Zlinx Radio Modem

ZP Series

Documentation Number: ZPXXx-XXXXx-MR-2508
pn#7696R1

This product designed and manufactured in Ottawa, Illinois USA
of domestic and imported parts by

B&B electronics MANUFACTURING COMPANY

707 Dayton Road -- P.O. Box 1040 -- Ottawa, IL 61350 USA
Phone (815) 433-5100 -- General Fax (815) 433-5105

Phone (815) 433-5100 -- **General Fax** (815) 433-5105
Website: **www.bb-elec.com**

European Headquarters

B&B Electronics

Westlink Commercial Park -- Oranmore, Co. Galway, Ireland

Phone +353 91-792444 -- **Fax** +353 91-792445
Website: **www.bb-europe.com**

B&B Electronics Mfg. Co. Inc. – June 2008

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Introduction

Easy to install, up to 7 mile range No wires, no cables! Zlinx radio modems get your data moving farther, easier, and at less cost than running cable. Plug-n-play, Modbus compatible, signal strength indicator, space saving DIN rail mounting. Heavy-duty, wide temperature design handles most industrial power configurations and tough indoor/outdoor environments.

Model #	Frequency	Radio Power	RF Data Rate
ZP24D-192RM-MR	2.4GHz	50mW	19.2Kbps
ZP24D-96RM-MR	2.4GHz	50mW	9600bps
ZP9D-192RM-MR	900MHz	100mW	19.2Kbps
ZP9D-96RM-MR	900MHz	100mW	9600bps

Package Contents

- Radio Modem (Table Above)
- Antenna
- Software CD
- Manual on CD
- Will require separate 18-30VAC or 10-48VDC Power Supply

  ZP24D-xxxx-MR = 1.5W max
  ZP9D-xxxx-MR = 1.5W max

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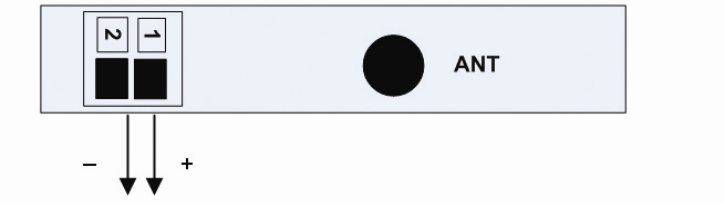
Hardware Installation

Dip switch Settings

Dipswitch	OFF	ON
1	4-wire	2-wire
2	4-wire	2-wire
3	No termination	Termination
4	RS-422	RS-485

Mounting and Power

- Install on properly grounded DIN rail
  - Operating Temperature is -40 to 85C
  - Operating Humidity is 10-90% non-condensing
- Connect Power Supply
  - Power supply is 10-48 VDC or 18-30 VAC



10-48 VDC
or
18-30 VAC

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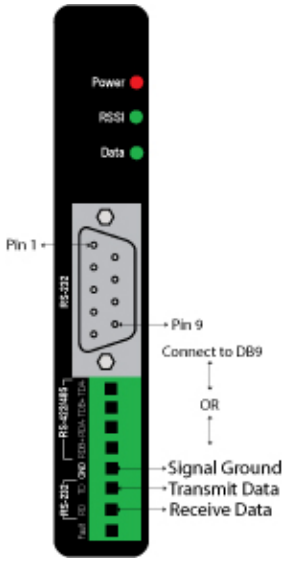
Serial Connections

RS-232

RS-232 always present on DB9

DB9F Pin	Signal Name	Direction
1	Data Carrier Detect	Out
2	Receive Data	Out
3	Transmit Data	In
4	Data Terminal Ready	In
5	Signal Ground	---
6	Data Set Ready	Out
7	Request To Send	In
8	Clear To Send	Out
9	Not used	---



Note: The DTR input is used to put the radio into sleep mode. The radio sleep option must be enabled first using the configuration software. Once enabled, lowering the DTR signal will put the radio in sleep mode and raising the DTR signal will put the radio in idle mode, ready to receive or transmit data.

RS-232

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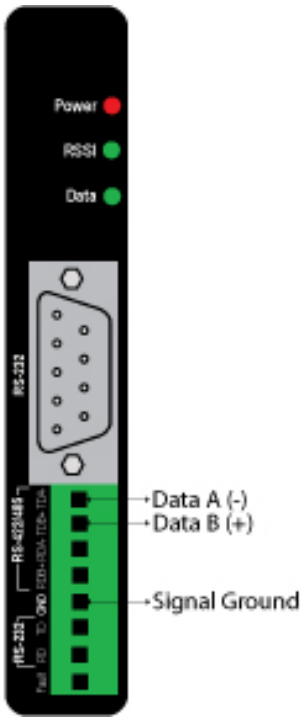
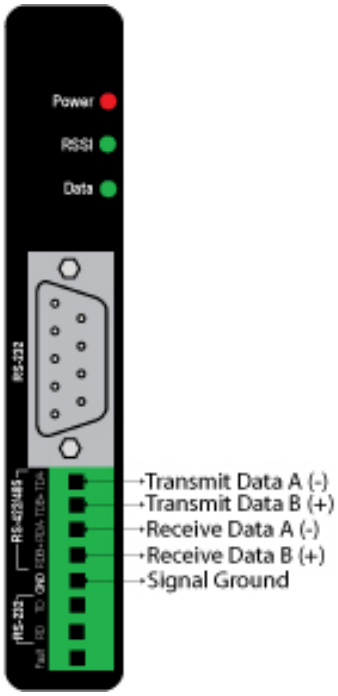
RS-422/485





RS-485 (2-Wrie) **RS-422/485 (4-Wire)**

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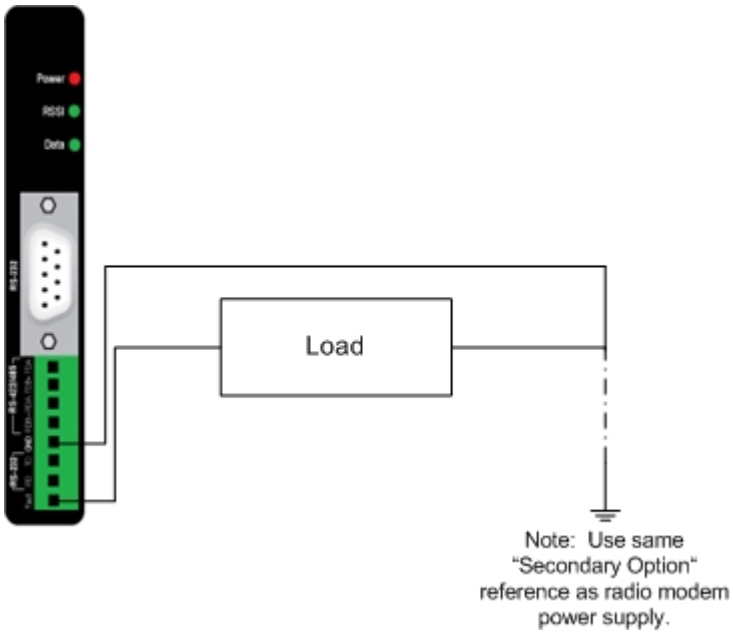
Wireless Link Failure Output

- Zlinx Radio modems offer a source (PNP)transistor output when the wireless signal strength drops below a critical level (link failure or miss packets)
- 40 mA max current



Note: In order for the RSSI LED to continuously indicate the signal strength, set the RP command (RSSI PWM Timer) to FF.

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LED Indicators

Front Panel LED	Status
Power	Red = ON OFF = No Power
RSSI (Signal Strength)	Green = Strong Yellow = OK Red = Weak OFF = No Signal
Wireless Data	Green = Blink ON with data

Note: In order for the RSSI LED to continuously indicate the signal strength, set the RP command (RSSI PWM Timer) to FF.

Radio Frequency Information

- The Zlinx Product is shipped with an antenna with the following expected ranges.
    - These ranges are for line of sight installations and may vary depending on your particular installation.
    - The antenna connection on the radio modem is an RPSMA female plug.
    - B&B Electronics has a wide variety of accessory antennas. Visit www.bb-elec.com.

Model #	Indoor Range	Outdoor Range
ZP24D-192RM-MR	up to 600 feet	up to 3 miles
ZP24D-96RM-MR	up to 600 feet	up to 3 miles
ZP9D-192RM-MR	up to 1500 feet	up to 7 miles
ZP9D-96RM-MR	up to 1500 feet	up to 7 miles

- The radio frequency, power, and data rate vary depending on model. Refer to the table below.

Model #	Frequency	Radio Power	RF Data Rate
ZP24D-192RM-MR	2.4GHz	50mW	19.2Kbps
ZP24D-96RM-MR	2.4GHz	50mW	9600bps
ZP9D-192RM-MR	900MHz	100mW	19.2Kbps
ZP9D-96RM-MR	900MHz	100mW	9600bps

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Zlinx Manager Software

Installation

- The Zlinx Manager Software is contained CD.
- Insert the CD into the drive.
- The installation program should auto start.
- Follow the on screen prompts.

Set Up

1. Connect your PC to the modem using a straight through serial cable.
2. Start the Zlinx Manage Software and click on the radio modem button.

