



ZumLink Z9-C or Z9-T

Covers Model: Z9-C or Z9-T

User Manual



Part Number: LUM0075AA

Revision: May-2016

Safety Information

The products described in this manual could fail in a variety of modes due to misuse, age, or malfunction. Systems with these products must be designed to prevent personal injury and property damage during product operation and in the event of product failure.



Warning! Remove power before connecting or disconnecting the interface or RF cables.

Warranty Information

FreeWave Technologies, Inc. warrants the FreeWave® ZumLink Z9-C or Z9-T (Product) against defects in materials and manufacturing for a period of two years from the date of shipment, depending on model number. In the event of a Product failure due to materials or workmanship, FreeWave will, at its discretion, repair or replace the Product. For evaluation of Warranty coverage, return the Product to FreeWave upon receiving a Return Material Authorization (RMA).

In no event will FreeWave Technologies, Inc., its suppliers, or its licensors be liable for any damages arising from the use of or inability to use this Product. This includes business interruption, loss of business information, or other loss which may arise from the use of this Product. OEM customer's warranty periods can vary.

Warranty Policy will **not apply** in the following circumstances:

1. If Product repair, adjustments, or parts replacements are required due to accident, neglect, or undue physical, electrical, or electromagnetic stress.
2. If Product is used outside of FreeWave specifications as stated in the Product's data sheet.
3. If Product has been modified, repaired, or altered by Customer unless FreeWave specifically authorized such alterations in each instance in writing. This includes the addition of conformal coating.

Special Rate Replacement Option

A special rate replacement option is offered to non-warranty returns or upgrades. The option to purchase the replacement unit at this special rate is only valid for that RMA. The special replacement rate option expires if not exercised within 30 days of final disposition of the RMA.

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FCC Notifications

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference and 2) this device must accept any interference received, including interference that may cause undesired operation.

The content of this guide covers FreeWave Technologies, Inc. models sold under FCC ID: KNYPM0101AA.

All models sold under the listed FCC ID(s) must be installed professionally and are only approved for use when installed in devices produced by FreeWave Technologies or third party OEMs with the express written approval of FreeWave Technologies, Inc. Changes or modifications should not be made to the device.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC NEMA Installation and Label

Where applicable, the models described in this guide must be installed in a NEMA enclosure. When any FreeWave Technologies, Inc. module is placed inside an enclosure, a label must be placed on the outside of the enclosure. The label must include the text: **"Contains Transmitter Module with FCC ID: KNYPM0101AA."**

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 52 cm between the radiator and your body.

FCC Notification of Power Warning

The ZumLink Z9-C or Z9-T covered in this document has a maximum transmitted output power of +30dBm.

The antennas used MUST provide a separation distance of at least 52 cm from all persons and MUST NOT be co-located or operate in conjunction with any other antenna or transmitter.

IC Notifications

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Ce dispositif est conforme aux normes permis-exemptes du Canada RSS d'industrie. L'opération est sujette aux deux conditions suivantes : (1) ce dispositif peut ne pas causer l'interférence, et (2) ce dispositif doit accepter n'importe quelle interférence, y compris l'interférence qui peut causer le fonctionnement peu désiré du dispositif.

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UL Power Source

Input power shall be derived from a certified, Class 2:

- single power source or
- an limited power source (LPS) in accordance with IEC/EN 60950-1.
- Input voltage for the **ZumLink Z9-C or Z9-T** is +3 to +5VDC ($\pm 10\%$).



ZumLink Z9-C or Z9-T Product Safety Standards and Editions

- HazLoc Standards
 - ANSI/ISA 12.12.01-2013
- Ordinary Location Standards
 - UL 60950, 2nd Edition
 - CAN/CSA-C22.2 No. 60950, 2nd Edition
 - IEC 60950, 2nd Edition
 - EN 60950, 2nd Edition

Schedule of Limitations

- Antenna connection is internal wiring only.
- The Ex Components shall only be used in an area of not more than pollution degree 2, as defined in IEC/EN60664-1.
- The Ex Components shall be installed in an enclosure with tool removable door or cover that provides a degree of protection not less than IP 54 in accordance with IEC/EN60679-15.
- Transient protection shall be provided that is set at a level not exceeding 140 % of the peak rated voltage value at the supply terminals to the equipment.
- All connectors (J1 to J4) do not have mating connectors with the devices.
- The securement of these connectors must be evaluated during end-product investigation.
- Temperature test was conducted at a rated supply voltage and the maximum surface temperature of 61°C was recorded at 60°C ambient temperature.

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Preface

Thank you for purchasing the FreeWave **ZumLink Z9-C or Z9-T**.

Other **ZumLink Z9-C or Z9-T** Information



Use the FreeWave www.freewave.com website to download the latest version of these documents.

Document	Description	FreeWave Part Number
User Manual	The User Manual provides detailed information about setup, drag-and-drop configuration, and safety information for the ZumLink Z9-C or Z9-T .	LUM0075AA
Quick Start Guide	The Quick Start Guide provides the out-of-the-box setup of the ZumLink Z9-C or Z9-T .	QSG0028AA

Contacting FreeWave Technical Support

For up-to-date troubleshooting information, check the **Support** page at www.freewave.com.

FreeWave provides technical support Monday through Friday, 8:00 AM to 5:00 PM Mountain Time (GMT -7).

- Call toll-free at 1.866.923.6168.
- In Colorado, call 303.381.9200.
- Contact us through e-mail at moreinfo@freewave.com.

Printing this Document

This document is set to print double-sided with a front cover and a back cover. Viewing this document online with a PDF viewer, may show pages intentionally left blank to accommodate the double-sided printing.

