SOUNDNINE INC

S9

*Helping build successful
monitoring systems*

Ultimodem Operating Manual

Soundnine Inc Doccument #R010Q
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Hardware

Size: 230 mm x 35 mm x 46 mm

Materals: PET & Titanium

Depth Rating: 1,000 meters

Mass: 380 grams

The Ultimodem assembled on a mooring cable is nearly concentric and will fit through a 5 cm diameter opening. Allow at least 28 cm length for the modem and mating connector.

Serviceable Parts

Battery

The modem uses a single AA 3.6V lithium battery. Saft LS14500 or equivalent. The LS14500 is rated 2.6 amp-hours, we usually de-rate to 2.0 amp hours to account for self-discharge and temperature effects.

A typical IM system sampling six times per hour will last a bit longer than one year on this battery.

O-Ring

Modem uses an x-profile double-sealing o-ring. They are available from Soundnine or McMaster-Carr. We recommend Molykote M44 lubricant on the o-ring. Excess lubricant is not desirable, use just enough to wet the surface of the o-ring on all sides.

Faceplate Screws

The faceplate and screws are titanium. Replacement screws must be titanium – use of other materials will cause significant galvanic corrosion. Replacement screws are available Soundnine or McMaster-Carr.

Faceplate

Replacement faceplates are available from Soundnine. The faceplate should be replaced if accidentally bent, scratched on the o-ring sealing surface or otherwise damaged.

Desiccant

The desiccant package should be replaced every time the housing is opened. Replacement desiccant is available from Soundnine or McMaster-Carr.

Coupler Clamp

The coupler clamp assembly both clamps the modem to the mooring line and clamps the ferrite toroid half of the IM coupler in position. This clamp must be fully closed to guarantee reliable communications. There should be no gap between the coupler clamp and the modem housing.

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The coupler clamp size must match the outer diameter of the mooring cable. Coupler clamps are available in a variety of sizes, please specify your cable outer diameter and if that diameter is a measured value or a nominal value when ordering.

Connector

The MCBH connector should be replaced only by Soundnine. Some customers may be able to perform this service, but it requires using a soldering iron next to a plastic o-ring sealing surface – this is best done with the appropriate jigs and tools to protect the sealing surface.

Replacement Parts List

Item	Description	Soundnine Part Number	McMaster-Carr Part Number
O-ring	Double-Seal X-Profile O-Ring, Buna-N, Number 032	202CA	90025K426
Desiccant	0.6"x1.1" silica gel	2039E	2189K12
Faceplate screws	2-56 x 3/8" titanium socket head cap screw	2034B	95435A219
Coupler Clamp Screws	M4-18mm Socket head cap screw, 316 stainless steel	2040A	92290A161
Coupler Clamp Screw Retainer o-ring	O-Ring, Buna-N, 1MM wide, 3MM ID,	2041F	9262K441
Faceplate	Custom machined titanium	50035	
Connector	Subconn MCBH4-M		
Coupler Clamp	Custom polyester and ferrite assembly	50036 **Specify cable diameter when ordering**	

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Power & Communication Connector

The UltiModem accepts input voltages from 3.5V to 28V. The input power is linearly regulated to 3.3V, so use the lowest available input voltage within the acceptable range to conserve power.

Power can be connected or removed at any time in normal operation[1]. There is no danger of corrupting the modem's configuration by removing power unexpectedly. If power is removed while the modem is writing to a file in flash memory then the data may not be recorded properly, but the data structure will not be corrupted.
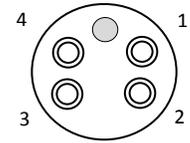
Male Face View
MCBH 4M

Signal	PCB Pin	Wire Color	MCBH4 Pin
GND	1	Black	1
+VDC	2	Green	4
Transmit Out	3	White	2
Receive In	4	Red	3

---

[1] Do not remove power when performing firmware updates.