3. The radio modem launcher screen will appear

3. Click on the Radio Modem Configuration button to configure the modem on-line or the Radio Modem Configuration Button (offline) to configure the modem offline. Follow the on screen directions to configure the modem. Note: using the off-line configuration button skips the auto modem discovery process.

On-Line Configuration

1. Click the Radio Modem Configuration Button. The following screen will appear.

2. Use the pull down menu items to set up the communication parameters.

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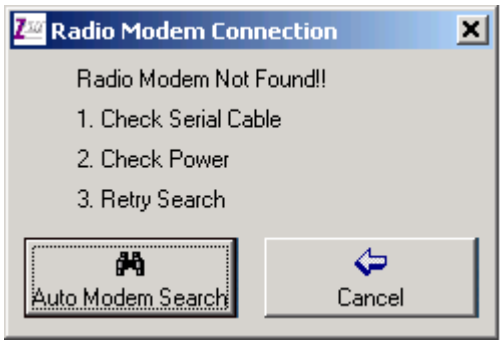
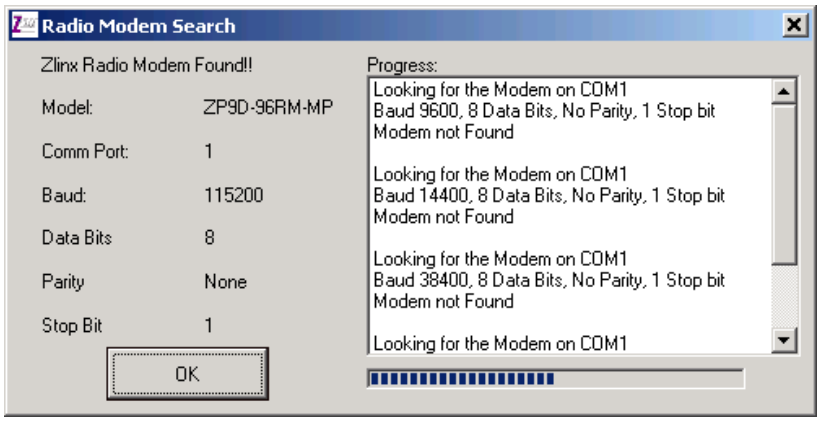
3. Click the Auto Modem Search button. The Zlinx Manager software will find the radio modem. If the modem is not found, the following screen will appear.



4. When the modem is found, the following screen will appear.



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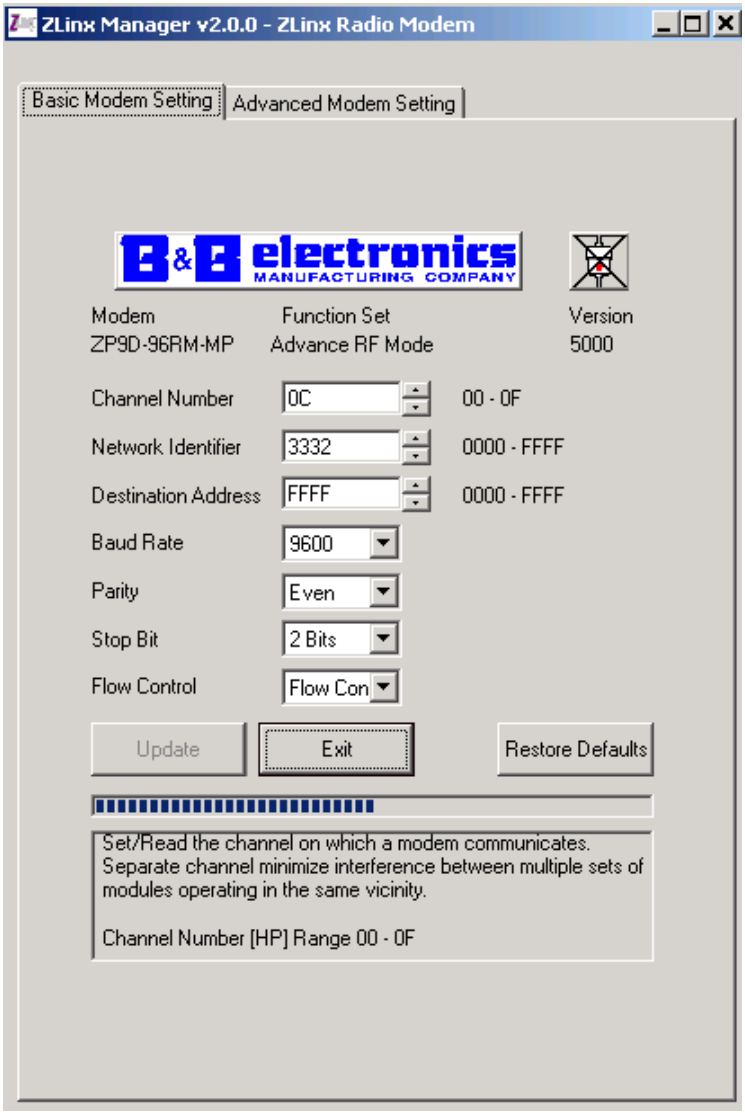
5. Click OK. The following screen will appear.



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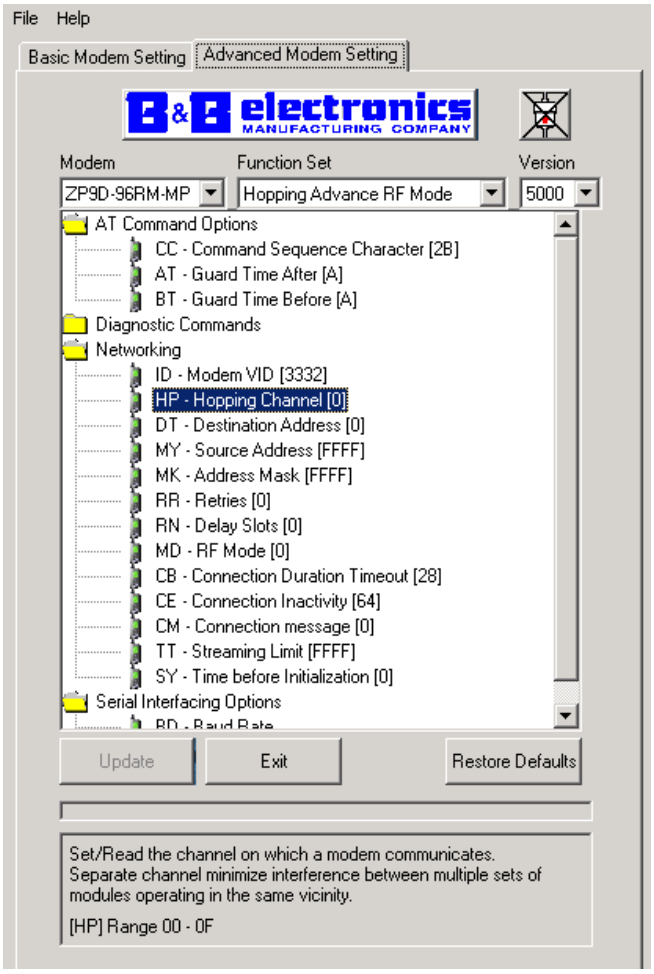
5. On the Basic Modem setting tab, configure a unique channel number, network identifier, and destination address. This will prevent interference from other modems. Click the Update button to save the parameters. Click the Restore Defaults button to revert to the default configuration.

6. Use the advanced tab to configure additional parameters. When each option is highlighted, the text box will display an explanation of the command and the associated hex range. Click the update button to save the parameters. Click the Restore Defaults button to revert to the default configuration.



