10/12/06

Version 5.5 Undocumented features

The following are commands and settings that are not documented in the Rev E Users manual.
NOTE: The commands and settings in this document have not been thoroughly tested and are not guaranteed to be bug free. Use at your own risk.

ATT1 - Return to normal operation, End AGC test (ATT2) and transmit test (ATT3).

ATT2 - Test Mode 2: Outputs the max and min AGC pointer every 1/2 second
<min AGC> - <max AGC>. To exit this mode use ATT1

ATT3 - Transmit test msg at an interval based on sregister 12 (use ATT1 to exit)
If bit 0 of Sregister 12 = 0 then interval will be 4 secs
If bit 0 of Sregister 12 = 1 then interval will be 6 secs
NOTE: Sregisters 14 on the transmitting modem must address (sregister 18) of the receiving modem. Also, this mode will end when modem goes to lowpower mode.
(set S10 to 255 to have this go on forever)

ATT4 - Puts modem in diagnostic transmit mode
The following commands are available in this mode:
P – Transmit a 3.125ms CW burst every 800ms
C – Transmit a CW tone. WARNING this should never be done at full power, or outside the frequency range of the transducer
S – Stop transmitting
F <n>K - Set the frequency to n Khz, note the default is the center frequency of the band
Ln – Set the power level. Note the setting on n are the same as sregister 6.
X – exits this diagnostic mode.

ATT5 – Similar to ATT3 except only transmits one packet

ATT6: Wake up test. The modem will go into lowpower mode, and will wake up to a one tone burst at the band center frequency. Hit any key will end this mode.

ATT7 - Fix AGC at one gain level.

ATT8 - Test the watchdog timer. Locks up software, if the watchdog is working the modem should reset in less than 5 seconds.

ATT9 – Special transmit test – similar to ATT5 but transmits multiple bit rates.

ATTA – Special transmit test – similar to ATT3 but transmits multiple bit rates.

ATC – Check mode of operation, will return either “Aquisition mode”, “receiving packet” or “Transmitting”.

ATI - Outputs version # and build date

ATES – Reboot the modem.

ATUn – Similar to the ATY command, except that it will keep repeating the test. The Remote modem can be made to stop repeating the test by sending an ATX command.

AT$Kn – Tells the remote modem at address n to generate the Break command. This command also puts the modems into online mode.

ATECn:EQ – This is a special message written to make Telesonar PC more efficient, it will return the following information from the modem at address n: Battery Voltage, # bytes stored in the datalogger, and the values of sregister 4,6,14 & 15.

ATECn:ERnnn[:mmm] –
This command reads one or more S-registers from the remote modem at address n. "nnn" is a string of 1 or more digits, indicating the first register to read. ":mmm" is an optional field (the [and] indicate optional and are not actually sent), indicating the last S-register to be read. The result will be formatted as a sequence of %04d prints, separated by spaces, with a terminating <newline>.
NOTE: The maximum number of S-registers to be read or written at one time is 32.

ATECn:EWnnn[:mmm] =xxx[yyy zzz …]\n –
This command writes one or more S-registers from the remote modem at address n. "nnn" is a string of 1 or more digits, indicating the first register to write. ":mmm" is an optional field (the [and] indicate optional and are not actually sent), indicating the last S-register to be written. After the "=" there is a list of hex values, separated by a space. Up to 4 digits (9999) are allowed (the [and] indicate optional values, in case more than one register is being written). If more values are provided than required, the extra values will be ignored. If too few values are provided, only the number of values provided will be changed. After writing the sregister this command will store all the sregisters, and read back the sregisters that were changed.
NOTE: The maximum number of S-registers to be read or written at one time is 32.

ATMn – Local command to toggle spare 1 control line. This is also the control line to active the release motor or turn or activate the burnwire circuit. Where:

n=0 Set control line to 0vdc, release off

n=1 set control line to 3.3vdc, activate release or turn on burnwire.