Document Styles

This document uses these styles:

- FreeWave applications appear as: **FreeWave**.
- Parameter setting text appears as: **[Page=radioSettings]**
- File names appear as: **configuration.cfg**.
- File paths appear as: **C:\Program Files (x86)\FreeWave Technologies**.
- User-entered text appears as: **xxxxxxxxxx**.
- 3rd-party names appear as: **Notepad®**.



Caution: Indicates a situation that **MAY** cause damage to personnel, the radio, data, or network.

Example: Provides example information of the related text.

FreeWave Recommends: Identifies FreeWave recommendation information.

Important!: Provides crucial information relevant to the text or procedure.

Note: Emphasis of specific information relevant to the text or procedure.



Tip! Provides time saving or informative suggestions about using the product.



Warning! Indicates a situation that **WILL** cause damage to personnel, the radio, data, or network.

Documentation Feedback

Send comments or questions about this document's content to techpubs@freewave.com. In the email, include the title of the document or the document's part number and revision letter (found in the footer).

1. ZumLink Z9-C or Z9-T Included Accessories

The **ZumLink Z9-C or Z9-T** package contains these items:

ZumLink Z9-C or Z9-T Included Accessories	
Qty	Description
1	ZumLink Z9-C or Z9-T device
1	ZumLink Z9-C or Z9-T Quick Start Guide

Note: See [Approved Antennas \(on page 14\)](#) for detailed information.
Approved antennas can be purchased directly from FreeWave.

2. ZumLink Z9-C or Z9-T CLI Configuration

Note: This information in this document applies to FreeWave [ZumLink Z9-C or Z9-T](#) models.

Procedure

Important!: A Serial Port on the computer is required for this procedure.

1. Using the **Data Interface Connector** (see [ZumLink Z9-C or Z9-T Data Interface Connector \(on page 16\)](#) for location):
 - a. Apply power to the [ZumLink](#).
 - b. Connect to the Serial Interface of the [ZumLink](#).
 - The [Z9-C](#) model has an RS232 interface and can be connected directly to an RS232 device.
 - FreeWave offers a cable (ASC2414DJ) from the radio to a DB9 connector that includes a reset button and power input jack.
 - The [Z9-T](#) model has a TTL interface and does NOT work directly with RS232.
 - If connecting up to a device or circuit that is RS232, a circuit is required to adapt between the two interfaces.
2. If the [ZumLink](#) is connected to a computer, open a terminal program (e.g., [Tera Term](#)).

Note: In this example procedure, [Tera Term](#) is used.

3. In [Tera Term](#), on the **File** menu, select **New Connection**.

2. ZumLink Z9-C or Z9-T CLI Configuration

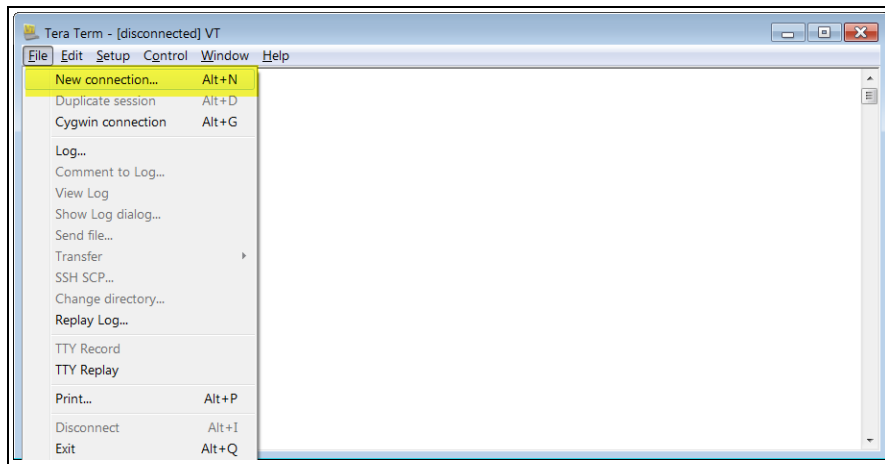


Figure 1: File menu > New Connection

The **Tera Term New Connection** dialog box opens.

4. Click the **Port** list box arrow and select the COM port the **ZumLink** device is connected to.

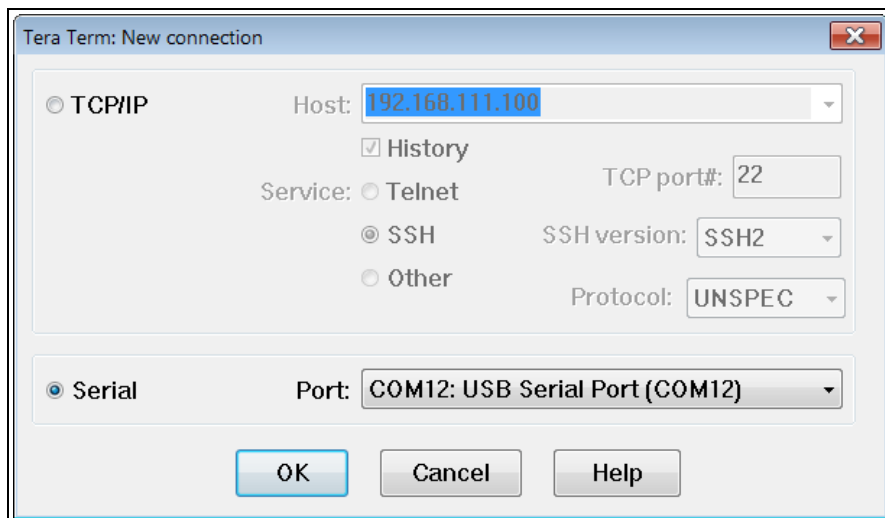


Figure 2: Select the **ZumLink COM port**

5. Click **OK** to save the changes and close the dialog box.
The **Tera Term** window shows the connected COM port and Baud rate in the title bar of the window.
6. In the **Tera Term** window, click the **Setup** menu and select **Serial Port**.

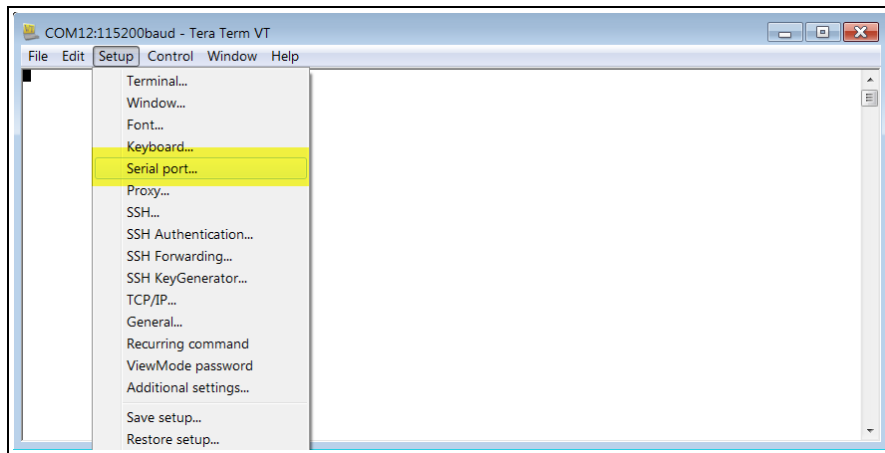


Figure 3: Serial menu > Setup Port

The **Tera Term: Serial Port Setup** dialog box opens.

Note: The image shows the default **ZumLink** settings.

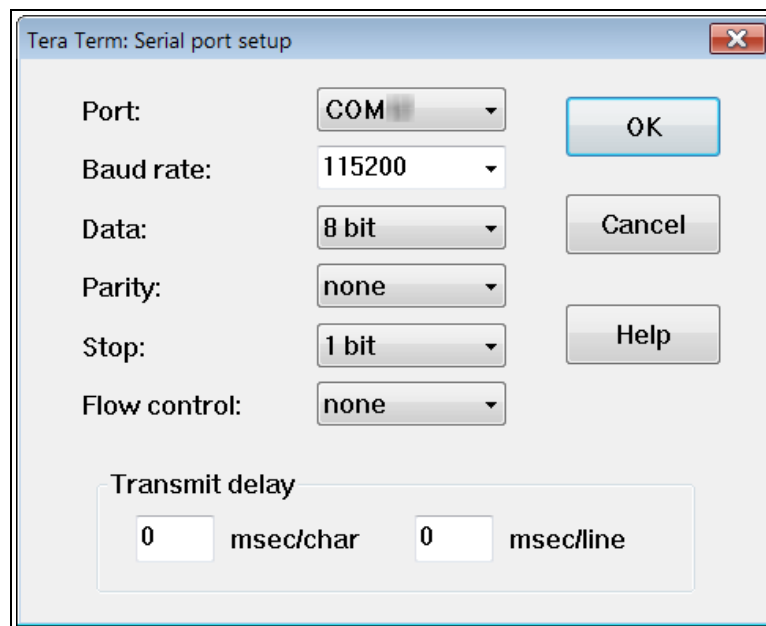


Figure 4: Tera Term: Serial Port Setup dialog box with default settings

7. Verify, and change if required, the **Tera Term** serial port settings (except the **Port** setting) of the connected **ZumLink** so the settings are the same as the defaults shown in the image.

Example: If the **Baud Rate** is 9600, click the list box arrow and select 115200.

8. Click **OK** to save the changes and close the dialog box.
9. On the **ZumLink**, pull the **Pin 2-Interrupt** line **Low** to activate the **FreeWave Shell** and disrupt data flow.
10. Return **Pin 2-Interrupt** to **High**.

11. In **Tera Term**, press <Enter>.
The **FreeWave Shell** returns.

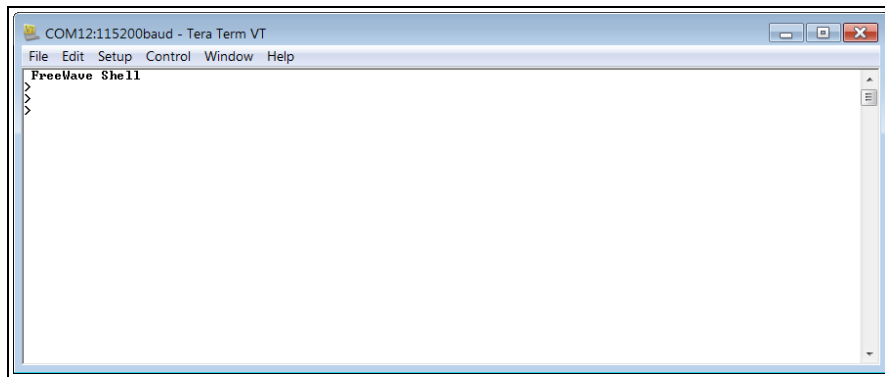


Figure 5: FreeWave Shell in Tera Term

12. At the > prompt, type **pages** and press <Enter>.
The available **ZumLink** information appears.

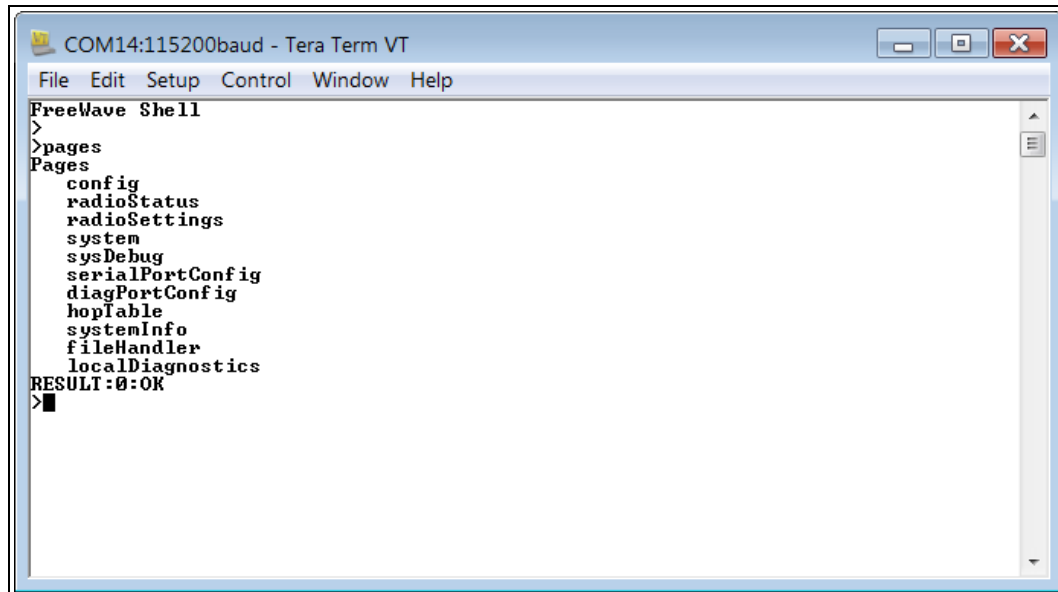


Figure 6: Pages information

13. Type **radiosettings** and press <Enter>.
The **ZumLink** radioSettings appear.

```

COM14:115200baud - Tera Term VT
File Edit Setup Control Window Help
>radioSettings
[Page=radioSettings]
radioMode=Endpoint
rfDataRate=RATE_1M
txPower=26
networkId=43981
nodeId=35671
frequencyKey=0
radioFrequency=915.0000
radioHoppingMode=Hopping_Off
beaconInterval=FOUR_HUNDRED_MS
lnaBypass=0
ccaRssiThresh=-82
maxLinkDistanceInMiles=20
maxPacketSize=900
frequencyMasks=
RESULT:0:OK
>
    
```

Figure 7: ZumLink radioSettings

14. Set the **radioSettings.txPower** between 10 and 30.

Example: **txPower=30** or **radioSettings.txPower=30**.

15. Select one radio and set the **radioSettings.radioMode=Gateway**.
16. Set the other radios in the network with a **radioSettings.radioMode=Endpoint**.
17. Set the **radioSettings.networkId** to be the same on all radios in the network.
18. On each Endpoint, set the **radioSettings.nodeId** to a unique number (between 2 and 65533) in the network.

Important!: The Gateway **radioSettings.nodeId** defaults to 1 and CANNOT be changed.

19. Type **Save** (for the settings to remain after a power cycle) and press <Enter>.
20. Type **exit** and press <Enter> to exit the FreeWave Shell.

Tip! Type **help** to view additional information about the ZumLink settings.

3. Approved Antennas

3.1 900MHz Antennas

3.1.1 900MHz Omni-Directional Antennas

The **ZumLink** 900MHz is approved by the FCC for use with omni-directional antennas with a 7.15dBi gain or less.

Note: These antennas, including antenna gains, are approved for use with the **ZumLink** device.

900MHz Omni-Directional Antennas				
Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturer Model Number	FreeWave Part Number
5.00	7.15	Antenex	EB8965C	EAN0905WC
3	5.15	Maxrad	MAX-9053	EAN0900WC
-0.15	2.0	Mobile Mark	PSKN3-925S	EAN0900SR
-2.15	0	Mobile Mark	PSTG0-915SE	EAN0900SQ

3.1.2 900MHz Directional Antennas

The **ZumLink** 900MHz is approved by the FCC for use with directional antennas with a 16.0dBi gain or less.

900MHz Directional Antennas				
Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturer Model Number	FreeWave Part Number
6.45	8.6	WaveLink	PRO890-8-40F02N4	EAN0906YC
5.85	8.0	WaveLink	PRO898-8	
13.85	16.0	WaveLink	PRO890 -16 -40F02N4	

3.1.3 Alternative Antennas

Antennas other than those listed in this section can potentially be used with the **ZumLink** with provisions.

- The antennas must be of a similar type.
- The antenna gain CANNOT exceed 7.15dBi for Omni-directional.
- The antenna gain CANNOT exceed 16.0dBi for Directional antennas.
- The overall system EIRP does not exceed 36dBm.



Warning! A proper combination with the **ZumLink** is required to ensure the system meets FCC requirements.

4. ZumLink Z9-C or Z9-T Data Interface Connector

- The **ZumLink Z9-C or Z9-T** includes a 14-pin header for power input, data input and output, diagnostics, and configuration.
- This 14-pin header:
 - is equivalent to the Samtec TMM-107-01-G-D-SM-A.
 - mates with Samtec CLT, SQT, SQW, ESQT, TLE, SMM, MMS, and TCSD style connectors.

Note: FreeWave defines TTL as 0 (zero) to 3.3VDC.

ZumLink Z9-C or Z9-T Data Interface Connector				
Pin #	Signal Description and Name	Radio Input / Output	Z9-C Signal Level	Z9-T Signal Level
1	Power (B+)	Input	+3 to +5VDC (±10%)	+3 to +5VDC (±10%)
2	Interrupt	Input	TTL	TTL
3	Data Terminal Ready (DTR)	Input	RS-232	TTL
4	Ground (GND)	N/A		
5	Transmitted Data (TXD)	Output	RS-232	TTL
6	Radio Reset	Input	TTL	TTL
7	Received Data (RXD)	Input	RS-232	TTL
8	Carrier Detect (CD)	Output	RS-232	TTL
9	Request To Send (RTS)	Input	RS-232	TTL
10	Clear To Send (CTS)	Output	RS-232	TTL

4. ZumLink Z9-C or Z9-T Data Interface Connector

ZumLink Z9-C or Z9-T Data Interface Connector				
Pin #	Signal Description and Name	Radio Input / Output	Z9-C Signal Level	Z9-T Signal Level
11	Diagnostic Received Data (Diag RX)	Input	RS-232	TTL
12	Diagnostic Transmitted Data (Diag TX)	Output	RS-232	TTL
13	Ground (GND)	N/A		
14	Unused	N/A		

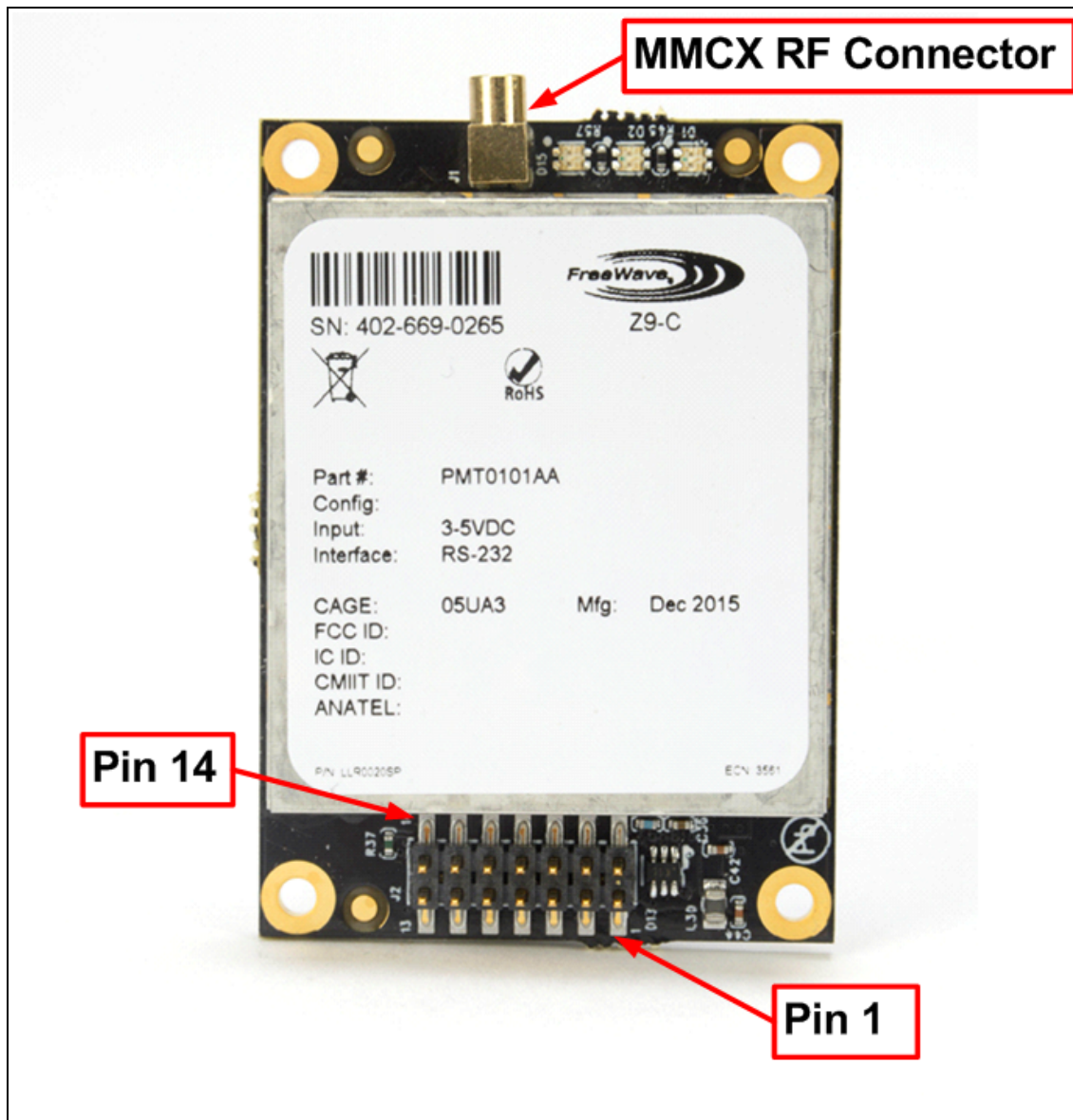


Figure 8: ZumLink Z9-C or Z9-T MMCX RF Connector, Pin 1, and Pin 14 of Data Interface Connector

5. ZumLink Z9-C or Z9-T Settings and Descriptions

These are the **Page Settings** for the **ZumLink Z9-C or Z9-T**:

- [config](#) (on page 20)
- [diagPortConfig](#) (on page 21)
- [radioSettings](#) (on page 23)
- [radioStatus](#) (on page 33)
- [serialPortConfig](#) (on page 34)
- [system](#) (on page 35)
- [systemInfo](#) (on page 36)

Note: If the "=" sign is appended to the parameter, it is an implied change to that parameter.
If a value is NOT included after the "=", the value becomes a null, space, or 0 (zero) depending on the parameter.