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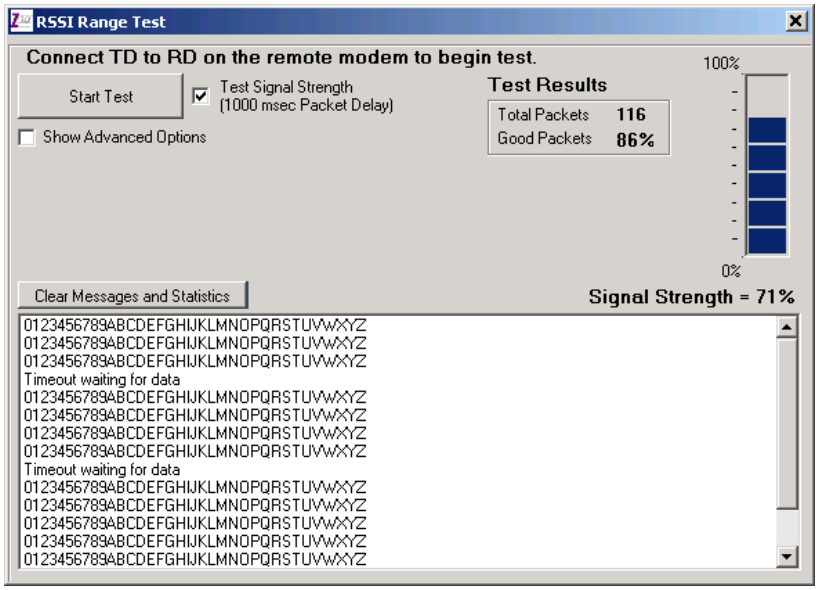
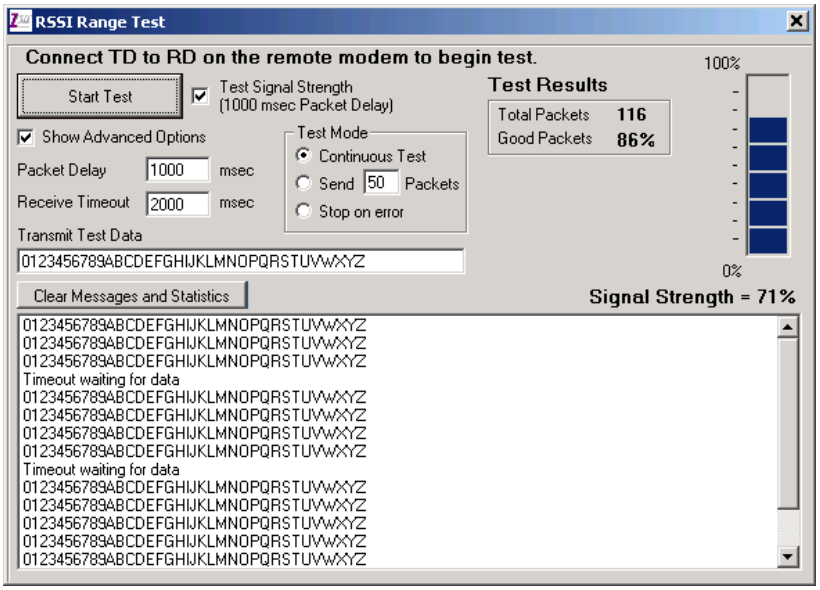
Test / Troubleshoot

1. The RSSI Range Test allows you test your installation. Cross connect TD and RD on the remote modem before running the test.



2. The basic screen shows test results and signal strength. Check the Show Advanced Option Box to customize the test.



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Firmware Update

1. Connect your PC to the radio modem using a straight through serial cable and the auto connect function. The new firmware must be stored on the PC's local drive.

2. From the Zlinx Manager Radio Modem launch screen, click the firmware update button.

3. Once connected, the software will determine which firmware versions are available on the PC and what version is loaded in the modem. The following screen allows you to chose which firmware version to load.

4. Select the firmware version to load from the pull down menu and click the update button.

Specifications

RF Properties	
Physical Standard	ZP24D-192RM-MR = Proprietary radio ZP24D-96RM-MR = Proprietary radio ZP9D-192RM-MR = Proprietary radio ZP9D-115RM-LR = Proprietary radio
Range	Radio Dependant ZP24D-****-MR (2.4GHz) = up to 600 feet indoor or 3 mile outdoor ZP9D-****-MR (900MHz) = up to 1500 feet indoor or 7 mile outdoor
Frequency	900MHz/2.4GHz
Transmit Power	Radio Dependant ZP9D-****-MR = 100mW (900MHz), ZP24D-****-MR = 50mW (2.4GHz)
Software	Zlinx Radio Modem
Support	Windows 2000, 2003 Server, XP, and Vista
Features	AT Command Terminal emulation RSSI signal range test Modem emulation
Antenna Options	External Reverse Polarity SMA male jack connector, omni directional (included with product)
Radio Address	Defaulted at factory, set by software otherwise
Serial settings	
Baud	1200, 2400, 4800, 9600, 19200, 38400, 57600
Data bit	7, 8
Parity	None, even, odd, mark, space
Stop bit	1, 2
RS-232	
Connector	DB9F DCE
Lines	TX, RX, RTS, CTS, DTR, DSR, DCD, RI, GND
Connector	Removable terminal block
Lines	TX, RX, GND
RS-422	
Connector	Removable terminal block
Lines	2 or 4 wire – TX+, TX-, RX+, RX-, GND (2 or 4 wire dipswitch selectable)
Termination	120 Ohm Dipswitch selectable
RS-485	
Connector	Removable terminal block
Lines	2 or 4 wire with SD control – TX+, TX-, RX+,

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<table>
<tr><td></td><td>RX-, GND (2 or 4 wire dipswitch selectable)</td></tr>
<tr><td>SD control</td><td>Bit wise</td></tr>
<tr><td>Termination</td><td>120 Ohm Dipswitch selectable</td></tr>
<tr><td>Transistor link failure</td><td>No wireless signal or RSSI LED off</td></tr>
<tr><td>Connector</td><td>Removable terminal block with RS-422/485</td></tr>
<tr><td>Output type</td><td>Open collector, dry contact, 40mA</td></tr>
<tr><td>Power Supply</td><td></td></tr>
<tr><td>Connector</td><td>Removable terminal block</td></tr>
<tr><td>Input Voltage</td><td>10–48VDC, 18-30VAC</td></tr>
<tr><td>Power Consumption</td><td>ZP24D-xxxx-MR = 1.5W max
ZP9D-xxxx-MR = 1.5W max</td></tr>
<tr><td>Dimensions</td><td>1.2W x 3.3D x 4.7H</td></tr>
<tr><td>Environmental</td><td>Intended for indoor use only</td></tr>
<tr><td>Operating Temperature</td><td>-40 to 85ºC (-40 to 185ºF)</td></tr>
<tr><td>Storage Temperature</td><td>-40 to 85ºC (-40 to 185ºF)</td></tr>
<tr><td>Operating Humidity</td><td>10 to 90% non-condensing</td></tr>
<tr><td>Enclosure Rating</td><td></td></tr>
<tr><td>Rating</td><td>IP30</td></tr>
<tr><td>Mounting</td><td>DIN rail mount, 35mm</td></tr>
<tr><td>LED Status</td><td>
<table>
<tr><th>Front Panel LED</th><th>Status</th></tr>
<tr><td>Power</td><td>Red = On
OFF = No Power</td></tr>
<tr><td>RSSI (Signal Strength)</td><td>Green = Strong
Yellow = OK
Red = Weak
OFF = No Signal</td></tr>
<tr><td>Wireless Data</td><td>Green = Blink on with data</td></tr>
</table>
Note: In order for the RSSI LED to continuously indicate the signal strength, set the RP command (RSSI PWM Timer) to FF.
</td></tr>
<tr><td>Certifications</td><td></td></tr>
<tr><td>FCC</td><td>FCC Part 15 Class B</td></tr>
<tr><td>CE</td><td>CISPR (EN55022) Class B</td></tr>
<tr><td></td><td>EN61000-6-1 Generic Standards for Residential, Commercial, & Light Industrial</td></tr>
<tr><td></td><td>EN61000-4-2 ESD</td></tr>
<tr><td></td><td>EN61000-4-3 RFI</td></tr>
</table>

	EN61000-4-4 EFT
	EN61000-4-5 Surge
	EN61000-4-6 CI
	EN61000-4-8 Power Frequency Magnetic
	EN61000-4-11 Voltage Dips & Interruptions
UL	UL, cUL
RoHS directive (lead free)	Yes

Example: Both of the following examples change the module's destination address to 0x1A0D and save the new address to non-volatile memory. These examples use a PC running hyper terminal connected to the radio modem.

Method 1 (One line per command)

Send AT Command	System Response
+++	OK <CR> (Enter into Command Mode)
ATDT <Enter>	current Destination Address <CR> (Read)
ATDT1A0D <Enter>	OK <CR> (Change destination address)
ATWR <Enter>	OK <CR> (Write to non-volatile memory)
ATCN <Enter>	OK <CR> (Exit Command Mode)

Method 2 (Multiple commands on one line)

Send AT Command	System Response
+++	OK <CR> (Enter into Command Mode)
ATDT <Enter>	current Destination Address <CR> (Read)
ATDT1A0D,WR,CN <Enter>	OK <CR> (Execute commands)

Note: In order to use hyper terminal to send data to the module, PC com port settings must match the baud, parity & stop bit parameters stored in the module.

Use the "PC Settings" tab to configure PC com port settings to match module parameter values.

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Binary Command Example

To Send Binary Commands:

Example: Use binary commands to change the Zlinx Module's destination address to 0x1A0D and save the new address to non-volatile memory. 1. RT Command must be set to "1" in AT Command Mode to enable binary programming.	
2. Assert CMD (Pin 5 is driven high).	(Enter Binary Command Mode)
3. Send Bytes (parameter bytes must be 2 bytes long):	
00	(Send DT (Destination Address) Command)
0D	(Least significant byte of parameter bytes)
1A	(Most significant byte of parameter bytes)
08	(Send WR (Write) Command)
4. De-assert CMD (Pin 5 is driven low)	(Exit Binary Command Mode)

Note: (pin 1) is de-asserted high when commands are being executed. Hardware flow control must be disabled as will hold off parameter bytes.

Command Reference Table

Zlinx Commands (The modem expects numerical values in hexadecimal. "d" denotes decimal equivalent.)

AT Command	Binary Command	AT Command Name	Range	Command Category	# Bytes Returned	Factory Default
AM v4.30*	0x3A (58d)	Auto-set MY	-	Networking & Security	-	-
AT	0x05 (5d)	Guard Time After	0x02 – 0xFFF F [x 100 msec]	Command Mode Options	2	0x0A (10d)
BD v4.2B*	0x15 (21d)	Baud Rate	Stand ard baud rates: 0 – 6 (custo m rates also suppor ted)	Serial Interfacing	2	factory-set RF data rate
BK v4.30*	0x2E (46d)	Serial Break Passing	0 – 1	Serial Interfacing	1	0
BO v4.30*	0x30 (48d)	Serial Break Timeout	0 - 0xFFF F [x 1 secon d]	Serial Interfacing	2	0
BT	0x04 (4d)	Guard Time Before	0 – 0xFFF F [x 100 msec]	Command Mode Options	2	0x0A (10d)
CB v4.30*	0x33 (51d)	Connection Duration Timeout	0x01 – 0xFFF F [x 100 msec]	Networking & Security	2	0x28 (4d sec)
CC	0x13 (19d)	Command Sequence Character	0x20 – 0x7F	Command Mode Options	1	0x2B ("+")
CD v4.2B*	0x28 (40d)	DO3 Configuration	0 – 4	Serial Interfacing	1	0
CE v4.30*	0x34 (52d)	Connection Inactivity Timeout	0 – 0xFFF F [x 10 msec]	Networking & Security	2	0x64 (1d sec)
CF v4.30*	0x35 (53d)	Connection Failure	0 – 0xFFF	Networking & Security	2	0

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		Count	F			
CL v4.30*	0x39 (57d)	Last Connection Address	[read-only]	Diagnostics	2	-
CM v4.30*	0x38 (56d)	Connection Message	0 – 1	Networking & Security	1	0
CN	0x09 (9d)	Exit AT Command Mode	-	Command Mode Options	-	-
CO v4.30*	0x2F (47d)	DO3 Timeout	0 - 0xFFFF [x 1 second]	Serial Interfacing	2	0x03
CS v4.27D*	0x1F (31d)	DO2 Configuration	0 – 4	Serial Interfacing	1	0
CT	0x06 (6d)	Command Mode Timeout	0x02 – 0xFFFF [x 100 msec]	Command Mode Options	2	0xC8 (200d)
DC v4.30*	0x37 (55d)	Disconnect	-	Networking & Security	-	-
DR v4.30*	0x2D (45d)	DI3 Configuration	0 – 4	Serial Interfacing	1	0
DT	0x00 (0d)	Destination Address	0 – 0xFFFF	Networking & Security	2	0
E0	0x0A (10d)	Echo Off	-	Command Mode Options	-	-
E1	0x0B (11d)	Echo On	-	Command Mode Options	-	-
ER	0x0F (15d)	Receive Error Count	0 – 0xFFFF	Diagnostics	2	0
FH	0x0D (13d)	Force Wake-up Initializer	-	Sleep (Low Power)	-	-
FL	0x07 (7d)	Software Flow Control	0 – 1	Serial Interfacing	1	0
FT v4.27B*	0x24 (36d)	Flow Control Threshold	0 – 0xFF [bytes]	Serial Interfacing	2	varies
GD	0x10 (16d)	Receive Good Count	0 – 0xFFFF	Diagnostics	2	0
HP	0x11 (17d)	Hopping Channel	0 – 6	Networking & Security	1	0
HT	0x03 (3d)	Time before Wake-up Initializer	0 – 0xFFFF [x 100 msec]	Sleep (Low Power)	2	0xFFFF
ID v4.2B*	0x27 (39d)	Modem VID	User-settabl	Networking & Security	2	-

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			e: 0x10 - 0x7FFF Read-only: 0x8000 – 0xFFFF			
IU v4.30*	0x3B (59d)	DI2, DI3 Update Timer	0 - 0xFFFF [x 100 msec]	Serial Interfacing	2	0x0A (10d)
LH	0x0C (12d)	Wake-up Initializer Timer	0 – 0xFF [x 100 msec]	Sleep (Low Power)	1	0x01
MD v4.30*	0x32 (50d)	RF Mode	0 – 4	Networking & Security	1	0
MK	0x12 (18d)	Address Mask	0 – 0xFFFF	Networking & Security	2	0xFFFF
MY v4.30*	0x2A (42d)	Source Address	0 – 0xFFFF	Networking & Security	2	0xFFFF
NB v4.30*	0x23 (35d)	Parity	0 – 5	Serial Interfacing	1	0
PC v4.22*	0x1E (30d)	Power-up Mode	0 – 1	Command Mode Options	1	0
PK v4.30*	0x29 (41d)	RF Packet Size	0 - 0x100 [bytes]	Serial Interfacing	2	0x40 (64d)
PW v4.22*	0x1D (29d)	Pin Wake-up	0 – 1	Sleep (Low Power)	1	0
RB v4.30*	0x20 (32d)	Packetization Threshold	0 - 0x100 [bytes]	Serial Interfacing	2	0x01
RE	0x0E (14d)	Restore Defaults	-	(Special)	-	-
RN v4.22*	0x19 (25d)	Delay Slots	0 – 0xFF [slots]	Networking & Security	1	0
RO v4.2A*	0x21 (33d)	Packetization Timeout	0 – 0xFFFF [x 200 µsec]	Serial Interfacing	2	0
RP v4.2A*	0x22 (34d)	RSSI PWM Timer	0 - 0x7F [x 100 msec]	Diagnostics	1	0
RR v4.22*	0x18 (24d)	Retries	0 – 0xFF	Networking & Security	1	0

RS v4.22*	0x1C (28d)	RSSI	0x06 – 0x36 [read-only]	Diagnostics	1	-
RT	0x16 (22d)	DI2 Configuration	0 - 2	Serial Interfacing	1	0
RZ v4.30*	0x2C (44d)	DI Buffer Size	[read-only]	Diagnostics	-	-
SB v4.2B*	0x36 (54d)	Stop Bits	0 - 1	Serial Interfacing	1	0
SH v4.27C*	0x25 (37d)	Serial Number High	0 – 0xFFFF [read-only]	Diagnostics	2	-
SL v4.27C*	0x26 (38d)	Serial Number Low	0 – 0xFFFF [read-only]	Diagnostics	2	-
SM	0x01 (1d)	Sleep Mode	0 – 8	Sleep (Low Power)	1	0
ST	0x02 (2d)	Time before Sleep	0x10 – 0xFFFF [x 100 msec]	Sleep (Low Power)	2	0x64 (100d)
SY	0x17 (23d)	Time before Initialization	0 – 0xFF [x 100 msec]	Networking & Security	1	0 (disabled)
TO v4.30*	0x31 (49d)	DO2 Timeout	0 - 0xFFFF (x 1 sec)	Serial Interfacing	2	0x03
TR v4.22*	0x1B (27d)	Transmit Error Count	0 – 0xFFFF	Diagnostics	2	0
TT v4.22*	0x1A (26d)	Streaming Limit	0 – 0xFFFF [0 = disabled]	Networking & Security	2	0xFFFF
VR	0x14 (20d)	Firmware Version	0 x 0xFFFF [read-only]	Diagnostics	2	-
WR	0x08 (8d)	Write	-	(Special)	-	-

*Firmware version in which command and parameter options were first supported.

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NOTE: AT Commands issued without a parameter value will return the currently stored parameter.

Zlinx Command Descriptions

Command descriptions in this section are listed alphabetically. Command categories are designated within "< >" symbols that follow each command title. Zlinx Modules expect parameter numerical values in hexadecimal (designated by the "0x" prefix).

AM (Auto-set MY) Command
<Networking & Security> AM Command is used to automatically set the MY (Source Address) parameter from the factory-set module serial number. The address is formed with bits 29, 28 and 13-0 of the serial number (in that order).

AT Command: ATAM
Binary Command: 0x3A (58 decimal)
Minimum firmware version required: 4.40

AT (Guard Time After) Command
<Command Mode Options> AT Command is used to set the DI time-of-silence that follows the AT command sequence character (CC Command). By default, AT Command Mode will activate after one second of silence.

Binary Command: 0x05 (5 decimal)	
Parameter Range:	0x02 – 0xFFFF [x 100 milliseconds]
Number of bytes returned: 2	
Default Parameter Value: 0x0A (10 decimal)	
Related Commands: BT (Guard Time Before), CC (Command Sequence Character)	

Refer to the AT Commands section to view the default AT Command Mode Sequence.

BD (Interface Data Rate) Command

<Serial Interfacing> BD Command allows the user to adjust the UART interface data rate and thus modify the rate at which serial data is sent to the RF module. The new baud rate does not take effect until the CN command is issued. The RF data rate is unaffected by the BD parameter.

Most applications will require one of the seven standard baud rates; however, non-standard baud rates are also supported.

Note: If the interface data rate is set to exceed the fixed RF data rate of the module, flow control may need to be implemented as described in the Pin, Flow Control and CS (DO2 Configuration) sections.

AT Command: ATBD

Binary Command: 0x15 (21 decimal)

Parameter Range (Standard baud rates): 0 – 6
(Non-standard baud rates): 0x7D – 0xFFFF

Parameter	Configuration (bps)
0	1200
1	2400
2	4800
3	9600
4	19200
5	38400
6	57600

Number of bytes returned: 2

Default Parameter Value: Set to equal module's factory-set RF data rate.