ATK – Local command to get the status of the CTS input. This is also the input used by the release to indicate the ARM/release status. This command returns the following messages:

"CTS=0" if the voltage of the CTS line is 0VDC
"CTS=1" if the voltage of the CTS line is greater than 1.5vdc

ATJ - Local command to get the status of the external A/D input. This is also the input used by the tilt sensor on the Smart Release. This command returns the following messages:

"TILT=0" if the voltage at J9 pin 1 is less than 1.25vdc
"TILT=1" if the voltage at J9 pin 1 is greater than 1.25vdc

AT$Nn,m – burNwire command

n - is the address of the modem
m - is the release code
The command will require the address of the modem and the release code. Once the command is received it will verify the release code. If the release code was not valid then an acknowledgment, which will display the following message:
"Invalid release code"
Otherwise it will send an acknowledgment, which will display the following message: "Valid release code-waiting for burn..."

The modem will then use the spare 1 control line to activate the circuit. It will keep the circuit on for 10 minutes. After 10 minutes the burn wire circuit will shut down. Note that during the 10 minutes that the burn wire is activated the modem will still respond to acoustic commands such as the range command and the status command.

AT%Bfreq,cmd – Send FSK command tone to Benthos release unit

freq is the frequency that the release receives on, in Hz.
cmd is a letter identifying the command tone to send, A through M.
This command takes a receive frequency and a command letter and sends an FSK command acoustically to a Benthos release unit. The duration of the tone is controlled by S-register 51, and ranges between 4 and 12 seconds with a default of 8. The frequency is specified in Hz, and must be on an even 250 Hz interval within the range 7000 to 15000. Additionally, the modem must be in "Release 7-10K", "LF", or "Release 13-15K" band. If any of these conditions is not met, an "Invalid command" response will be returned when attempting to execute the AT% command.

Acoustic command to control an output line from the modem

The spare 0 control line is on pin 7 of J8 (on Rev C board only for rev D boards …) and is normally low (0vdc). This line stays low during modem reset and initialization. This line can be commanded through either an acoustic command or a local command to go into a high state (3.3vdc).

AT$Zn,m Command to acoustically set and clear the spare 0 control line. The receiving modem will acoustically acknowledge receipt of this command.
n – Address of the modem
m – State to set the line to.
0 – set the line low (0vdc)
1- Set the line high (3.3vdc)

Command to locally set and clear spare 0 control line
ATZm
m – State to set the line to.
0 – set the line low (0vdc)
1 - Set the line high (3.3vdc)

Acoustic command to control external device enable from the modem

The external device enable control line is on pin 7 of J4 and is normally high impedance (open). This line stays open during modem reset and initialization. This line can be commanded through an acoustic command to go into an enabled (low impedance) state which will sink current from an external source.

AT$Xn,m Command to acoustically set and clear the external device enable control line. The receiving modem will acoustically acknowledge receipt of this command.
n – Address of the modem
m – State to set the line to.
0 – set the line disabled (high impedance)
1 – set the line enabled (low impedance)

Sregister 03: Host to modem baud rate
Setting bit 6 to a 1 will cause the modem to ignore the parity bit, thus allow 7 bit, odd(or even) parity, 1 stop bit to work. For example the setting for 9600, RS-232, with no echo would be S3=66.

Sregister 05: Receive mode
0 – normal,
1 – frequency hopped acquisition receive mode,
2 - same as 1, but includes bit error count of test message.

Sregister 11: Operating mode
ATS11=4 Sets software flow control (XON/XOFF), only active if there is more than 4k of data input in online mode. This change was made for the S4 current meter.

Sregister 13: For the FSI wave/current meter application set S13=18 to make the output look like the ATM-87X series. The "DATA:(#bytes):" part of the output is surpressed, so that it looks more like the ATM-87X format.

Sregister 15: Operating mode
ATS15=17 Mode used by for PSA-916/TCM2 system
This mode is very similar to s15=1, except that it looks for an * which
is the checksum of a TCM2 string, it ignores the next 4 characters, and
then asserts device enable (this is connected to a relay which switches the RX
line to the PSA-916). A #Z is sent which cause the PSA-916 to send an altimeter
reading. An 'A' (for Altimeter is output). Then anything received from the
PSA-916 is output. After the forwarding delay expires, the data is transmitted
In addition, the Device enable is unasserted, readying us for the next TCM2 string.

