages.