5. XBee-PRO 900HP Command Reference Tables

Special

Table 5-01. Special Commands

AT Command	Name and Description	Parameter Range	Default
AC	**Apply Changes**. Immediately applies new settings without exiting command mode.	--	--
FR	**Software Reset**. Reset module. Responds immediately with an "OK" then performs a reset 100ms later.	--	--
RE	**Restore Defaults**. Restore module parameters to factory defaults.	--	--
WR	**Write**. Write parameter values to non-volatile memory so that parameter modifications persist through subsequent resets. Note: Once WR is issued, no additional characters should be sent to the module until after the "OK\r" response is received.	--	--

MAC/PHY Level

Table 5-02. MAC/PHY-level Commands

AT Command	Name and Description	Parameter Range	Default
AF	**Available Frequencies**. This read only command can be queried to return a bitfield of the frequencies that are available in the module's region of operation. This command returns a bitfield. Each bit corresponds to a physical channel. Channels are spaced 400 kHz apart: Bit 0 – 902.400 MHz Bit 1 – 902.800 MHz . . . Bit 31 – 914.800 MHz . . . Bit 63 – 927.600 MHz	0x1FFFFFF – 0x00FFFFFFFFFFFFFFFF	USA/Canada: 0x00FFFFFFFFFFFFFFFF (channels 0 – 63) Australia: 0x00FFFFFFFE00000000 (channels 33 – 63) Brazil: 0x00FFFFFFFE00000FFF (channels 0-11, 33 – 63) Singapore: 0x00FFE00000000000
CM	**Channel Mask**. The channel mask command allows channels to be selectively enabled or disabled. This is useful to avoid using frequencies that experience unacceptable levels of RF interference. This command is a bitfield. Each bit in the bitfield corresponds to a frequency as defined in the Available Frequencies (AF) command. When a bit in the Channel Mask and the corresponding bit in the Available Frequencies are both set to 1 then that physical channel may be chosen by the module as an active channel for communication. The minimum number of channels required for operation can be queried with the Minimum Frequencies (MF) command. If a CM setting would result in less than MF active channels being enabled, then an error will be returned. If there are more active channels enabled than required by MF, then the first MF frequencies will be used (higher active frequencies may be unused in favor of lower ones). All modules in a network must use an identical set of active channels. Separate networks which are in physical range of each other should use different Preamble Patterns (HP) and/or Network ID's (ID) to avoid receiving data from the other network. The user may find the Energy Detect (ED) command especially useful when choosing what channels to enable or disable. **Note:** Channel 19 (910.000MHz) is disabled by default. This channel has approximately 2dBm worse receiver sensitivity than other channels. It is suggested that this channel not be used.	0x1FFFFFF – 0x00FFFFFFFFFFFFFFFF	0xFFFFFFFFFFF7FFFF

AT Command	Name and Description	Parameter Range	Default
MF	**Minimum Frequency Count**. This read only command can be queried to determine the minimum number of channels that must be enabled with the CM command for proper operation in the modules region of operation.	1-50	USA/Canada: 25 Australia: 25 Brazil: 25 Singapore: 11
HP	**Preamble ID**. The preamble ID for which module communicates. Only modules with matching preamble IDs can communicate with each other. Different preamble IDs minimize interference between multiple sets of modules operating in the same vicinity. When receiving a packet this is checked before the network ID, as it is encoded in the preamble, and the network ID is encoded in the MAC header. **Note**: When using modules certified for use in Singapore, HP settings of 1, 2, or 3 have reduced performance compared to the other settings. These settings should be avoided in this region.	0-7	0
ID	**Network ID**. The user network identifier. Nodes must have the same network identifier to communicate. Changes to ID can be written to non-volatile memory using the WR command. Only modules with matching IDs can communicate with each other. When receiving a packet this is checked after the preamble ID. If using OEM network IDs, 0xFFFF will use the factory value.	0-0x7FFF	0x7FFF
MT	**Broadcast Multi-Transmit**. The number of additional MAC-level broadcast transmissions. All broadcast packets are transmitted MT+1 times to ensure it is received.	0-5	3
PL	**Power Level**. Set/Read the power level at which the RF module transmits conducted power. Power level 4 is calibrated and the other power levels are approximate. .	0 = +7 dBm, (5 mW) 1 = +15 dBm, (32 mW) 2 = +18 dBm, (63 mW) 3 = +21 dBm, (125 mW) 4 = +24 dBm, (250 mW)	4
RR	**Unicast Mac Retries**. The maximum number of MAC level packet delivery attempts for unicasts. If RR is non-zero packets sent from the radio will request an acknowledgement, and can be resent up to RR times if no acknowledgements are received.	0-0xF	0x10
ED	**Energy Detect**. Start an Energy Detect scan. This parameter is the time in milliseconds to scan all channels. The module will loop through all the channels until the time elapses. The maximal energy on each channel is returned, and each value is followed by a comma with the list ending with a carriage return. The values returned reflect the detected energy level in units of -dBm.	0-0xFF	0x10

Diagnostics

Table 5-03. Diagnostics Commands - MAC Statistics and Timeouts

AT Command	Name and Description	Parameter Range	Default
BC	**Bytes Transmitted.** The number of RF bytes transmitted. This count is incremented for every PHY level byte transmitted. The purpose of this count is to estimate battery life by tracking time doing transmissions. This number rolls over to zero from 0xFFFF. The counter can be reset to any 16-bit value by appending a hexadecimal parameter to the command.	0-0xFFFF	0
DB	**Received Signal Strength.** This command reports the received signal strength of the last received RF data packet. The DB command only indicates the signal strength of the last hop. It does not provide an accurate quality measurement for a multihop link. The DB command value is measured in -dBm. For example if DB returns 0x60, then the RSSI of the last packet received was -96dBm.	0-0xFF [read-only]	0
ER	**Received Error Count**. This count is incremented whenever a packet is received which contained integrity errors of some sort. Once the number reaches 0xFFFF, further events will not be counted. The counter can be reset to any 16-bit value by appending a hexadecimal parameter to the command.	0-0xFFFF	0
GD	**Good Packets Received**. This count is incremented whenever a good frame with a valid MAC header is received on the RF interface. Once the number reaches 0xFFFF, further events will not be counted. The counter can be reset to any 16-bit value by appending a hexadecimal parameter to the command.	0-0xFFFF	0
EA	**MAC ACK Timeouts.** This count is incremented whenever a MAC ACK timeout occurs on a MAC level unicast. Once the number reaches 0xFFFF further events will not be counted. The counter can be reset to any 16-bit value by appending a hexadecimal parameter to the command.	0-0xFFFF	0
TR	**Transmission Errors**. This count is incremented whenever a MAC transmission attempt exhausts all MAC retries without ever receiving a MAC acknowledgement message from the destination node. Once the number reaches 0xFFFF, further events will not be counted. The counter can be reset to any 16-bit value by appending a hexadecimal parameter to the command.	0-0xFFFF	0

Table 5-03. Diagnostics Commands - MAC Statistics and Timeouts

AT Command	Name and Description	Parameter Range	Default
UA	**MAC Unicast Transmission Count.** This count is incremented whenever a MAC unicast transmission occurs for which an ACK is requested. Once the number reaches 0xFFFF further events will not be counted. The counter can be reset to any 16-bit value by appending a hexadecimal parameter to the command.	0-0xFFFF	0
%H	**MAC Unicast One Hop Time**. The MAC unicast one hop timeout in milliseconds. Changing MAC parameters can change this value.	[read-only]	0xCF
%8	**MAC Broadcast One Hop Time**. The MAC broadcast one hop timeout in milliseconds. Changing MAC parameters can change this value.	[read-only]	0x1BE