Example: Entering **txPower** returns the current value of **txPower**.
Entering **txPower=** is an implied change to **txPower**.
If a value is NOT included, it changes **txPower** to 10.

config

config - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=config]	config.factoryDefaults=	This setting restores the ZumLink to its factory default configuration. Example: config.factoryDefaults=set
[Page=config]	config.reset=	All options reset the ZumLink Z9-C or Z9-T. The options are: • config.reset=now • config.reset=reboot is this valid? John to verify • config.reset=reset is this valid? John to verify
[Page=config]	config.restore=	This setting reloads the config settings of the ZumLink that were saved. Phil asks: What are the options? Note: Restore happens automatically when the ZumLink starts.
[Page=config]	config.save=	This setting saves changes made to the ZumLink configuration. Phil asks: Is NOW the only option? I think one option is config.save=1. Example: config.save=now

diagPortConfig

diagPortConfig - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=diagPortConfig]	diagPortConfig.cliBaudRate=	This setting sets the baud rate for the diagnostic port. The options are: - What are the options here? Note: The default value is 115200.
[Page=diagPortConfig]	diagPortConfig.databits=	This setting defines the byte length for the diagnostic port. The options are: 7 bits 8 bits Note: The default value is 8.
[Page=diagPortConfig]	diagPortConfig.diagBaudRate=	Note: The default value is 115200.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

diagPortConfig - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=diagPortConfig]	diagPortConfig.diagMode=	The options are: • Packetized • What other options are there? • • Note: The default value is Diag.
[Page=diagPortConfig]	diagPortConfig.parity=	This setting defines the parity for the diagnostic port. The options are: • Odd • Even • None Note: The default value is None.
[Page=diagPortConfig]	diagPortConfig.stopbits=	This setting defines the number of stop bits for the diagnostic port. The options are: • None • 1 • 2 Note: The default value is 1.

radioSettings

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.beaconInterval=	The beaconInterval controls how often a Gateway radio sends out a beacon packet and changes to the next radio frequency in the hopping pattern. - A longer beaconInterval gives the system better throughput in channel environments where interference is minimal. - Throughput can be improved in some situations with shorter beacon intervals. Important! The Endpoint radios will obtain this value from a Gateway with the same networkId. Editing this value when the radioMode is set to Endpoint will return an OK; HOWEVER, the value will become what the Gateway is set to as soon as it processes a received beacon. The options are: - TWENTY_FIVE_MS - FIFTY_MS - ONE_HUNDRED_MS - TWO_HUNDRED_MS - FOUR_HUNDRED_MS Example: radioSettings.beaconInterval=FIFTY_MS. Note: The default value is FOUR_HUNDRED_MS.
[Page=radioSettings]	radioSettings.ccaRssiThresh=-	This parameter uses the receive signal strength to determine if there is a signal on the radio before transmission. Note: The default value is -82.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.frequencyKey=	The Frequency Key is a number used as an index to select a hopping table. Note: The Endpoint radios will obtain this value from a Gateway with the same networkId. • The Frequency Key setting boundaries are 0 (zero) to 31. • When a hop table loads, the Frequency Key is adjusted to whatever is available in the actual hop table. • An invalid frequency setting is determined by being outside of the specified range. • If an invalid frequency setting is found, the Frequency Key is NOT changed. • A frequency setting can also be invalid if the Frequency Key setting is larger than the number of hopping tables for a specific rfDataRate. • In that case, the Frequency Key is set to 0 (zero). • settings at 1M rfDataRate, it looks like any invalid setting will not change the frequency key for any type of error — This came from John's edits - does it need to be included here for Thor A? • The options are Key0 (zero) to Key23. TRUE? Note: The default value is Key0 (zero).

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.frequencyMasks=	Frequency Masks are used to mask off frequencies or a set of frequencies in a hop table. - The format for single channels is: - frequencyMasks=xxx.yyyy,xxx.yyyy,xxx.yyyy. Example: frequencyMasks=903.0000,908.0000,925.0000. - The format for a range of channels is: - frequencyMasks=xxx.yyyy-xxx.yyyy,xxx.yyyy. Example: frequencyMasks=902.1000-905.1000,920.1000-927.9000 - The format for a combination of channels is: - frequencyMasks=902.1000-905.1000,920.1000-927.9000,915.0200 Where: - xxx is a value between 902-927. - yyyy is a value between .0000-.9999. Note: Least significant digits are not required. Example: .9, .09, .009 are valid entries. Important!: Frequency mask entries MUST BE less than 128 bytes. A comma MUST separate the values - NOT a comma and a space.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
		Example: A single entry such as 904.0 masks off any frequencies using 904.0 as a center frequency along with any bandwidth on each side of the center frequency as a function of rfDataRate. A frequency range such as 904.0-906.9999 masks off any frequencies in the range of 904.0 minus the bandwidth associated with the data rate, through 906.9999 plus the bandwidth associated with the data rate. - Errors occur when masking reduces the number of frequencies below regulatory minimums. - For channel sizes < 500kHz, the radio must frequency hop. - If the number of channels is >= 50, the maximum transmit output power is 30dBm. - If the number of channels is < 50, the transmit output power is 24dBm. - This does NOT apply for channel sizes greater than 500 kHz which can operate single channel or frequency hopping. Notes - Both Gateway and Endpoint radios MUST use the same value for the frequencyMasks setting. - If the frequencyMasks comes back empty see frequencyMasksErrors for any errors. - Use frequencyMasks=1 to clear the frequency Masks. John asks if there's another way to do this clearing? Note: The default value is Blank.