Related Commands: CN (Exit Command Mode)

Minimum firmware version required: 4.2B
(Custom baud rates not previously supported.)

Non-standard Interface Data Rates: When parameter values outside the range of standard interface data rates are sent, the closest rate represented by the number is stored in the BD register. For example, a rate of 19200 bps can be set by sending the following command line "ATBD4B00". When the BD command is sent with a non-standard interface data rate, the UART will adjust to accommodate the requested interface rate. In most cases, the clock resolution will cause the stored BD parameter to vary from the parameter that was sent (refer to the table below). Reading the BD command (send "ATBD" command without an associated parameter value) will return the value that was actually stored in the BD register.

Parameter Sent vs. Parameter Stored BD Parameter Sent (HEX) Interface Data Rate (bps)

BD Parameter Sent (HEX)	Interface Data Rate (bps)	BD Parameter Stored (HEX)
0	1200	0
4	19,200	4
7	115,200	7
12C	300	12B
1C200	115,200	1B207

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BK (Serial Break Passing) Command

<Serial Interfacing> Pass a serial break condition on the DI pin to the DO pin of another module.

AT Command: ATBK

Binary Command: 0x2E (46 decimal)

Parameter Range: 0 – 1

Parameter	Configuration
0	disable
1	enable

Default Parameter Value: 0

Number of bytes returned: 1

Related Commands: BO (Serial Break Timeout)

Minimum Firmware Version Required: 4.30

BO (Serial Break Timeout) Command

<Serial Interfacing> DO pin will return to default after no serial break status information is received during the timeout period.

Use with BK parameter = 1.

AT Command: ATBO

Binary Command: 0x30 (48 decimal)

Parameter Range: 0 – 0xFFFF [x 1 second]

Default Parameter Value: 0

Number of bytes returned: 2

Related Commands: BK (Serial Break Passing)

Minimum Firmware Version Required: 4.30

BT (Guard Time Before) Command

<Command Mode Options> BT Command is used to set the DI pin silence time that must precede the command sequence character (CC Command) of the AT Command Mode Sequence.

Refer to the AT Commands section to view the default AT Command Mode sequence.

AT Command: ATBT

Binary Command: 0x04 (4 decimal)

Parameter Range: 0 – 0xFFFF [x 100 milliseconds]

Default Parameter Value: 0x0A (10 decimal)

Number of bytes returned: 2

Related Commands: AT (Guard Time After), CC (Command Sequence Character)

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CB (Connection Duration Timeout) Command
<Networking & Security> Set/Read the maximum amount of time an exclusive connection between a base and remote module in a point-to-multipoint network is sustained. The remote module will disconnect when this timeout expires.

Binary Command: 0x33 (51 decimal)
Parameter Range: 0x01 – 0xFFFF [x 100 milliseconds]
Default Parameter Value: 0x28 (4d seconds)
Number of bytes returned: 2
Related Commands: CE (Connection Inactivity Timeout), DC (Disconnect), MD (RF Mode)
Minimum Firmware Version Required: 4.30

CC (Command Sequence Character) Command
<Command Mode Options> CC Command is used to set the ASCII character to be used between Guard Times of the AT Command Mode Sequence (BT+ CC + AT). The AT Command Mode Sequence activates AT Command Mode (from Idle Mode).

AT Command: ATCC
Binary Command: 0x13 (19 decimal)
Parameter Range: 0x20 – 0x7F
Default Parameter Value: 0x2B (ASCII “+” sign)
Number of bytes returned: 1
Related Commands: AT (Guard Time After), BT (Guard Time Before)

Refer to the AT Commands section to view the default AT Command Mode sequence.

CD (DO3 Configuration) Command
<Serial Interfacing> CD Command is used to redefine the behavior of the DO3 (Data Output 3)/RX LED line.

AT Command: ATCD

Binary Command: 0x28 (40 decimal)

Parameter Range: 0 – 4

Parameter	Configuration
0	RX LED
1	Default high
2	Default low
3	(reserved)
4	Assert only when packet addressed to module sent

Default Parameter Value: 0

Number of bytes returned: 1

Minimum Firmware Version Required: 4.2B

CE (Connection Inactivity Timeout) Command
<Networking & Security> Set/Read the duration of inactivity that will cause a break in a connection between modules. The base module will disconnect when no payload has been transferred for the time specified by the CE parameter.

AT Command: ATCE
Binary Command: 0x34 (52 decimal)
Parameter Range: 0 – 0xFFFF [x 10 milliseconds]
Default Parameter Value: 0x64 (1d second)
Number of bytes returned: 2
Related Commands: CB (Connection Duration Timeout), DC (Disconnect), MD (RF Mode)
Minimum Firmware Version Required: 4.30

CF (Connection Failure Count) Command
<Diagnostics> Set/Read the number of times the base module expired retries attempting to send a Connection Grant Packet. Set to zero to clear the register.

AT Command: ATCF
Binary Command: 0x35 (53 decimal)
Parameter Range: 0 – 0xFFFF
Default Parameter Value: 0
Number of bytes returned: 2
Minimum Firmware Version Required: 4.30

CL (Last Connection Address) Command
<Diagnostics/Networking & Security> Read the address of the remote module that last connected to the base module. A remote module will return its DT (Destination Address) parameter.

AT Command: ATCL
Binary Command: 0x39 (57 decimal)
Parameter Range: 0 – 0xFFFF [read-only]
Number of bytes returned: 2
Minimum Firmware Version Required: 4.30

CM (Connection Message) Command
<Networking & Security> Select whether base sends connect messages to the host when a connection is established. When enabled, a "CONNECTXXXX" string is sent to the host of the base module. "XXXX" is the MY (Source Address) of the connected remote module.

AT Command: ATCM	
Binary Command: 0x38 (56 decimal)	
Parameter Range: 0 – 1	
Parameter	Configuration
0	enable
1	disable
Default Parameter Value: 0	
Number of bytes returned: 1	
Minimum Firmware Version Required: 4.30	

CN (Exit AT Command Mode) Command
<Command Mode Options> CN Command is used to explicitly exit AT Command Mode.

AT Command: ATCN
Binary Command: 0x09 (9 decimal)

CO (DO3 Timeout) Command
<Serial Interfacing> DO3 (Data Output 3) output will return to default after no DI3 (Data Input 3) status information is received during the timeout period.
Use with CD = 1 or 2, DR = 1.

AT Command: ATCO
Binary Command: 0x2F (47 decimal)
Parameter Range: 0 – 0xFFFF [x 1 second]
Default Parameter Value: 3
Number of bytes returned: 2
Related Commands: CD (DO3 Configuration),DR (DI3 Configuration)
Minimum Firmware Version Required: 4.30

CS (DO2 Configuration) Command

<Serial Interfacing> CS Command is used to select the behavior of the DO2 (Data Output 2) pin signal. This output can provide RS-232 flow control, control the TX enable signal (for RS-485 or RS-422 operations), or set the default level for the I/O line passing function.

By default, DO2 provides RS-232 (Clear-to- Send) flow control.

AT Command: ATCS

Binary Command: 0x1F (31 decimal)

Parameter Range: 0 – 4

Parameter	Configuration
0	RS-232 flow control
1	RS-485 TX enable low
2	high
3	RS-485 TX enable high
4	low

Default Parameter Value: 0

Number of bytes returned: 1

Related Commands: RT (DI2 Configuration), TO (DO2 Timeout)

Minimum Firmware Version Required: 4.27D

CT (Command Mode Timeout) Command

<Command Mode Options> CT Command is used to set the amount of time of inactivity before AT Command Mode automatically terminates. After a CT time of inactivity, the module exits AT Command Mode and returns to Idle Mode. AT Command Mode can also be exited manually using the CN (Exit AT Command Mode) Command.

AT Command: ATCT

Binary Command: 0x06 (6 decimal)

Parameter Range: 2 – 0xFFFF
[x 100 milliseconds]

Default Parameter Value: 0xC8 (200 decimal, 20 seconds)

Number of bytes returned: 2

DC (Disconnect) Command

<Networking & Security> DC Command is used (when in Multi-Streaming Mode (MD = 1 or 2)) to explicitly force the disconnection of an active exclusive connection. If MD = 1, the base module will force the disconnection of an exclusive connection. If MD = 2, the remote module will send a “Disconnect Request Packet” to the base module

AT Command: ATDC

Binary Command: 0x37 (55 decimal)

Related Commands: CB (Connection Duration Timeout), CE (Connection Inactivity Timeout), MD (RF Mode)

Minimum Firmware Version Required: 4.30

DR (DI3 Configuration) Command

<Serial Interfacing> DR Command is used to configure DI3 (pin 2, SLEEP) for I/O line passing (use with CD = 1 or 2 and CO) or controlling connection status (use with MD = 1 or 2).