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General Operation

The Ultimodem serves either as a 'master' modem attached to a controller / data logger controlling an IM network, as a 'slave' modem connecting a single instrument to an IM network, or as a 'peer' in a network with more symmetric operation. The same modem hardware serves all of these applications.

Operation as Master

When all communication on an IM network is initiated by a single modem, that modem may be referred to as a master. Often a modem connected to a buoy controller or data logger serves as a master.

When a modem serves as a master is should be prevented from waking from sleep in response to IM activity. Do this with the WAKEUPSRC command. WAKEUPSRC=1 prevents the modem from responding to unexpected signals on the IM network.

Operation as Slave

When all communication with a particular modem is initiated remotely that modem may be referred to as a slave. Modems connected to instruments or sensors usually serve as slaves. In most applications modems serving as slaves should be prevented from waking in response to activity on the RS232 serial port. This prevents situations where the serial instrument sends a prompt to the modem then the modem responds with a S9> prompt, resulting in an error message from the instrument, followed by an error message from the modem... creating an infinite loop wasting energy and preventing correct operation.

To prevent this, use the WAKEUPSRC command. WAKEUPSRC=2 prevents the modem from responding to unexpected signals on the RS232 serial port. This disables Host Service mode.

Operation as a Peer

When an application requires a modem to both receive transmissions initiated from a remote modem and initiate communication with remote modems it acts as a 'peer'. Peer networks are more complex because:

1. multiple devices may attempt to communicate on the IM network at the same time.
2. commands arriving from either the IM network or RS232 port may attempt to access the same modem resources at the same time. For example, reading a data file through the IM network while writing to the file on the RS232 interface.
3. data for the RS232 port (a # command) may arrive from the IM network while the modem is accepting commands on the RS232 port.

The Ultimodem supports peer operation. Peer applications require significantly more planning and testing compared to master/slave networks.

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Serial Communication

The RS232 serial interface default settings are 19200 baud, 8 bits, no parity, 1 stop bit. Note the MCBH connector pinout RX and TX lines are reversed from the most common configuration – this allows 1-1 wiring of cables connecting the UltiModem to most instruments. See the

Power & Communication Connector section for connector pin descriptions.

Operating Modes

Low Power (sleep) Mode

After a hard power-down, a PWROFF command or a timeout the modem will be in low power mode. Power consumption in sleep mode is typically 30 microamps. The modem wakes from sleep according to the WAKEUPSRC setting.

Host Service Mode

When the modem wakes in response to activity on the RS232 serial port it immediately activates host service mode. Host Service mode is disabled if the WAKEUPSRC setting is 2 (IM only). Note that Host Service mode and IM Service mode may be active simultaneously (if the WAKEUPSRC setting is 0). When starting Host Service mode the modem:

1. activates the RS232 driver
2. waits 2 milliseconds
3. clears the receive buffer -- to clear the partially received character which caused the wakeup
4. waits 10 milliseconds for the RS232 driver fully power up
5. transmits:

```
PWRUP
S9>
```

The modem is ready to accept command as soon as this prompt is transmitted.

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Returning to Sleep (Exiting Host Service Mode)

Use the SLEEP or PWROFF command to exit host service mode (these commands are identical). Modem behavior depends on the state of the modem when the command is received:

1. If IM line is captured:
    a. Send "SENDING PWROFF" to RS232 serial port
    b. Send PWROFF to the IM network.
    c. Wait for the PWROFF command to be transmitted
    d. Wait 10 milliseconds
    e. Disable the IM transmitter
    f. Wait another 10 milliseconds
2. Send "SLEEP" to the RS232 serial port
3. Disable serial output
4. Enter sleep mode if IM Service mode not active

Forcing Sleep Mode

The operator can force the modem to enter sleep mode (regardless of any other active modes) with the RESET command.

IM Service Mode

The modem enters IM Service mode in response to activity on the IM network. When IM Service mode is active the modem can receive and reply to commands from the IM network. IM Service mode is disabled if the WAKEUPSRC setting is 1 (RS232 only). Note that Host Service mode and IM Service mode may be active simultaneously (if the WAKEUPSRC setting is 0).