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.lnaBypass=	The lnaBypass setting controls enabling and disabling the Low Noise Amplifier (LNA) which can boost the receive signal by 10dB. • The options are 0 (zero) and 1. • When the lnaBypass=1, the LNA of the radio module is bypassed. • If lnaBypass=0, the LNA is enabled. • If lnaBypass=<anything but 0> it is set to 1.  It can be useful to bypass the LNA if there is a presence of strong signals in band and packet reception is not good. Note: The default value is 0 (zero).
[Page=radioSettings]	radioSettings.maxLinkDistanceinMiles=	The maxLinkDistanceinMiles setting controls the maximum one-way distance (in miles) between any node in the network. Important! All nodes in the network that communicate with each other should use the same distance value. • The minimum value is 0 (zero) miles. • The maximum value is 120 miles. Note: The default value is 20 miles.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.maxPacketSize=	John asks: Can this really be set from the CLI John says this CANNOT be changed in Thor A is this other content applicable to Thor B? Note: This is a ZumLink Golden Setting. - The options are any number between 0 and 9. - Max packet size can be optimized. FreeWave Recommends: Use the default settings for normal operation.
[Page=radioSettings]	radioSettings.networkId=	Note: This is a ZumLink Golden Setting. This is the Network Identifier. The networkId setting is used to subdivide traffic on radio units. Radio units can only communicate with other units that have the same networkId setting. Note: If radios are on the same frequency they will still receive data from radios of a different networkId, but the data is dropped. Enter any number between 0 and 65535. Note: The default value is 43981.

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.nodeId=	Important!: Each radio with the same networkId must have a UNIQUE nodeId. • This setting defines the ID of the radio. • The Gateway device will always have a nodeId of value 1. • Enter any number between 2 and 65533. Note: The default value is a unique number between 2 and 65533 for an Endpoint.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.radioFrequency=	Note: This is a ZumLink Golden Setting. This setting designates the Operating Center Frequency in MHz. - The radioFrequency parameter ONLY takes effect when radioHoppingMode=Hopping_Off. - All radios in a network must have the same frequency. - If the radioFrequency parameter is set too close to the band edge for the current rfDataRate, the radio module will reject the setting.  Tip! Read back this value after setting it to determine if it was accepted by the radio module. Valid boundaries are: 4M data rate: 904.5504 - 925.7472 MHz 1M data rate: 903.0528 - 927.0144 MHz 500K data rate: 902.7072 - 927.3600 MHz 250K data rate: 902.5344 - 927.4176 MHz 115.2K data rate: 902.4768 - 927.5904 MHz Note: The default value is 915.0000.

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.radioHoppingMode=	Note: This is a ZumLink Golden Setting. The radioHoppingMode parameter is used to enable or disable frequency hopping. Important!: The Gateway and Endpoint radios MUST use the same value for this setting. - For rfDataRate values ≥ 500kbps, the choice of hopping mode should be selected based on network frequency planning and channel conditions. - For rfDataRate values < 500kbps, radioHoppingMode is forced On. The options are: - Hopping_Off - Hopping_On Example: radioSettings.radioHoppingMode=Hopping_On. Note: The default value is Hopping_Off.
[Page=radioSettings]	radioSettings.radioMode=	This setting designates the device as a Gateway or Endpoint unit. - Each network MUST have only ONE Gateway unit. - The remaining units MUST be configured as Endpoints. - The Gateway device will always have a nodeId of value 1. Note: The default value is Endpoint.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.rfDataRate=	Note: This is a ZumLink Golden Setting. This setting defines the RF link data rate speed in bits per second. • A higher RF link data rate provides more throughput at the expense of link distance or fade margin. • When changing from lower data rates to higher ones (e.g., RATE_115.2K to RATE_1M), the radioFrequency may be set back to 915.000 MHz if the signal would have been out of band. • The communication range is dependent on the rfDataRate setting. • The min value increases and the max value decreases as the rfDataRate increases. • The increase of channel bandwidth affects these ranges. Important!: The Gateway and Endpoint radios MUST use the same value for this setting. The options are: • RATE_4M • RATE_1M • RATE_500K • RATE_250K • RATE_115.2K Note: The default value is RATE_1M.

radioSettings - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioSettings]	radioSettings.txPower=	- This setting defines the RF output transmit power for the radio. - A higher power can be used to increase link margin. - Use a lower transmit power to reduce interference when multiple radio networks are in close proximity. - Enter 10 to 30 - At 250K rfDataRate, if the number of frequencies in the hop table is >= to 50 after the masks are applied, txPower is limited to 30dB. - If the number of frequencies are >= 30, but < 50, txPower is set to .25 W (24dbm) ONLY if the current setting for txPower is >= 24dB. Note: The default value is 26.

radioStatus

radioStatus - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=radioStatus]	radioStatus.curRssi=-	This setting designates the WHAT. Enter any number between what and what. Note: The default value is 89.