AT Command: ATDR

Binary Command: 0x2D (45 decimal)

Parameter Range: 0 – 4

Parameter	Configuration
0	Disabled
1	DI3 I/O passing enabled
2	Connect on low
3	Disconnect on high
4	Connect and Disconnect

Default Parameter Value: 0

Number of bytes returned: 1

Related Commands: CD (DO3 Configuration),CO (DO3 Timeout), MD (RF Mode)

Minimum Firmware Version Required: 4.30

DT (Destination Address) Command

<Networking & Security> DT Command is used to set the networking address of an Zlinx Module. Zlinx Modules use three filtration layers: Channels (ATHP), Vendor Identification Number (ATID) and Destination Addresses (ATDT). DT Command assigns an address to a module that enables it to communicate only with other modules having the same addresses. All modules that share the same Destination Address can communicate freely with each other. Modules in the same network with a different Destination Address (than that of the transmitter) will listen to all transmissions to stay synchronized, but will not send any of the data out their serial ports.

AT Command: ATDT

Binary Command: 0x00

Parameter Range: 0 – 0xFFFF

Default Parameter Value: 0

Number of bytes returned: 2

Related Commands: HP (Hopping Channel), ID (Module VID), MK (Address Mask)

E0 (Echo Off) Command

<Command Mode Options> The E0 command turns off character echo in AT Command Mode. By default, echo is off.

AT Command: ATE0

Binary Command: 0x0A (10 decimal)

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E1 (Echo On) Command

<Command Mode Options> E1 Command turns on the echo in AT Command Mode. Each typed character will be echoed back to the terminal when ATE1 is active. E0 is the default.

AT Command: ATE1
Binary Command: 0x0B (11 decimal)

ER (Receive Error Count) Command

<Diagnostics> Set/Read the receive error count. The error-count records the number of packets partially received then aborted on reception error. This value returns to 0 after a reset and is not non-volatile (value does not persist in the module's memory after a power-up sequence). Once the receive error count reaches its maximum value (up to 0xFFFF), it remains at its maximum count value until the maximum count value is explicitly changed or the module is reset.

AT Command: ATER
Binary Command: 0x0F (15 decimal)
Parameter Range: 0 – 0xFFFF
Default Parameter Value: 0
Number of bytes returned: 2
Related Commands: GD (Receive Good Count)

FH (Force Wake-up Initializer) Command

<Sleep (Low Power)> FH Command is used to force a Wake-up Initializer to be sent on the next transmission. WR (Write) Command does not need to be issued with FH Command.

Use only with cyclic sleep modes active on remote modules.

AT Command: ATFH
Binary Command: 0x0D (13 decimal)

FL (Software Flow Control) Command

<Serial Interfacing> FL Command is used to configure of module with software flow control. Hardware flow control is implemented with the Zlinx Module as the DO2 pin ( ), which regulates when serial data can be transferred to the module. FL Command is used to allow software flow control. XON character used is 0x11 (17 decimal). XOFF character used is 0x13 (19 decimal).

AT Command: ATFL	
Binary Command: 0x07 (7 decimal)	
Parameter Range: 0 – 1	
Parameter	Configuration
0	Disable software flow control
1	Enable software flow control
Default Parameter Value: 0	
Number of bytes returned: 1	

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FT (Flow Control Threshold) Command

<Serial Interfacing> Set/Read the flow control threshold. When FT bytes have accumulated in the DI buffer, is de-asserted or the XOFF software flow control character is transmitted.

AT Command: ATFT
Binary Command: 0x24 (36 decimal)
Parameter Range: 0 – 0xFF [bytes] (Maximum value equals the receiving module DO buffer size minus 0x11 bytes)
Default Parameter Value: Receiving module DO Buffer size minus 0x11
Number of bytes returned: 2
Minimum Firmware Version Required: 4.27B

GD (Receive Good Count) Command

<Diagnostics> Set/Read the count of good received RF packets. Parameter value is reset to 0 after every reset and is not non-volatile (value does not persist in the module's memory after a power-up sequence). Once the "Receive Good Count" reaches its maximum value (up to 0xFFFF), it remains at its maximum count value until the maximum count value is manually changed or the module is reset.

AT Command: ATGD
Binary Command: 0x10 (16 decimal)
Parameter Range: 0 – 0xFFFF
Default Parameter Value: 0
Number of bytes returned: 2
Related Commands: ER (Receive Error Count)

HP (Hopping Channel) Command

<Networking & Security> HP Command is used to set the module hopping channel number. A channel is one of three layers of addressing available to the module. In order for modules to communicate with each other, the modules must have the same channel number since each network uses a different hopping sequence. Different channels can be used to prevent modules in one network from listening to transmissions of another.

AT Command: ATHP
Binary Command: 0x11 (17 decimal)
Parameter Range: 0 – 6
Default Parameter Value: 0
Number of bytes returned: 1
Related Commands: DT (Destination Address), ID (Module VID), MK (Address Mask)

HT (Time before Wake-up Initializer) Command

<Sleep (Low Power)> If any modules within range are running in a "Cyclic Sleep" setting, a wake-up initializer must be used by the transmitting module for sleeping modules to remain awake [refer to the LH ("Wake-up Initializer Timer") Command]. When a receiving module in Cyclic Sleep wakes, it must detect the wake-up initializer in order to remain awake and receive data. The value of HT Parameter tells the transmitter, "After a period of inactivity (no transmitting or receiving) lasting HT amount of time, send a long wake-up initializer". HT Parameter should be set to match the inactivity timeout [specified by ST (Time before Sleep) Command] used by the receiver(s).

AT Command: ATHT
Binary Command: 0x03 (3 decimal)
Parameter Range: 0 – 0xFFFF [x 100 milliseconds]
Default Parameter Value: 0xFFFF (means that long wake-up initializer will not be sent)
Number of bytes returned: 2
Related Commands: LH (Wake-up Initializer Timer), SM (Sleep Mode), ST (Time before Sleep)

From the receiving module perspective, after HT time elapses and the inactivity timeout (ST command) is met, the receiver goes into cyclic sleep. In cyclic sleep, the receiver wakes once per sleep interval to check for a wake-up initializer. When a wake-up initializer is detected, the module will stay awake to receive data. The wake-up initializer must be longer than the cyclic sleep interval to ensure that sleeping modules detect incoming data. When HT time elapses, the transmitter then knows that it needs to send a long Wake-up Initializer for all receivers to be able to remain awake and receive the next transmission. Matching HT to the time specified by ST on the receiving module guarantees that all receivers will detect the next transmission.

ID (Modem VID) Command

<Networking & Security> Set/Read the VID (Vendor Identification Number). Only modules with matching VIDs can communicate with each other. Modules with non-matching VIDs will not receive unintended data transmission.

AT Command: ATID
Binary Command: 0x27 (39 decimal)
Parameter Range (user-settable): 0x10 - 0x7FFFF (Factory-set and read-only): 0x8000 – 0xFFFF
Number of bytes returned: 2
Minimum Firmware Version Required: 4.2B (previous firmware versions did not support user-settable IDs.)

IU (DI2, DI3 Update Timer) Command

<Serial Interfacing> Set/Read the interval at which the status of DI2, DI3 and Break is transmitted. Additionally, status is transmitted whenever there is a transition. A setting of “0” disables periodic update. DI2 or DI3 passing must be enabled for the update to take place.

AT Command: ATIU
Binary Command: 0x3B (59 decimal)
Parameter Range: 0 - 0xFFFF [x 100 ms]
Default Parameter Value: 0x0A (10 decimal)
Number of bytes returned: 2
Related Commands: BK (Serial Break Passing), BO (Serial Break Timeout), CO (DO3 Timeout), DR (Disconnect), RT (DI2 Configuration), TO (DO2 Timeout)
Minimum Firmware Version Required: 4.30

LH (Wake-up Initializer Timer) Command

<Sleep (Low Power)> Set/Read the amount of time during which the RF initializer is sent. When receiving modules are put into Cyclic Sleep Mode, they power-down after a period of inactivity [specified by ST (Time before Sleep) Command] and will periodically awaken and listen for transmitted data. In order for the receiving modules to remain awake, they must detect ~35ms of the wake-up initializer.

AT Command: ATLH	
Binary Command: 0x0C (12 decimal)	
Parameter Range:	0 – 0xFF [x 100 milliseconds]
Default Parameter Value: 1	
Number of bytes returned: 1	
Related Commands: HT (Time before Wake-up Initializer), SM (Sleep Mode), ST (Time before Sleep)	

LH Command must be used whenever a receiver is operating in Cyclic Sleep Mode. This lengthens the Wake-up Initializer to a specific amount of time (in tenths of a second). The Wake-up Initializer Time must be longer than the cyclic sleep time that is determined by SM (Sleep Mode) Command. If the wake-up initializer time were less than the Cyclic Sleep interval, the connection would be at risk of missing the wake-up initializer transmission.

Refer to the figures in the Sleep Mode sections to view correct and incorrect configuration diagrams. The images help visualize the importance that the LH value be greater than the SM cyclic sleep value.

MD (RF Mode) Command
<Networking & Security> The MD command is used to select/read the RF Mode (Peer-to-peer, Multi-Stream or Repeater Modes) of the module.

Multi-Streaming Mode enables exclusive connections in point-to-multipoint networks. Refer to the Multi-Streaming Mode section for more information regarding how these parameter values affect other parameter values.

Repeater Mode enables longer range via an intermediary module. When MD=3, the module will act as a "store and forward" repeater. Any packets not addressed to this node will be repeated. A Repeater End Node (MD=4) handles repeated messages, but will not forward the data over-the-air.