Commands

Commands are not case sensitive. They must be terminated by a carriage return character (CR, 0x0D). If a line feed (LF, 0x0A) follows the carriage return character it will be ignored.

Status Commands

GETCD

Displays modem configuration.

```
S9>GETCD
<Config type='Ultimodem' mid='09P' v='0'>
<Hardware>
  <Assembly>14032-1</Assembly>
  <Firmware>ULTIMODEM V0.6B</Firmware>
</Hardware>
<Settings>
  baud=19200
  mod=1200 baud@4.8k (1)
  id=02
```

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```
  group=0
  wakeupsrc=IM & RS232 (0)
  hostPrompt=S>
  cmdTO=60
  asyncRx=1
  telMode=1
  hostWakeup=2
  termFromHost=13
  termToHost=254
  thost0=0
  thost1=5
  thost2=3000
  thost3=12000
  thost4=500
  thost5=5
  tmodem2=500
  tmodem3=18000
  icd=1
  echo=1
</Settings></Config>

OK; 0 Events
S9>
```

GETSD

Displays modem status. This includes the battery voltage. Note the battery voltage may be low or zero when the modem is powered externally.

```
S9>GETSD
<Status type='Ultimodem' mid='09P' v='0'>
<DataBuffer>
  nextWrite=0
  transmitted=0
  notTransmitted=0
</DataBuffer>
  Vbat=1.555
    IM IDLE
    RS232 ACTIVE
</Status>

OK; 0 Events
S9>
```

GETEC

Displays event counters. Event counters are a useful debugging tool for S9. Most events to not indicate a problem. If you are concerned about events recorded on your modem please feel free to forward the GETEC response to S9.

```
S9>
<EventData>
numEvents = 1
nextAddr = 1040
   0, EA73, ../../Usart2.c:66-1
</EventData>
```

In the example above the event was Usart2.c, line 66. This means a framing error on the RS232 serial port input.

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VER

Displays modem hardware and firmware version. Note the HTYPE (hardware type) is different for OEM modems (14032-1) vs modems in housings (15011-1).

```
S9>VER
HTYPE 14032-1
CD AB0B0AE0, 12000002
CODE TYPE ULTI A
FIRM ULTIMODEM V0.6B
CDATE Feb  1 2016 14:37:24

OK; 0 Events
S9>
```

Configuration Commands

Modem configuration is extremely important. An improperly configured modem may seem unresponsive to either the RS232 port or the IM network. Use GETCD to retrieve the modem's configuration settings.

The name of each configuration setting is also a command to modify that setting. For example, the THOST1 setting can be changed with:
```
THOST1 100
```
or
```
THOST1=100
```

Refer to Configuration Settings for a full list of settings.

SETDEFAULTS

This command resets all modem configuration to default values.

Utility Commands
TXTEST

Supported in IM Service mode only. This transmits a series of characters as a communications test.

PWROFF or SLEEP

Terminates the current mode (IM Service or Host Service) allowing the modem to return to low-power sleep mode.

RESET

Forces a full reset (like a reboot). This forces the modem to return to low-power sleep mode, abandoning all in-process activity.

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RESETEC

Resets the event counters.

File Commands

The modem has several files in flash memory (A, F, D) and one file in RAM (S). Files are identified by a single letter. Some files may be run as simple command scripts, others are reserved for data storage & transfer. Additional script files and file commands will be added soon.

Available Files

F File

The F file is used for scripts – most importantly firmware update scripts. Firmware update files are streamed to the F file, then the file is run with the RUN F command. The F file can may also be used for custom scripts where each line of the file is a modem command. Note that some commands cannot be used in scripts – check the 'blocks' section of the Complete Command Set.

D File

The D file is a 6 Mbyte circular buffer for ASCII data. It is intended for automatic data-transfer applications which are not yet fully developed.

A File

The A file is a script file used to retrieve data or perform other functions though the RS232 serial port. This file is described in more detail under Communication through remote modems to their RS232 serial ports uses the # command. In the Example Communication Session above, the line:

```
#0Atest
```

Sends the string "test" to the RS232 port of the modem with device ID=0A. Any reply from the serial port is wrapped in the <host> tags. Both the reply any errors or other communication from the remote modem are wrapped in the <Remote> tags.

Data Collection Script.

S File

The S file records data collected while the A file is running. The S file resides in RAM and can be read through the IM interface.

File Commands
WRITE

Writes data to a file.

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```
S9>write d
USE 'END S9D' OR ESCAPE TO END
this is being written to the file
USER ABORT (ESC)
OK; 0 Events
S9>
```

APPEND

Appends data to a file.

```
S9>erase a
OK; 0 Events
S9>append a this is a new line
OK; 0 Events
S9>append a this is another line
OK; 0 Events
S9>read a
<FILE>
this is a new line
this is another line

</FILE>

OK; 0 Events
S9>
```

READ

Retrieves data from a file. See example above under APPEND.

ERASE

Erases a file. See example above under APPEND.

RUN

Runs a script file.

DUMPFLASH

A utility command to retrieve the entire contents of flash memory. This allows significant data recovery if the D file is accidentally erased. This command takes about ten minutes to run.

IM Commands

CL or FCL (Capture Line)

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This captures the IM network. Only one device can transmit at a time on an IM network. CL or FCL starts transmitting a carrier signal on the IM network. This is required prior to transmitting commands to the IM network.

SWT (Send wake-up Tone)

Sends a wake-up tone to the IM network. A wake-up tone is a 4800Hz tone which triggers many IM instruments (including older instruments from Sea-Bird Electronics) to wake from their sleep modes and start listening for commands on the IM network.

MLN (Measure Line Noise)

Measures the noise on the IM line.

IMMONITOR or IMMON

Starts a monitor mode where the modem attempts to decode signals from the IM network regardless of whether any devices are transmitting. If nothing is transmitting the modem will probably send a stream of random characters – including non-ASCII characters.

Press Escape (0x1B) to exit from this mode.

XTP

Performs a single sample and retrieves data from all XTP sensors on the IM network. Press escape (0x1B) to exit this mode early. If you exit this mode early any XTP's on the IM network may still be transmitting data.

REL

Releases the IM line. This is the opposite of CL or FCL.

Communicating with Remote Devices

Communicating with other modems is currently a three-step process:

1) Capture the IM line with CL or FCL
2) Send IM commands to either remote modems (using ! commands) or through remote modems to the instruments connected to them (using # commands)
3) Release the IM line when finished

Most IM communication uses an addressing scheme where the first few characters of a transmission are the device ID (address) of the intended recipient. These address characters are followed by the data or commands to transmit. Only the modem with matching address replies.

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Example Communication Session

```
PWRUP
S9>
S9>fcl
OK; 0 Events
S9>ID?
<Remote>
 id = 0A</Remote>
<qs>4049</qs>
OK; 0 Events
S9>!0Aver
<Remote>
HTYPE 14032-1
CD AB0B0AE0, 12000002
CODE TYPE ULTI A
FIRM ULTIMODEM V0.6B
CDATE Jan 21 2016 10:29:58

OK; 0 Events; qs 11780
</Remote>
<qs>4843</qs>
OK; 0 Events
S9>#0Atest
<Remote>
 <Host>
This is the reply from the remote serial port
</Host>
</Remote>
<qs>4843</qs>
OK; 0 Events
S9>rel
OK; 0 Events
S9>sleep
```

Communicating with Remote Modems

Communication with remote modems (as opposed to serial instruments connected to those modems) uses the ! command. In the Example Communication Session above, the line:

```
    !0Aver
```

sent the VER command to the modem on the IM network with device ID=0A. The reply from modem 0A was surrounded with the <Remote> tag.