Factory Sregisters are sregisters 21 thru sregister 41.
ATS22? - view all factory sregisters
ATSn*m - set factory sregister n to value m.
Sregister 21: Threshold for FH acquisition and transpond tone detect Lower values will make it more prone to false detects. Note that lower values will be subject to high levels of false detects. The threshold of 120 will detect tones at a very low SNR (~3db).
DEFAULT: 120

Sregister 22: Data Truck Mode
This mode stores incoming data to the Datalogger instead of outputting it via the serial port.
0 - normal operation, all received data is output via the serial port
1 - Data Truck mode, all received data is stored in the datalogger
2 - Combined mode, received data is both stored in the data logger and output to serial port.

Sregister 23: Sets Bandwidth

S23* 1 for full Bandwidth
S23*2 for half bandwidth

Sregister 24: Sets the center frequency of the band.
The center frequency(fc) is calculated as follows: Fc = (Sregister 24 + 16) * 160.
For example some common settings:
56 = 11520hz (LF Band)
100 = 18560hz (MF band)
156 = 27520hz (HF band)
To set:
1. ATS24*<value > <enter>
2. Use the command AT&W<enter> to store value
3. Cycle power.

Sregister 25: Tracking threshold.
DEFAULT:150 (note that 0 will be no threshold and 999 will surpress all tracking)

Sregister 26: Chirp detection threshold.
DEFAULT:27

Sregister 27: 1st baud SNR threshold.
DEFAULT:28

Sregister 28: Device Enable Line Control.
0 – default and standard operation.
1-Special operation used by MBARI transpond mode, during transpond commands the device enable will be enabled (active low) at all other times the line will be in a high impedance state and also used by the Lost communication feature. This setting is also useful with device enable sync pulses (commanded with AT^T). When set to 1, the DE line will be in a high impedance state until the acoustic sync pulse command is received, during which is will pulse low impedance for a couple of milliseconds.

Sregister 29: -
0 - normal operation
1 - Modem will store all received stats, along with selected diagnostics messages.
2 – Modem will store all received data
3 – Modem will store both received data and received stats and diagnostic messages

Sregister 30 : - Used by the psk receiver to set the number of feed forward taps. Default is 8
Sregister 31 - Used by the psk receiver to set the number of feed back taps. Default is 4

Sregister 32 sets the interrogation pulse length in transpond mode. The duration is set in 10240hz samples and can range from 102 (10ms) to 256 (25ms). The default will be 10ms.

Sregister 33 sets the receive pulse length expected in transpond mode. The settings are 0 for a 12.5ms pulse and 1 for a 6.25ms pulse. If using a TR6000/TR7000 its default will be 10ms, so set this sregister to 12.5ms

Sregister 35: Enable/disable packet counter.
0 - packet counter disabled
1 - prepends a 16 bit count on all transmitted packets

Sregister 37: Datalogger mode
0 – Normal Datalogger
1 – Ring Buffer

sregsiter 39 Lost Communication Feature
If the modem does not receive an acoustic message addressed to itself within the delay set by sregister 39, then the following will occur:

a. The Device enable line will be asserted (if sregister 28 is set to 1)
b. After 125ms delay the message 0xAA 0x82 0x01 0x01 0x84 will be output.
c. Sregister 39 will be set to 0, thus turning off the lost communication feature

0 - disable the feature and values
1 to 999 will set the delay in 15 second increments.

sregsiter 40 sets the turnaround time in tenths of a ms in transpond mode. The default will be 0.0ms.

Sregister 41: Release code
This register can have a value between 0 and 999.

Sregister 42: Special diagnostic mode

Sregister 44: Configuration Code

0 – Normal modem – Battery voltage will not be monitored
1 – Modem is an SR-100, Start up message will say ”Smart Release”, Battery voltage will be periodically monitored, and when battery voltage drops below threshold, Data telemetry functions will be disabled.
2 - 1 – Modem is an SM-75, Start up message will say Smart Modem, Battery voltage will be periodically monitored, and when battery voltage drops below threshold, Data telemetry functions will be disabled.

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Sregister 51: FSK Command Tone duration

4-12 – number of seconds FSK tones sent with the AT%... command will be applied.

Sregister 4: The following are additional acoustic baud rate available

ATS4=1 :set to 80 b/s Frequency Hopping modulation
ATS4=16 :Set to 1200 Baud Hadamard
ATS4=17 :Set to 1066 baud Hadamard with 3.125ms Multipath Guard Period
ATS4=18 :Set to 600 baud Hadamard with 25ms Multipath Guard Period
ATS4=19 :Set to 600 baud Hadamard with Rate 1/2 Convolutional Code
ATS4=20 :Set to 600 Baud Hadamard repeated twice
ATS4=22 :Set to 300 baud Hadamard with Rate 1/2 Convolutional Code, 25ms MGP
ATS4=23 :Set to 300 baud Hadamard repeated twice with 25ms MGP
ATS4=25 :Set to 150 Baud Hadamard repeated twice, Rate 1/2 conv. code, 25ms MGP(32 tones)
ATS4=27 :Set to 200 Baud Hadamard with Rate 1/2 Convolutional Code, 50ms MGP
ATS4=28 :Set to 100 Baud Hadamard repeated six times with 25ms MGP
ATS4=30 :Set to 150 Baud Hadamard Doppler Tolerant, Rate 1/2 conv. code, 25ms MGP(32 tones)

ATS4=32 :Set to 2400 b/s, 1 of 4
ATS4=33 :Set to 2133 b/s, 1 of 4 with 12.5ms Multipath Gurad Period
ATS4=34 :Set to 1200 b/s, 1 of 4 with 25ms Multipath Gurad Period
ATS4=35 :Set to 1200 b/s, 1 of 4 with Rate 1/2 Convolutional code
ATS4=36 :Set to 1066 b/s, 1 of 4 4 with Rate 1/2 Convolutional code, 3.125 MGP
ATS4=38 :Set to 600 b/s, 1 of 4 with Rate 1/2 conv. code, 25ms MGP
ATS4=39 :Set to 600 b/s, 1 of 4 repeated twice with R=1/2 Cc
ATS4=41 :Set to 300 b/s, 1 of 4 repeated twice with Rate 1/2 conv. code, 25ms MGP
ATS4=42 :Set to 200 b/s, 1 of 4 repeated twice with Rate 1/2 conv. code, 50ms MGP
ATS4=43 :Set to 140 b/s, 1 of 4 repeated four time with R=1/2 conv.code, 25ms MGP
ATS4=44 :Set to 140 b/s, 1 of 4 repeated two times with R=1/2 conv.code, 25ms MGP (less tones 16 total)

Transpond Mode:

The acoustic modem can be commanded to get the round trip travel time between the acoustic modem and up to 21 transponders. The mode uses the ATNm command, where m is the interrogation frequency in Hz (prior to release 5.4.3 this parameter was in tenths of kHz). The interrogation frequency must be between 7 and 15 kHz. Once the command is entered, the modem transmits a tone burst at a user specified pulse length and at the specified frequency. There will be a receiver lockout of 3ms, once the tone has been transmitted. The modem will listen on 21 separate receive channels on even 250 Hz frequencies through the modem's frequency band. Any time a tone is detected, the frequency, the total roundtrip time will be reported milliseconds, and the detection level using a relative scale are reported. The turnaround time as set in S-register 40 will be removed from the roundtrip time. The modem will continue listen for a user settable range gate time. Once the range gate time has expired the modem will switch back to acoustic communication mode, and output a user message.

S-register 21 sets the threshold. The default is 120. Lower values will make it more prone to false detects. Note that lower values will be subject to high levels of false detects. The threshold of 120 will detect tones at a very low SNR (~3 db).

S-register 32 sets the interrogation pulse length. The duration is set in 10240 Hz samples and can range from 102 (10 ms) to 256 (25 ms). The default will be 10 ms.

S-register 33 sets the receive pulse length expected. The settings are 0 for a 12.5ms pulse and 1 for a 6.25ms pulse. The default will be 10ms. For the TR6000/TR7000 this should be set to 12.5ms

S-register 40 sets the turnaround time in tenths of a ms. The default will be 0.0ms.

Range Gate time will be set by S-register 7. S-register 7 is documented in the Acoustic Telemetry user's manual. S-register 7 is set in 0.5 second increments and can range from 07 (3.5 sec) to 64 (32 sec). In transpond mode a setting of 26 will give a 13 sec range gate which is suitable for an approx. range of 5km.