AT Command: ATMD

Binary Command: 0x32 (50 decimal)

Parameter Range: 0 – 4

Parameter	Configuration
0	Peer-to-Peer (transparent operation)
1	Multi-Stream Base
2	Multi-Stream Remote
3	Repeater & End Node
4	End Node

Default Parameter Value: 0

Number of bytes returned: 1

Related Commands: CB (Connection Duration Timeout), CE (Connection Inactivity Timeout), CM (Connection Message), DC (Disconnect)

Minimum Firmware Version Required: 4.30

MK (Address Mask) Command
<Networking & Security> MK Command is used to set/read the address mask of the module.

All data packets contain the destination address (DT Parameter) of the transmitting module. When an RF data packet is received, the transmitter's destination address is logically "ANDed" (bitwise) with the Address Mask of the receiver. The resulting value must match the destination address or the address mask of the receiver for the packet to be received and sent out the module DO serial port. If the "ANDed"
value does not match either the destination address or the address mask of the receiver, the packet is discarded. (All "0" values are treated as "irrelevant" values and are ignored.)

AT Command: ATMK

Binary Command: 0x12 (18 decimal)

Parameter Range: 0 – 0xFFFF

Default Parameter Value: 0xFFFF
(Destination address (DT parameter) of the transmitting module must exactly match the destination address of the receiving module.)

Number of bytes returned: 2

Related Commands: DT (Destination Address), HP (Hopping Channel), ID (Module VID), MY (Source Address)

MY (Source Address) Command
<Networking & Security>
Set/Read the source address of the module.

AT Command: ATMY
Binary Command: 0x2A (42 decimal)
Parameter Range: 0 – 0xFFFF
Default Parameter Value: 0xFFFF (Disabled – the DT (Destination Address) parameter serves as both source and destination address.)
Number of bytes returned: 2
Related Commands: DT (Destination Address), HP (Hopping Channel), ID (Modem VID), MK (Address Mask), AM (Auto-set MY)
Minimum Firmware Version Required: 4.30

NB (Parity) Command
<Serial Interfacing>
Select/Read parity settings for UART communications.

AT Command: ATNB

Binary Command: 0x23 (35 decimal)

Parameter Range: 0 – 5

Parameter	Configuration
0	8-bit (no parity or 7-bit (any parity)
1	8-bit even
2	8-bit odd
3	8-bit mark
4	8-bit space
5	9-bit

Default Parameter Value: 0

Number of bytes returned: 1

Minimum Firmware Version Required: 4.30 (previous versions did not support the 9th bit.

PC (Power-up Mode) Command
<Command Mode Options>
PC Command allows the module to power-up directly into AT Command Mode from reset or power-on. If PC Command is enabled with SM Parameter set to 1, DI3 (pin 2) can be used to enter the module into AT Command Mode. When the DI3 pin is deasserted (low), the module will wake-up in AT Command Mode. This behavior allows module DTR emulation.

AT Command: ATPC

Binary Command: 0x1E (30 decimal)

Parameter Range: 0 – 1

Parameter	Configuration
0	Power-up to Idle Mode
1	Power-up to AT Command Mode

Default Parameter Value: 0

Number of bytes returned: 1

Minimum Firmware Version Required: 4.22

PK (RF Packet Size) Command

<Serial Interfacing> Set/Read the maximum size of the RF packets sent out a transmitting module. The maximum packet size can be used along with the RB and RO parameters to implicitly set the channel dwell time.

AT Command: ATPK
Binary Command: 0x29 (41 decimal)
Parameter Range: 0 – 0x100 [Bytes]
Default Parameter Value: 0x40 (64 decimal)
Number of bytes returned: 2
Related Commands: RB (Packetization Threshold), RO (Packetization Timeout)
Minimum Firmware Version Required: 4.30

Changes to this parameter may have a secondary effect on the RB (Packet Control Characters) parameter. RB must always be less than or equal to PK. If PK is changed to a value less than the current value of RB, RB is automatically lowered to be equal to PK.

PW (Pin Wake-up) Command

<Sleep (Low Power)> Under normal operation, a module in Cyclic Sleep Mode cycles from an active state to a low-power state at regular intervals until data is ready to be received. If the PW Parameter is set to 1, SLEEP (pin 2) can be used to wake the module from Cyclic Sleep. If the SLEEP pin is de-asserted (low), the module will be fully operational and will not go into Cyclic Sleep. Once SLEEP is asserted, the module will remain active for the period of time specified by ST (Time before Sleep) Command and will return to Cyclic Sleep Mode (if no data is ready to be transmitted). PW Command is only valid if Cyclic Sleep has been enabled.

AT Command: ATPW
Binary Command: 0x1D (29 decimal)
Parameter Range: 0 – 1

Parameter	Configuration
0	Disabled
1	Enabled

Default Parameter Value: 0
Number of bytes returned: 1
Related Commands: SM (Sleep Mode), ST (Time before Sleep)
Minimum Firmware Version Required: 4.22

RB (Packetization Threshold) Command

<Serial Interfacing> RF transmission will commence when data is in the DI Buffer and either of the following criteria are met:

- RO times out on the UART receive lines (ignored if RO = 0)
- RB characters have been received by the UART (ignored if RB = 0)

AT Command: ATRB
Binary Command: 0x20 (32 decimal)
Parameter Range: 0 – 0x100 [bytes](Maximum value equals the current value of PK Parameter (up to 0x100 HEX (800 decimal))
Default Parameter Value: 1
Number of bytes returned: 2
Related Commands: PK (RF Packet Size), RO (Packetization Timeout)
Minimum Firmware Version Required: 4.30

If PK is lowered below the value of RB; RB is automatically lowered to match PK.

Note: RB and RO criteria only apply to the first packet of a multi-packet transmission. If data remains in the DI Buffer after the first packet, transmissions will continue in streaming manner until there is no data left in the DI Buffer (UART receive buffer).

RE (Restore Defaults) Command

AT Command: ATRE
Binary Command: 0x0E (14 decimal)

<Diagnostics> RE Command restores all configurable parameters to factory default settings. However, RE Command will not write the restored values to non-volatile (persistent) memory. Issue the WR (Write) Command after the RE command to save restored parameter values to non-volatile memory.

RN (Delay Slots) Command

AT Command: ATRN
Binary Command: 0x19 (25 decimal)
Parameter Range: 0 – 0xFF [slots]
Default Parameter Value: 0 (no delay slots are inserted)
Number of bytes returned: 1
Related Commands: RR (Retries), TT (Streaming Limit)
Minimum Firmware Version Required: 4.22

<Networking & Security> RN Command is only applicable if retries have been enabled [RR (Retries) parameter > 0], or if forced delays will be inserted into a transmission [TT (Streaming Limit) parameter > 0]. RN Command is used to adjust the time delay that the transmitter inserts before attempting to resend a packet. If the transmitter fails to receive an acknowledgement after sending a packet, it will insert a random number of delay slots (ranging from 0 to (RN minus 1)) before attempting to resend the packet. Each delay slot lasts for a period of 38ms.

If two modules attempted to transmit at the same time, the random time delay after packet failure would allow one of the two modules to transmit the packet successfully, while the other would wait until the channel opens up to begin transmission.

RO (Packetization Timeout) Command

AT Command: ATRO
Binary Command: 0x21 (33 decimal)
Parameter Range: 0 – 0xFFFF [x 200 µs]
Default Parameter Value: 0
Number of bytes returned: 2
Minimum Firmware Version Required: 4.2A

<Serial Interfacing> Set/Read the time of silence (no bytes received) after which transmission begins. After a serial byte is received and if no other byte is received before the RO timeout, the transmission will start.

RP (RSSI PWM Timer) Command

AT Command: ATRP	
Binary Command: 0x22 (34 decimal)	
Parameter Range:	0 - 0x7F [x 100 milliseconds]
Default Parameter Value: 0	(disabled)
Number of bytes returned: 1	
Minimum Firmware Version Required: 4.2A	

<Diagnostics> RP Command is used to enable PWM (Pulse Width Modulation) output on the CONFIG pin. The output is calibrated to show the level the received RF signal is above the sensitivity level of the module. The PWM pulses vary from zero to 95 percent. Zero percent means the received RF signal is at or below the published sensitivity level of the module. The following table shows levels above sensitivity and PWM values.

The total period of the PWM output is 8.32 ms. Because there are 40 steps in the PWM output; the minimum step size is 0.208 ms.

PWM Chart

dBm above Sensitivity	PWM percentage (high period / total period)
10	47.5%
20	62.5%
30	77.5%

A non-zero value defines the time that the PWM output will be active with the RSSI value of the last received RF packet. After the set time when no RF packets are received, the PWM output will be set low (0 percent PWM) until another RF packet is received. The PWM output will also be set low at power-up. A parameter value of 0xFF permanently enables the PWM output and it will always reflect the value of the last received RF packet.

PWM output shares the Config input pin. When the module is powered, the Config pin will be an input. During the power-up sequence, the Config pin will be read to determine whether the module is going into AT Command Mode. After this, if RP parameter is a non-zero value, the Config pin will be configured as an output and set low until the first RF packet is received. With a non-zero RP parameter, the Config pin will be an input for RP ms after power up.