Communicating with Instruments Connected to Remote Modems

Communication through remote modems to their RS232 serial ports uses the # command. In the Example Communication Session above, the line:

```
    #0Atest
```

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Sends the string "test" to the RS232 port of the modem with device ID=0A. Any reply from the serial port is wrapped in the <host> tags. Both the reply any errors or other communication from the remote modem are wrapped in the <Remote> tags.

Data Collection Scripts

There are two types of script files. One is a command script (the F file) used for firmware updates or configuration scripts. The other is a data collection script (the A file) used to collect data from the RS232 serial port. Data collection scripts use a special limited command set. These commands are almost identical to commands used in the DANTE buoy controller to collect data from serial instruments.

When the A file script is running all data received from the serial port is recorded in the S file. Most applications run the A file then retrieve the data collected from the S file.

Data Collection Example

This is an example of running a data collection script on a remote modem and retrieving the result:

```
S9>fcl
OK; 0 Events
S>!0Arun a
<Remote>
 RUNNING PROGRAM A

OK; 0 Events; qs 11056
</Remote>
<qs>3471</qs>

OK; 0 Events
S>!0Aread s
<Remote>
<FILE id='S'>
This text was recorded from the serial port while file A script ran
</FILE>

OK; 0 Events; qs 11056
</Remote>
<qs>3636</qs>

OK; 0 Events
S9>
```

SERIAL ON

Enables the modem serial port at the specified baud rate. The baud rate may be any multiple of 1200 up to 115200.

```
SERIAL ON 9600
```

Enables the serial port at 9600 baud (8-bits, no parity, 1 stop bit, no flow control)

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SERIAL OFF

Disables the modem serial port

BINARY

Sets the modem RS232 port to operate in binary data mode (default is ASCII). In binary mode all data received from the sensor is converted to ASCII hex. Note that data is stored as ASCII hex in the data buffer, meaning number of bytes stored in the sample data buffer is twice the length of the received binary data.

ASCII

Sets the modem RS232 port to ASCII mode (default is ASCII). In ASCII mode all data sent to and received from the serial port is expected to be plain text. Non-text characters (>0x7F) may be ignored, cause events in the event counters and / or be replaced with other characters ('X', '$' or '*').

CLEARBUFFER

Clears the contents of the S file (the receive data buffer). This is intended to remove characters that result from transients on the serial data lines when a sensor is powered. Any data received before a CLEARBUFFER command is lost and not recorded in any log file.

DELAY

Waits a specified time in milliseconds, up to a maximum of 15 minutes. (15 min * 60 seconds/min*1000 milliseconds per second = 900000 milliseconds).

```
DELAY 100
```

Waits 100 milliseconds

TIMESTAMP

The TIMESTAMP command is not yet implemented.

SEND

Transmits characters to the modem serial port. Behavior of this command depends on the ASCII/Binary setting (see ASCII and BINARY commands)

ASCII Mode (default)

```
SEND "a string\r"
```

Sends 'a string' followed by carriage return (hex 0D) to the serial port.

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The maximum string length is 64 characters.

A few common character sequences are available to send special or non-printing characters to the modem serial port:

Sequence	Description	Hex Value
\r	Carriage Return	0D
\n	Line Feed	0A
\\	Front slash	2F
\"	Quote	22
\t	Tab	09

So `SEND "test\r\n"` will send 'test' followed by CR (hex 0D) and LF(hex 0A)

Binary Mode

`SEND "6120737472696E670D"`

Sends 'a string' followed by carriage return (hex 0D) to the serial port.

The maximum string length is 32 binary characters, which is 64 bytes of ASCII hex.

WAITFOR

Waits for a string to arrive on the modem serial port, with a maximum delay. If the maximum delay time is reached without receiving the target string then the modem adds 'UM-TIMEOUT' to the received data buffer and proceeds to the next line of the script. Behavior of this command depends on the ASCII/Binary setting (see ASCII and BINARY commands)

ASCII Mode

`WAITFOR "S>" 3000`

Waits for the string 'S>' for up to 3 seconds.