Network

Table 5-04. Network Commands - DigiMesh and Repeater

AT Command	Name and Description	Parameter Range	Default
CE	**Node Messaging Options.** The module's routing and messaging mode bit field. A routing module will repeat broadcasts. Indirect Messaging Coordinators will not transmit point-to-multipoint unicasts until they are requested by an Indirect Messaging Poller. Setting a radio as an Indirect Messaging Poller will cause it to regularly send polls to its Indirect Messaging Coordinator. Nodes can also be configured to route, or not route, multi-hop packets. Bit 0 - Indirect Messaging Coordinator enable All point-multipoint unicasts will be held until requested by a polling end device. Bit 1 - Disable routing on this node When set, this node will not propagate broadcasts or become an intermediate node in a DigiMesh route. This node will not function as a repeater. Bit 2 - Indirect Messaging Polling enable Periodically send requests for messages held by the node's coordinator. Bit 0 and bit 2 cannot be set at the same time.	0-6	0
BH	**Broadcast Hops**. The transmission hops for broadcast data transmissions. Set to 0 for maximum radius. If BH is set greater than NH then the value of NH is used. Supported in both variants.	0-0x20	0
NH	**Network Hops** The maximum number of hops expected to be seen in a network route. This value doesn't limit the number of hops allowed, but it is used to calculate timeouts waiting for network acknowledgements. Supported in both variants.	0-0x20	
NN	**Network Delay Slots**. Set or read the maximum random number of network delay slots before rebroadcasting a network packet.	0 to 0x05	3
MR	**Mesh Unicast Retries** The maximum number of network packet delivery attempts. If MR is non-zero, packets sent will request a network acknowledgement, and can be resent up to MR+1 times if no acknowledgements are received. We recommend setting this value to 1. If this parameter is set to 0, then network ACKs are disabled. Routes can be found initially, but will never be repaired if a route fails. Supported in the 200k variant only.	0 to 7	1

Addressing

Table 5-05. Addressing Commands

AT Command	Name and Description	Parameter Range	Default
SH	**Serial Number High**. The upper 32 bits of the module's unique IEEE 64-bit MAC address.	0-0xFFFFFFFF [read-only]	Factory
SL	**Serial Number Low**. The lower 32 bits of the module's unique IEEE 64-bit MAC address.	0-0xFFFFFFFF [read-only]	Factory
DH	**Destination Address High**. The upper 32 bits of the 64-bit destination address. When combined with DL, it defines the destination address used for transmission in transparent mode.	0-0xFFFFFFFF	0
DL	**Destination Address Low**. The lower 32 bits of the 64-bit destination address. When combined with DH, DL defines the destination address used for transmission in transparent mode.	0-0xFFFFFFFF	0x0000FFFF

Table 5-05. Addressing Commands

AT Command	Name and Description	Parameter Range	Default
TO	**Transmit Options**. This command defines transmission options for all packets originating from this radio. These options can be overridden on a packet-by-packet basis by using the TxOptions field of the API TxRequest frames. **Bit Meaning Description** 6, 7 Delivery method b'00 - <invalid option>. b'01 - Point-Multipoint b'10 - Repeater mode (directed broadcast of packets) b'11 - DigiMesh (not available on 10k product) 5 Reserved <set this bit to 0> 4 Reserved <set this bit to 0> 3 Trace Route Enable a Trace Route on all DigiMesh API packets 2 NACK Enable a NACK messages on all DigiMesh API packets 1 Disable RD Disable Route Discovery on all DigiMesh unicasts 0 Disable ACK Disable acknowledgments on all unicasts Example #1: Setting TO to 0x80 would cause all transmissions to be sent using repeater mode. Example #2: Setting TO to 0xC1 would cause all transmissions to be sent using DigiMesh, with network acknowledgments disabled.	Bits 6 & 7 cannot be set to DigiMesh on the 10k build. Bits 4 & 5 must be set to 0 Bits 1, 2, & 3 cannot be set on the 10k build	0x40 (10k product) 0xC0 (200k product)
NI	**Node Identifier**. A string identifier for this module. The string accepts only printable ASCII data In AT Command Mode, the string can not start with a space. A carriage return or comma ends the command. Command will automatically end when maximum bytes for the string have been entered. This string is returned as part of the ATND (Network Discover) command. This identifier is also used with the ATDN (Destination Node) command.	up to 20 byte ASCII string	a space character
NT	**Node Discover Timeout.** The amount of time a node will spend discovering other nodes when ND or DN is issued. This value is used to randomize the responses to alleviate network congestion.	0x20 - 0x2EE0 [x 100 msec]	0x82 (130d)
NO	**Node Discovery Options**. The options value for the network discovery command. The options bitfield value can change the behavior of the ND (network discovery) command and/or change what optional values are returned in any received ND responses or API node identification frames. Options include: 0x01 = Append DD value (to ND responses or API node identification frames) 0x02 = Local device sends ND or FN response frame when ND is issued. 0x04 = Append RSSI (of the last hop for DigiMesh networks) to ND or FN responses or API node identification frames.	0-0x07 [bitfield]	0
CI	**Cluster ID**. The application layer cluster ID value. This value will be used as the cluster ID for all data transmissions. The default value 0x11 (Transparent data cluster ID)	0-0xFFFF	0x11
DE	**Destination Endpoint**. The application layer destination ID value. This value will be used as the destination endpoint for all data transmissions. The default value (0xE8) is the Digi data endpoint.	0-0xFF	0xE8
SE	**Source Endpoint**. The application layer source endpoint value. This value will be used as the source endpoint for all data transmissions. The default value 0xE8 (Data endpoint) is the Digi data endpoint	0-0xFF	0xE8