LF Transponders (7-15 kHz)

Any ATM-88X LF modem can be used with the Benthos TR6000 transponders. The 21 receive channels are 7.0 kHz, 7.25 kHz, 7.5kHz, 7.75 kHz, …, 15.0 kHz. Note that frequencies below the LF band (9-14 kHz) can only be received using the "Release 7-10K" band, and frequencies above the LF band can only be received with the "Release 13-15K" band.

The following is the set up or use with the TR6000s.

S-register 24 – Set to the proper band for receiving response pings. 56 for the LF band (9-14 kHz), 31 for the "Rls 7-10K" band (7-10 kHz), and 81 for the "Rls 13-15K" band (13-15 kHz). A modem reset must be performed after this register is changed. This only applies to the receipt of transponder pings. Pings of any frequency in the 7-15 kHz range can be sent regardless of the modem's band, assuming an LF transducer is used.

S-register 32 – set to 102 for a 10ms interrogation pulse. We assume that the TR7000s are set to send a 10 ms pulse length.

S-register 33 – Set to 0 for a 12.5ms receive tone duration. We assume that the TR-6000 is set to transmit a 10ms tone.

S-register 7 – Set to 26, this will set the range gate to 13 seconds, which will be good for a range of 5km.

The default interrogation frequency for these transponders is 9.0 kHz, so use the command "ATN9000" to interrogate the transponders.

Example:
>ATN9500<E> (this command will send out a 9.5 kHz interrogation pulse)
14.0kHz 00015ms   Detect level = 1084 (round trip time to 14.0khz transponder is 15ms)
09.5kHz 00101ms   Detect level = 0884
12.5kHz 02000ms   Detect level = 0129
End Transpond Mode (range gate time is up)
>

Ring Buffer

The "ring buffer" is actually two 64K flash buffers, which are setup so the user is always guaranteed to have the most recent 64K bytes of data. The way it works is data is written into one buffer, as soon as that buffer is filled data is put into the second buffer. As soon as the second buffer is filled, the first buffer is erased, and then used for the new data, and so on.

To activate the ring buffer use sregister 37 as follows.
Sregister 37:
0: Normal Datalogger mode, in this mode the datalogger is 704Kbytes. Once it is filled
up additional data will be lost until the entire buffer is erased.
1: Ring buffer mode, two 64K buffers, set up so the most recent data is always saved.

To enable the ring buffer, write to sregister 37 using the following command:

ATEW37=1<enter>
Note this will cause the current contents of the datalogger to be erased.

To retrieve data use the following commands (also documented in the manual):

AT$BNn<enter> : This command will report the number of bytes stored in the datalogger at address n.

AT$BTn<enter> : This will acoustically download the entire contents of the datalogger of the modem at address n. If in ring buffer mode the maximum possible size is a 128K (less 1 byte), but will typically be 64K

AT$BBn,m<enter> : This will acoustically download the mth 4K block of data from the datalogger at address m. The first 4K block is 0, and so on. To find out how many 4K blocks are available divide the number of bytes reported by the AT$BN command by 4096.

Device Enable Sync Pulse and Time-only Ranging

A momentary sync pulse can be acoustically triggered on the device enable line (pin 7 on J4) with the AT^T command. The command syntax is as follows:

AT^Tn<enter> : This will acoustically signal the node at address n to momentarily enable its device enable line (transitioning it from high impedance to low impedance and back). The sync pulse will last at least 1.5625 milliseconds. When the sync pulse is triggered, a string is

output on the modem's serial port in the form *SPD:xxxxxx where xxxxxx is the number of microseconds elapsed from the receipt of the acoustic command triggering the sync pulse and the output of the sync pulse on the device enable line. This information could be used to perform highly accurate timing operations.
Another function which may also be useful for high timing-accuracy triggering is the time-only ranging command. This is very similar to the standard ranging command except that the round trip time is output on the serial port instead of an estimation of the physical distance to the node.

AT^Rn<enter> : obtain a range off the node at address n and return the round trip time of the range and response (minus turnaround time and other overhead). Output is printed to the serial port in the following format:

roundtrip time(ms)=xxx.x

Where xxx.x is the acoustic round-trip time in milliseconds, with a tenths place beyond the decimal point. If the ranging operation fails, the modem will respond with:

Response Not Received