The maximum string length is 64 characters.

Binary Mode

`WAITFOR "533E" 3000`

Waits for the string 'S>' for up to 3 seconds. (0x53 is hex for 'S', 0x3E is hex for '>')

The maximum string length is 32 binary characters, which is 64 bytes of ASCII hex.

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Retrieving Data from XTP Sensors

XTP's are eXpendible Temperature and Pressure sensors with built-in inductive modems. XTP's use a simplified IM communication protocol with no device ID's. Use the XTP command to retrieve data from XTP sensors. The IM network must be idle for at least five seconds before sending the XTP command. The XTP command retrieves data from all XTP sensors on the IM network.

Complete Command Set

Command	Blocks	Parameters	Description
GETCD			Displays configuration settings
GETSD			Displays status data
GETEC			Displays event counters
VER			Displays hardware and firmware version
SETDEFAULTS			Resets all configuration to default values
TXTEST	RS232		Transmits a IM test string
PWROFF			Same as SLEEP. Terminates active mode (IM Service or Host Service)
SLEEP			Same as PWROFF. Terminates active mode (IM Service or Host Service)
RESETEC			Resets (clears) the event counters
RESET			Resets the modem – ending all processes and forcing return to sleep mode.
WRITE	FILE	A, F, D	Writes to a file.
APPEND	FILE	A	Appends a file
READ	FILE IM*	A, S, F, D	Reads a file. *READ S and READ A are allowed on IM interface. READ D and READ F are allowed only on serial interface.
ERASE	FILE	A, S, F, D	Erases a file
STATUS		A, S, F, D	Displays status about a file (not implemented for all files)
RUN	FILE	A, F	Runs a file as a script. RUN F runs F file as a simple command script. RUN A runs the A file as a data collection script.
DUMPFLASH	FILE IM		Outputs the entire contents of the flash memory. May take 10 minutes to complete.
FCL	IM IM ACTIVE		Same as CL. Captures the IM line.
CL	IM IM ACTIVE		Same as FCL. Captures the IM line.
SWT	IM		Sends a wake-up tone
MLN	IM IM ACTIVE		Measures noise on the IM line.
IMMONITOR (same as IMMON)	IM IM ACTIVE		Same as IMMON. Starts a monitor mode displaying all characters received from the IM network.

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IMMON (same as IMMONITOR)	IM IM ACTIVE		Same as IMMONITOR. Starts a monitor mode displaying all characters received from the IM network.
XTP	IM IM ACTIVE		Retrieves a sample from each XTP sensor on the IM network.
REL	IM		Releases the IM line
!	IM IM IDLE		Sends a command to a remote modem
!G	IM IM IDLE		Sends a group IM command to the network. There are no replies to group commands.
ID?	IM IM IDLE		Retrieves the device ID of the modem on the IM line. NOTE: this command does not work when more than one IM device is on the network!
#	IM IM IDLE		Sends a command through a remote modem to its serial port.
#G	IM IM IDLE		Sends a command through a group of remote modems to their serial ports.

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Configuration Settings

Note the name of each configuration setting is also a command to modify that setting. Use a space or = between the command and parameter value:
BAUD=19200
and
BAUD 19200
Are both acceptable.