Addressing Discovery/Configuration

Table 5-06. Addressing Discovery/Configuration Commands

AT Command	Name and Description	Parameter Range	Default
AG	**Aggregator Support**. The AG command sends a broadcast through the network that has the following effects on nodes which receive the broadcast: - The receiving node will establish a DigiMesh route back to the originating node, provided there is space in the routing table. - The DH and DL of the receiving node will be updated to the address of the originating node if the AG parameter matches the current DH/DL of the receiving node. - For API-enabled modules on which DH and DL are updated, an Aggregate Addressing Update frame will be sent out the serial port. Note that the AG command is only available on products that support DigiMesh.	Any 64-bit number	n/a

Table 5-06. Addressing Discovery/Configuration Commands

AT Command	Name and Description	Parameter Range	Default
DN	**Discover Node**. Resolves an NI (Node Identifier) string to a physical address (case sensitive). The following events occur after the destination node is discovered: <AT Firmware> 1. DL & DH are set to the extended (64-bit) address of the module with the matching NI (Node Identifier) string. 2. OK (or ERROR)\r is returned. 3. Command Mode is exited to allow immediate communication <API Firmware> 0xFFFE and 64-bit extended addresses are returned in an API Command Response frame. If there is no response from a module within (NT * 100) milliseconds or a parameter is not specified (left blank), the command is terminated and an "ERROR" message is returned. In the case of an ERROR, Command Mode is not exited.	20 byte ascii string	
ND	**Network Discover**. Discovers and reports all RF modules found. The following information is reported for each module discovered. MY<CR> (always 0xFFFE) SH<CR> SL<CR> NI<CR> (Variable length) PARENT_NETWORK ADDRESS<CR> (2 Bytes) (always 0xFFFE) DEVICE_TYPE<CR> (1 Byte: 0=Coord, 1=Router, 2=End Device) STATUS<CR> (1 Byte: Reserved) PROFILE_ID<CR> (2 Bytes) MANUFACTURER_ID<CR> (2 Bytes) DIGI DEVICE TYPE<CR> (4 Bytes. Optionally included based on NO settings.) RSSI OF LAST HOP<CR> (1 Byte. Optionally included based on NO settings.) <CR> After (NT * 100) milliseconds, the command ends by returning a <CR>. ND also accepts a Node Identifier (NI) as a parameter (optional). In this case, only a module that matches the supplied identifier will respond. If the ND command is sent through a local API frame, each response is returned as a separate Local or Remote AT Command Response API packet, respectively. The data consists of the above listed bytes without the carriage return delimiters. The NI string will end in a "0x00" null character.	n/a	n/a
FN	**Find Neighbors**. Discovers and reports all RF modules found within immediate RF range. The following information is reported for each module discovered. MY<CR> (always 0xFFFE) SH<CR> SL<CR> NI<CR> (Variable length) PARENT_NETWORK ADDRESS<CR> (2 Bytes) (always 0xFFFE) DEVICE_TYPE<CR> (1 Byte: 0=Coord, 1=Router, 2=End Device) STATUS<CR> (1 Byte: Reserved) PROFILE_ID<CR> (2 Bytes) MANUFACTURER_ID<CR> (2 Bytes) DIGI DEVICE TYPE<CR> (4 Bytes. Optionally included based on NO settings.) RSSI OF LAST HOP<CR> (1 Byte. Optionally included based on NO settings.) <CR> If the FN command is issued in command mode, after (NT*100) ms + overhead time, the command ends by returning a <CR>. If the FN command is sent through a local API frame, each response is returned as a separate Local or Remote AT Command Response API packet, respectively. The data consists of the above listed bytes without the carriage return delimiters. The NI string will end in a "0x00" null character.	n/a	n/a

Security

Table 5-07. Security Commands

AT Command	Name and Description	Parameter Range	Default
EE	**Security Enable** Enables or disables 128-bit AES encryption. This command parameter must be set the same on all devices for communication to work.	0-1	0
KY	**AES Encryption Key** Sets the 16 byte network security key value. This command is write-only; it cannot be read. Attempts to read KY will return an OK status. This command parameter must be set the same on all devices for communication to work. This value is passed in as hex characters when setting from AT command mode, and as binary bytes when set in ATI mode.	128-bit value	n/a

Serial Interfacing

Table 5-08. Serial Interfacing Commands

AT Command	Name and Description	Parameter Range	Default
BD	**Baud rate**. The UART baud rate (speed for data transfer between radio modem and host). Values from 0-8 select preset standard rates. Values at 0x39 and above select the actual baud rate. Providing the host supports it. Baud rates can go as high as 7Mbps. The values from 0 to 8 are interpreted as follows: **0** - 1,200bps **3** - 9,600bps **6** - 57,600bps **1** - 2,400bps **4** - 19,200bps **7** - 115,200bps **2** - 4,800bps **5** - 38,400bps **8** - 230,400bps	0 to 8, and 0x100 to 0x6ACFC0	0x03 (9600 bps)
NB	**Parity**. Set or read parity settings for UART communications. The values from 0 to 2 are interpreted as follows: **0** No parity **1** Even parity **2** Odd parity	0-2	0 (No parity)
SB	Stop Bits. The number of stop bits for the UART. **0** - One stop bit **1** - Two stop bits	0-1	0
RO	**Packetization Timeout**. The number of UART character times of inter-character silence required before packetization in transparent mode. Set (RO=0) to transmit characters as they arrive instead of buffering them into one RF packet.	0 - 0xFF [x character times]	3
FT	**Flow Control Threshhold**. The UART flow control threshhold. De-assert $\overline{\text{CTS}}$ and/or send XOFF when FT bytes are in the UART receive buffer. Re-assert $\overline{\text{CTS}}$ when less than FT - 16 bytes are in the UART receive buffer.	0x11 - 0x16F	0x13F
AP	**API mode**. The UART API mode. The following settings are allowed: **0** Transparent mode, API mode is off. All UART input and output is raw data and packets are delineated using the RO and RB parameters. **1** API mode without escapes is on. All UART input and output data is packetized in the API format. **2** API mode is on with escaped sequences inserted to allow for control characters (XON, XOFF, escape, and the 0x7e delimiter to be passed as data.)	0- 2	0
AO	**API Options**. The API data frame output format for received frames. This parameter applies to both the UART and SPI interfaces. **0** API RX Indicator (0x90) **1** API Explicit RX Indicator (0x91)	0, 1	0

I/O Settings

Table 5-09. I/O Settings and Commands

AT Command	Name and Description	Parameter Range	Default
CB	**Commissioning Pushbutton**. This command can be used to simulate commissioning button presses in software. The parameter value should be set to the number of button presses to be simulated. For example, sending the ATCB1 command will execute the action associated with 1 commissioning button press.	0-4	n/a
D0	**DIO0 / AD0 Configuration (Pin 20)**. 0 = Disabled 1 = Commissioning button 2 = ADC 3 = Digital input 4 = Digital output low 5 = Digital output high	0 - 5	1

Table 5-09. I/O Settings and Commands

AT Command	Name and Description	Parameter Range	Default
D1	**DIO1 / AD1 Configuration (Pin 19).** 0 = Disabled 1 = SPI Attention 2 = ADC 3 = Digital input 4 = Digital output low 5 = Digital output high 6 = Uart Data Present Indicator	0-6	0
D2	**DIO2 / AD2 Configuration (Pin 18).** 0 = Disabled 1 = SPI Clock 2 = ADC 3 = Digital input 4 = Digital output low 5 = Digital output high	0-5	0
D3	**DIO3 / AD3 Configuration (Pin 17).** 0 = Disabled 1 = SPI Slave Select 2 = ADC 3 = Digital input 4 = Digital output low 5 = Digital output high	0-5	0
D4	**DIO4 Configuration (Pin 11).** 0 = Disabled 1 = SPI_MOSI 2 = NA 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 1, 3-5	0
D5	**DIO5 / ASSOCIATE_INDICATOR Configuration (Pin 15).** 0 = Disabled 1 = Associated Indicator 2 = NA 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 1, 3-5	1
D6	**DIO6 / $\overline{\text{RTS}}$ Configuration (Pin 16).** 0 = Disabled 1 = RTS flow control 2 = NA 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 1, 3-5	0
D7	**DIO7 / $\overline{\text{CTS}}$ Configuration (Pin 12).** 0 = Disabled 1 = CTS flow control 2 = NA 3 = Digital input 4 = Digital output low 5 = Digital output high 6 = RS-485 Tx enable, low TX (0V on transmit, high when idle) 7 = RS-485 Tx enable, high TX (high on transmit, 0V when idle)	0, 1, 3-7	1
D8	**DIO8 / SLEEP_REQUEST Configuration (Pin 9).** 0 = Disabled 1 = Sleep request 2 = NA 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 1, 3-5	1
D9	**DIO9 / ON/$\overline{\text{SLEEP}}$ Configuration. (Pin 13)** 0 = Disabled 1 = ON/$\overline{\text{SLEEP}}$ output 2 = NA 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 1, 3-5	1

Table 5-09. I/O Settings and Commands

AT Command	Name and Description	Parameter Range	Default
P0	**DIO10 / RSSI / PWM0 Configuration (Pin 6).** 0 = Disabled 1 = RSSI PWM0 output 2 = PWM0 output 3 = Digital input 4 = Digital output low 5 = Digital output high	0-5	1
P1	**DIO11 / PWM1 Configuration (Pin 7).** 0 = Disabled 1 = 32.768 kH clock output 2 = PWM1 output 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 2-5	0
P2	**DIO12 Configuration (Pin 4).** 0 = Disabled 1 = SPI_MISO 3 = Digital input 4 = Digital output low 5 = Digital output high	0, 1, 3-5	0
P3	**DIO13 / DOUT Configuration (Pin 2).** 0 = Disabled 1 = UART DOUT output	0, 1	1
P4	**DIO14 / DIN Configuration (Pin 3).** 0 = Disabled 1 = UART DIN output	0, 1	1
PD	**Pull Direction**. The resistor pull direction bit field for corresponding I/O lines that are set in the PR command. 0 = pull down 1 = pull up	0-0x7FFF	0
PR	**Pull-up Resistor.** The bit field that configures the internal pull-up resistor status for the I/O lines. "1" specifies the pull-up/down resistor is enabled. "0" specifies no pullup/down. Bits: 0 - DIO4 / AD4 / SPI_MOSI 1 - DIO3 / AD3 / SPI_SSEL 2 - DIO2 / AD2 / SPI_SCLK 3 - DIO1 / AD1 / SPI_ATTN 4 - DIO0 / AD0 5 - DIO6 / RTS 6 - SLEEP_REQUEST 7 - DIN / CONFIG 8 - DIO5 / AD5 / ASSOCIATE 9 - On/SLEEP 10 - DIO12 / SPI_MISO 11 - DIO10 / PWM0 / RSSI 12 - DIO11/ PWM1 13 - DIO7/CTS 14 - PWM0 / DOUT	0 - 0x7FFF	0x7FFF
M0	**PWM0 Duty Cycle**. The duty cycle of the PWM0 line. The line should be configured as a PWM output using the P0 command.	0-0x3FF	0
M1	**PWM1 Duty Cycle**. The duty cycle of the PWM1 line. The line should be configured as a PWM output using the P1 command.	0-0x3FF	0
LT	**Assoc LED Blink Time**. The Associate LED blink time. If the Associate LED functionality is enabled (D5 command), this value determines the on and off blink times for the LED. If LT=0, the default blink rate will be used (500ms sleep coordinator, 250ms otherwise). For all other LT values, LT is measured in 10ms	0x14-0xFF [x 10 ms]	0
RP	**RSSI PWM Timer.** Time RSSI signal will be output after last transmission. When RP = 0xFF, output will always be on.	0 - 0xFF [x 100 ms]	0x28 (4 seconds)