RR (Retries) Command

Binary Command: 0x18 (24 decimal)	
Parameter Range:	0 – 0xFF
Default Parameter Value: 0	(disabled)
Number of bytes returned: 1	
Minimum Firmware Version Required: 4.22	

<Networking> Set/Read the number of retries that can be sent for a given RF packet. Once RR command is enabled (set to a non-zero value), RF packet acknowledgements and retries are enabled. After transmitting a packet, the transmitter will wait to receive an acknowledgement from a receiver. If the acknowledgement is not received in the period of time specified by the RN (Delay Slots) Command, the transmitter will transmit the original packet again.

The packet will be transmitted repeatedly until an acknowledgement is received or until the packet has been sent RR times.

Note: For retries to work correctly, all modules in the system must have retries enabled.

RS (RSSI) Command
<Diagnostics> Read the signal level of the last packet received. This reading is useful for determining range characteristics of the modules under various conditions of noise and distance.

AT Command: ATRS
Binary Command: 0x1C (28 decimal)
Parameter Range: 0x06 – 0x36 [read-only]
Number of bytes returned: 1
Minimum Firmware Version Required: 4.22

Once the command is issued, the module will return a value between 0x06 and 0x36. ('0x36' represents a very strong signal level and '0x06' indicates a low signal level.)

RT (DI2 Configuration) Command
<Serial Interfacing> RT command is used to dictate the behavior of the DI2/RTS/CMD line. RT Command must be issued to enable RTS flow control or binary programming.

AT Command: ATRT	
Binary Command: 0x16 (22 decimal)	
Parameter Range: 0 – 2	
Parameter	Configuration
0	disabled
1	Enable Binary Programming
2	Enable Flow Control
Default Parameter Value: 0	
Number of bytes returned: 1	

RZ (DI Buffer Size) Command
<Diagnostics> The RZ command is used to read the size of the DI buffer (UART RX (Receive)).

AT Command: ATRZ
Binary Command: 0x2C (44 decimal)
Parameter Range: Read-only
Number of bytes returned: 2
Minimum Firmware Version Required: 4.30

Note: The DO buffer size can be determined by multiplying the DI buffer size by 1.5.

SB (Stop Bits) Command
<Serial Interfacing> Set/Read the number of stop bits in the RF data packets.

AT Command: ATSB

Binary Command: 0x36 (54 decimal)

Parameter Range: 0 – 1

Parameter	Configuration
0	1 stop bits
1	2 stop bits

Default Parameter Value: 0

Number of bytes returned: 1

Minimum Firmware Version Required: 4.2B

SH (Serial Number High) Command
<Diagnostics> Set/Read the serial number high word of the module.

AT Command: ATSH

Binary Command: 0x25 (37 decimal)

Parameter Range: 0 – 0xFFFF [read-only]

Number of bytes returned: 2

Related Commands: SL (Serial Number Low)

Minimum Firmware Version Required: 4.27C

SL (Serial Number Low) Command
<Diagnostics> Set/Read the serial number low word of the module.

AT Command: ATSH

Binary Command: 0x26 (38 decimal)

Parameter Range: 0 – 0xFFFF [read-only]

Number of bytes returned: 2

Related Commands: SH (Serial Number High)

Minimum Firmware Version Required: 4.27C

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SM (Sleep Mode) Command
<Sleep Mode (Low Power)>
Set/Read Sleep Mode Settings. By default, Sleep Mode is disabled and the module remains continually active.

SM Command allows the module to run in a lower-power state and to be configured in one of eight settings.

Cyclic Sleep settings wake the module after the amount of time designated by SM Command. If the module detects a wake-up initializer during the time it is awake, it will synchronize with the transmitter and start receiving data after the wake-up initializer runs its duration. Otherwise, it returns to Sleep Mode and continues to cycle in and out of inactivity until the Wake-up Initializer is detected. If a Cyclic Sleep setting is chosen, the ST, LH and HT parameters must also be set as described in the "Sleep Mode" section of this manual.

AT Command: ATSM

Binary Command: 0x01

Parameter Range: 0 – 8

Parameter	Configuration
0	Disabled
1	Pin Sleep
2	Serial Port Sleep
3	Cyclic 0.5 second sleep (Module wakesevery 0.5 seconds)
4	Cyclic 1.0 second sleep
5	Cyclic 2.0 second sleep
6	Cyclic 4.0 second sleep
7	Cyclic 8.0 second sleep
8	Cyclic 16.0 second sleep

Default Parameter Value: 0

Number of bytes returned: 1

Related Commands:
Pin Sleep – PC (Power-up Mode), PW (Pin Wake-up)

Serial Port Sleep – ST (Time before Sleep)

Cyclic Sleep – ST (Time before Sleep), LH (Wake-up Initializer Timer), HT (Time Before Wake-up Initializer), PW (Pin Wake-up)

ST (Time before Sleep) Command
<Sleep Mode (Low Power)>
Set/Read the period of time in which the module remains inactive before entering into Sleep Mode. For example: If the ST parameter is set to 0x64 (100 decimal), the module will enter into Sleep mode after 10 seconds of inactivity (no transmitting or receiving). This command can only be used if Cyclic Sleep or Serial Port Sleep Mode settings have been selected using the SM command.

AT Command: ATST

Binary Command: 0x02

Parameter Range: 0x10 – 0xFFFF [x 100 milliseconds]

Default Parameter Value: 0x64 (100 decimal)

Number of bytes returned: 2

Related Commands: SM (Sleep Mode), LH (Wake-up Initializer Timer), HT (Time before Wake-up Initializer)

SY (Time before Initialization) Command

<Networking & Security> SY Command keeps a communication channel open as long as module transmits or receives before the active connection expires. It can be used to reduce latency in a query/response sequence and should be set 100 ms longer than the delay between transmissions.

AT Command: ATSY
Binary Command: 0x17 (23 decimal)
Parameter Range: 0 – 0xFF [x 100 milliseconds]
Default Parameter Value: 0 (Disabled - channel initialization info sent with each RF packet.)
Number of bytes returned: 1

This command allows multiple Zlinx Modules to share a hopping channel for a given amount of time after receiving data. By default, all packets include an RF initializer that contains channel information used to synchronize any listening receivers to the transmitter's hopping pattern. Once a new module comes within range, it is able to instantly synchronize to the transmitter and start receiving data. If no new modules are introduced into the system, the synchronization information becomes redundant once modules have become synchronized.

SY Command allows the modules to remove this information from the RF Initializer after the initial synchronization. For example, changing the SY Parameter to 0x14 (20 decimal) allows all modules to remain in sync for 2 seconds after the last data packet was received. Synchronization information is not re-sent unless transmission stops for more than 2 seconds. This command allows significant savings in packet transmission time.

Warning: Not recommended for use in an interference-prone environment. Interference can break up the session and the communications channel will not be available again until SY time expires.

With SY set to zero, the channel session is opened and closed with each ransmission – resulting in a more robust link with more latency.

TO (DO2 Timeout) Command

<Serial Interfacing>DO2 output will return to default after no DI2 status information is received during the timeout period.

Use with CS = 2 or 4.

AT Command: ATTO
Binary Command: 0x31 (49 decimal)
Parameter Range: 0 – 0xFFFF [x 1 second]
Default Parameter Value: 3
Number of bytes returned: 2
Minimum Firmware Version Required: 4.30

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TR (Transmit Error Count) Command

AT Command: ATTR
Binary Command: 0x1B (27 decimal)
Parameter Range: 0 – 0xFFFF
Default Parameter Value: 0
Number of bytes returned: 2
Related Commands: RR (Retries)
Minimum Firmware Version Required: 4.22

<Diagnostics> Read number of retransmit failures. The number of retransmit errors is incremented each time a packet is not acknowledged within the number of retransmits specified by the RR (Retries) parameter. It therefore counts the number of packets that were not successfully received and have been dropped.

The TR parameter is not non-volatile and therefore is reset to zero each time the module is reset.

TT (Streaming Limit) Command

AT Command: ATTT
Binary Command: 0x1A (26 decimal)
Parameter Range: 0 – 0xFFFF [bytes]
Default Parameter Value: 0xFFFF (65535d)
Number of bytes returned: 2
Related Commands: RN (Delay Slots)
Minimum Firmware Version Required: 4.22

<Networking & Security> Set/Read the number of bytes that can be sent out before a random delay is issued. TT Command is used to simulate full-duplex behavior.

If a module is sending a continuous stream of RF data, a delay is inserted (transmission is stopped, allowing other modules time to transmit (once it sends number of bytes specified by TT Command). Inserted random delay lasts between 1 & 'RN + 1' delay slots, where each delay slot lasts 38 ms.

VR (Firmware Version) Command

AT Command: ATVR
Binary Command: 0x14 (20 decimal)
Parameter Range: 0 – 0xFFFF [read-only]
Number of bytes returned: 2

<Diagnostics> Read the Firmware Version of the module.

WR (Write) Command

AT Command: ATWR
Binary Command: 0x08

<(Special)> WR Command writes configurable parameters to the module's non-volatile memory (Parameter values remain in the module's memory until overwritten by future use of WR Command).

If changes are made without writing them to non-volatile memory, the module reverts back to previously saved parameters the next time the module is powered-on.