Command	Parameter default value in ()	Description
ID	00-ZZ (01) Always two alphanumeric digits.	Modem ID for IM network.
GROUP	0-9 (0)	Group address for IM network.
WAKEUPSRC	0 (RS232 and IM) (0) 1 (RS232 only) 2 (IM Only)	Selects interfaces which can wake the modem from sleep mode
MODULATION (same as MOD)	1-4 (1)	Selects the encoding used for IM communication – this determines the speed of communication on the IM network.
MOD (same as MODULATION)		
BAUD	1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200	Baud rate for RS232 serial port.
HOSTPROMPT	11 characters max, no spaces	Prompt expected from host serial device.
CMDTO	10-300 (60) (seconds)	Time-out setting for Host Service mode. Host Service ends if no valid commands received for this length of time.
ASYNCRX	0 (off) 1 (on)	Enables/disables # commands on IM line when Host Service mode active. Only applies when WAKEUPSRC=0.
TELMODE	1 (old SBE compat) (1) 2 (IMM binary compat) 3 (max bandwidth)	Selects encoding of data on the IM network – allows full compatibility with IMMs, SIMs and instruments from SEA-Bird Electronics.
HOSTWAKEUP	0-255 (\r)	Selects action taken to wake host before forwarding data from incoming # commands. 0 - no action 1 - use IMFlag to wake host >2 – wake host with a serial break of length 10mS times HOSTWAKEUP setting. (HOSTWAKEUP=10 causes a 100mS break)
TERMFROMHOST	0-255 (0)	Selects a character from the host to trigger the end of a reply to an incoming # command. 0 – no termination character 1-253 – termination character
TERMTOHOST	0-255 (254)	Selects a character to send to the host to terminate incoming # commands. 0 – no termination character 254 – CR (0x0D) followed by LF (0x0A)
THOST0	0 – 1000	Maximum wait for host wakeup confirmation
THOST1	0-300 (5)	Delay after confirming host wakeup (in tens of milliseconds)

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THOST2	0-3000 (3000)	Maximum wait for start of host reply (in tens of milliseconds)
THOST3	100 – 18000 (12000)	Maximum host reply transmission time (in tens of milliseconds)
THOST4	5-18000 (500)	Inter-character delay timeout for host reply (in tens of milliseconds)
THOST5	5-3000 (5)	Not implemented
TMODEM2	0-3000 (500)	Max wait for start of IM reply (in Host Service mode, in tens of milliseconds)
TMODEM3	0-60000 (18000)	Max IM receive time (in Host Service mode, in tens of milliseconds)
ICD	0-50 (1)	Delay inserted between characters sent to host. Units are milliseconds.

Note: THOST, TMODEM and a few other settings are implemented with function similar to the like-named settings in Sea-Bird Electronics IMM's. This is for the convenience of customers seeking the superior performance of the UltiModem in applications already using older IM modems.

Firmware Updates

Firmware update files are text files with firmware encoded in ASCII hex. They are sent to the modem through the RS232 serial connection. Follow these steps to perform a firmware update:

1) Make sure the modem's battery has some life left in it – or connect an external power source. Firmware updates require a stable power supply.
2) Open a terminal program (we prefer TeraTerm)
3) Set the port flow control to Xon/Xoff or 'SOFTWARE HANDSHAKING' (under Setup->Serial Port in TeraTerm).
4) Press enter to get a S9> prompt from the modem. (if the WAKEUPSRC is set to 2 you need to change WAKEUPSRC to 0 using another modem)
5) Type the VER command to check the current firmware version of your modem
6) Send the firmware update file to the modem. (no encoding – in TeraTerm use File->Send File)
7) Wait for the file transmission to finish. This may take a minute or two at 19200 baud.
8) Enter the RUN F command to initiate parsing, integrity checking and device type verification. This may take 10 to 15 seconds. If the file is OK the modem will respond with:
   ```
   Confirmed – ready to program
   ```
9) Enter the PROGRAM command to start the firmware update. The firmware update takes only a few seconds. Do not disconnect power within 10 seconds of sending the PROGRAM command, doing so may corrupt the firmware and disable the controller.
10) After the firmware update completes the modem will be in sleep mode. Press a key to wake the modem and use the VER command to verify the new firmware version.

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Power Consumption

Power consumption depends significantly on operating mode. Modem current draw is not significantly affected by input voltage.

Mode	Operating Current	Notes
Low-power sleep	30 microamps	
Host Service	6 milliamps	2 mA for the modem, plus 4 mA for the RS232 driver.
IM Service, RS232 inactive (receive mode)	2 milliamps	
IM Service, RS232 active	6 milliamps	2 mA for the modem, plus 4 mA for the RS232 driver.

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