I/O Sampling

Table 5-010. I/O Sampling Commands

AT Command	Name and Description	Parameter Range	Default
AV	**Analog Voltage Reference**. The analog voltage reference that is used for A/D sampling. **0** = 1.25 V reference **1** = 2.5 V reference	0, 1	0
IC	**DIO Change Detection**. The digital I/O pins to monitor for changes in the I/O state. IC works with the individual pin configuration commands (D0-D9, P0-P2). If a pin is enabled as a digital input/output, the IC command can be used to force an immediate I/O sample transmission when the DIO state changes. IC is a bitmask that can be used to enable or disable edge detection on individual channels. Unused bits should be set to 0. Bit (I/O pin): 0 (DIO0) 1 (DIO1) 2 (DIO2) 3 (DIO3) 4 (DIO4) 5 (DIO5) 6 (DIO6) 7 (DIO7) 8 (DIO8) 9 (DIO9) 10 (DIO10) 11 (DIO11) 12 (DIO12)	0-0xFFFF	0
IF	**Sleep Sample Rate**.The number of sleep cycles that must elapse between periodic I/O samples. This allows I/O samples to be taken only during some wake cycles. During those cycles I/O samples are taken at the rate specified by IR.	1-0xFF	1
IR	**IO Sample Rate**. The I/O sample rate to enable periodic sampling. For periodic sampling to be enabled, IR must be set to a non-zero value, and at least one module pin must have analog or digital I/O functionality enabled (see D0-D9, P0-P2 commands). The sample rate is measured in milliseconds.	0 - 0xFFFF (ms)	0
IS	**Force Sample**. Forces a read of all enabled digital and analog input lines.	n/a	n/a
TP	**Temperature.** The current module temperature in degrees celsius in 8-bit two's compliment format.For example 0x1A = 26C, and 0xF6 = -10C	0x00 to 0xFF	n/a
%V	**Supply Voltage**. The supply voltage of the module in millivolts.	--	--

Sleep

Sleep Commands

AT Command	Name and Description	Parameter Range	Default
SM	**Sleep Mode**. The sleep mode of the module. 0 - Normal 1 - Pin sleep. In this mode, the sleep/wake state of the module is controlled by the SLEEP_REQUEST line. 4 - Asynchronous cyclic sleep. In this mode, the module periodically sleeps and wakes based on the SP and ST commands. 5 - Asynchronous cyclic sleep with pin wake-up. In this mode, the module acts in the same way as asynchronous cyclic sleep when SLEEP_RQ is asserted. When SLEEP_RQ is not asserted the module remains awake.. 7 - Sleep support mode. 8 - Synchronous cyclic sleep mode.	0, 1, 4, 5, 7, 8	0
SO	**Sleep Options**. The sleep options of the module. This command is a bitmask. For synchronous sleep modules, the following sleep options are defined: bit 0 = Preferred sleep coordinator bit 1 = Non-sleep coordinator bit 2 = Enable API sleep status messages bit 3 = Disable early wake-up bit 4 = Enable node type equality bit 5 = Disable lone coordinator sync repeat For ansynchronous sleep modules, the following sleep options are defined: bit 8 = Always wake for ST time	Any of the available sleep option bits can be set or cleared. Bit 0 and bit 1 cannot be set at the same time.	0x02

AT Command	Name and Description	Parameter Range	Default
SN	**Number of Sleep Periods.** The number of sleep periods value. This command controls the number of sleep periods that must elapse between assertions of the ON_SLEEP line during the wake time of asynchronous cyclic sleep. During cycles when the ON_SLEEP line is not asserted, the module will wake up and check for any serial or RF data. If any such data is received, then the ON_SLEEP line will be asserted and the module will fully wake up. Otherwise, the module will return to sleep after checking. This command does not work with synchronous sleep.	1 - 0xFFFF	1
SP	**Sleep Period**. The sleep period of the module. This command defines the amount of time the module will sleep per cycle.For a node operating as an Indirect Messaging Coordinator, this command defines the amount of time that it will hold an indirect message for an Indirect Messaging Poller. The coordinator will hold the message for (2.5*SP).	1 - 1440000 (x 10 ms)	2 seconds
ST	**Wake Time**. The wake period of the module. For asynchronous sleep modules, this command defines the amount of time that the module will stay awake after receiving RF or serial data. For synchronous sleep modules, this command defines the amount of time that the module will stay awake when operating in cyclic sleep mode. This value will be adjusted upwards automatically if it is too small to function properly based on other settings.	0x45-0x36EE80	0x7D0 (2 seconds)
WH	**Wake Host**. The wake host timer value. If the wake host timer is set to a non-zero value, this timer specifies a time (in millisecond units) that the device should allow after waking from sleep before sending data out the UART or transmitting an I/O sample. If serial characters are received, the WH timer is stopped immediately. When in synchronous sleep, the device will shorten its sleep period by the value specified by the WH command to ensure that it is prepared to communicate when the network wakes up. When in this this sleep mode, the device will always stay awake for the WH time plus the amount of time it takes to transmit a one-hop unicast to another node.	0-0xFFFF (x 1ms)	0

Sleep Diagnostics

Table 5-011. Diagnostics - Sleep Status Timing

AT Command	Name and Description	Parameter Range	Default
SS	**Sleep Status.** The SS command can be used to query a number of Boolean values describing the status of the module. Bit 0: This bit will be true when the network is in its wake state. Bit 1: This bit will be true if the node is currently acting as a network sleep coordinator. Bit 2: This bit will be true if the node has ever received a valid sync message since the time it was powered on. Bit 3: This bit will be true if the node has received a sync message in the current wake cycle. Bit 4: This bit will be true if the user has altered the sleep settings on the module so that the node will nominate itself and send a sync message with the new settings at the beginning of the next wake cycle. Bit 5: This bit will be true if the user has requested that the node nominate itself as the sleep coordinator (using the commissioning button or the CB2 command). Bit 6 = This bit will be true if the node is currently in deployment mode. All other bits: Reserved - All non-documented bits can be any value and should be ignored.	[read-only]	0x40
OS	**Operational Sleep Period**. The sleep period that the node is currently using. This number will oftentimes be different from the SP parameter if the node has synchronized with a sleeping router network. Units of 10mSec	[read-only]	0x12C
OW	**Operational Wake Period**. The wake time that the node is currently using. This number will oftentimes be different from the ST parameter if the node has synchronized with a sleeping router network. Units of 1 ms	[read-only]	0xBB8
MS	**Number of Missed Syncs**. The number of wake cycles that have elapsed since the last sync message was received. Supported in the mesh firmware variant only.	[read-only]	0
SQ	**Missed Sync Count**. Count of the number of syncs that have been missed. This value can be reset by setting ATSQ to 0. When the value reaches 0xFFFF it will not be incremented anymore.	0-0xFFFF	0

AT Command Options

Table 5-012. AT Command Options

AT Command	Name and Description	Parameter Range	Default
CC	**Command Character**. Set or read the character to be used between guard times of the AT Command Mode Sequence. The AT Command Mode Sequence causes the radio modem to enter Command Mode (from Idle Mode).	0 - 0xFF	0x2B
CN	**Exit Command Mode**. Explicitly exit the module from AT Command Mode.	n/a	n/a
CT	**Command Mode Timeout.** Set/Read the period of inactivity (no valid commands received) after which the RF module automatically exits AT Command Mode and returns to Idle Mode.	2-0x1770	0x64 (100d)
GT	**Guard Times**. Set required period of silence before and after the Command Sequence Characters of the AT Command Mode Sequence (GT + CC + GT). The period of silence is used to prevent inadvertent entrance into AT Command Mode.	0 to 0xFFFF	0x3E8 (1000d)

Firmware Commands

Table 5-013. Firmware Version/Information

AT Command	Name and Description	Parameter Range	Default
VL	**Version Long**. Shows detailed version information including application build date and time.	[read-only]	n/a
VR	**Firmware Version**. Read firmware version of the module.	0 - 0xFFFFFFFF [read-only]	Firmware-set
HV	**Hardware Version**. Read hardware version of the module.	0 - 0xFFFF [read-only]	Factory-set
HS	**Hardware Series**. The module hardware series number. For example, if the module is version S8B, this will return 0x801.	0-0xFFFF	Factory-set
DD	**Device Type Identifier.** Stores a device type value. This value can be used to differentiate multiple XBee-based products.	0-0xFFFFFFFF [read only]	0xC0000
NP	**Maximum RF Payload Bytes**. This value returns the maximum number of RF payload bytes that can be sent in a unicast transmission based on the current configurations.	0-0xFFFF [read-only]	0x100
CK	**Configuration CRC**. The CRC of the current settings. The purpose of this command is to allow the detection of an unexpected configuration change on a device. After a firmware update, this command may return a different value.		