serialPortConfig

serialPortConfig - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=serialPortConfig]	serialPortConfig.cliBaudRate=	This setting designates the WHAT. Enter any number between what and what. The default value is 89.  Caution: reset=now MUST be manually entered into the command line after the baudRate parameter is defined. Note: The default value is 115200.
[Page=serialPortConfig]	serialPortConfig.packetizedBaudRate=	This setting defines the data rate of the serial port when operating in packetized mode. Note: The default value is 3000000.
[Page=serialPortConfig]	serialPortConfig.passthruBaudRate=	This setting defines the data rate of the serial port when operating in pass through mode. Note: The default value is 115200.
[Page=serialPortConfig]	serialPortConfig.databits=	This setting defines the number of data bits per byte for the serial port. Note: The default value is 8.
[Page=serialPortConfig]	serialPortConfig.parity=	This setting defines the parity of the serial port. Note: The default value is None.

serialPortConfig - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=serialPortConfig]	serialPortConfig.stopbits=	This setting defines the number of stop bits of the serial port. Note: The default value is 1.
[Page=serialPortConfig]	serialPortConfig.flowControl=	This setting is used to set the flow control of the serial port.. Note: The default value is Hardware.
[Page=serialPortConfig]	serialPortConfig.passthruLatencyMode=	Note: The default value is Auto.
[Page=serialPortConfig]	serialPortConfig.passthruLatencyTimer=	Note: The default value is 16.

system

system - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=system]	system.exit	This setting is used to exit the configuration menu and into normal operation for transmitting and receiving data.

5. ZumLink Z9-C or Z9-T Settings and Descriptions

system - ZumLink Settings and Descriptions		
Page	CLI Command	Description
[Page=system]	system.serialMode=	This setting designates the serial port mode as either passthrough or packetized. • In passthrough mode, the serial port is used for data or configuration but not at the same time. • In packetized mode, both data and configuration is passed over the serial port simultaneously within a predefined packet. Note: The default value is Packetized.
[Page=system]	system.pages	This command lists all of the pages in the ZumLink Z9-C or Z9-T .

systemInfo

systemInfo - ZumLink Z9-C or Z9-T Settings and Descriptions		
Page	CLI Command	Description
[Page=systemInfo]	systemInfo.deviceConfiguration=	Note: The default value is A.
[Page=systemInfo]	systemInfo.deviceModel=	
[Page=systemInfo]	systemInfo.deviceSerialNumber=	This setting identifies the serial number of the ZumLink Z9-C or Z9-T .
[Page=systemInfo]	systemInfo.FirmwareVersion=	This setting identifies the firmware version of the ZumLink Z9-C or Z9-T .
[Page=systemInfo]	systemInfo.hopTableVersion=	This setting identifies the Hop Table Version.

Appendix A: ZumLink Z9-C or Z9-T 900MHz Technical Specifications

Note: Specifications may change at any time without notice. For the most up-to-date specifications information, see the product's data sheet available at www.freewave.com.

ZumLink Z9-C or Z9-T 900MHz Technical Specifications	
Specification	Description
Interfaces	
Data Connector	- Z9-C - RS-232, Dual row 14-pin header, 2mm pin spacing - Z9-T - TTL, Dual row 14-pin header, 2mm pin spacing
Serial Interface - Baud Rates	- RS-232: 9600 to 921,600 bps - TTL: 9600 to 3,000,000 bps
RF Connector	MMCX
Transmitter	
Frequency Range	902 to 928MHz
Output Power	10mW to 1W User selectable
Data Link Range	40 miles with clear Line of Sight
Modulation	- GFSK 8-ary FSK

ZumLink Z9-C or Z9-T 900MHz Technical Specifications													
Specification	Description												
Channel Sizes	• 230.4kHz • 345.6kHz • 691.2kHz • 1382.4kHz • 3225.6kHz												
RF Data Rate	• 115.2kbps • 250kbps • 500kbps • 1000kbps • 4000kbps • User selectable												
Hopping Channels	User selectable <table border="1"> <thead> <tr> <th>Data Rate (kbps)</th><th>Hopping Channels</th></tr> </thead> <tbody> <tr> <td>115.2</td><td>110</td></tr> <tr> <td>250</td><td>73</td></tr> <tr> <td>500</td><td>36</td></tr> <tr> <td>1000</td><td>18</td></tr> <tr> <td>4000</td><td>7</td></tr> </tbody> </table>	Data Rate (kbps)	Hopping Channels	115.2	110	250	73	500	36	1000	18	4000	7
Data Rate (kbps)	Hopping Channels												
115.2	110												
250	73												
500	36												
1000	18												
4000	7												
Hopping Patterns	Maximum of 16 patterns Note: There are less with larger channel bandwidths. User selectable												
Hopping Rates	• 25ms • 50ms • 100ms • 400ms User selectable												
Receiver													
Sensitivity	-106 dBm @ 115.2kbps for BER 10 ⁻⁴												
IF Selectivity	>40dB												
System Gain	Maximum of 136dB												
Data Transmission													
Error Detection	CRC, FEC, and ARQ												
Link Throughput	2000kbps												

ZumLink Z9-C or Z9-T 900MHz Technical Specifications	
Specification	Description
Data Encryption	AES 128
Protocol	Proprietary CSMA
Power Requirements	
Operating Voltage	+3 to +5VDC ($\pm 10\%$)
Tx Current	• 1230 mA @ 3VDC • 680 mA @ 5VDC
Rx Current	• 30 mA @ 3VDC • 13 mA @ 5VDC
Idle Current	• 30 mA @ 3VDC • 13 mA @ 5VDC
General Information	
Operating Temperature Range	-40 °C to +85 °C -40° F to 185° F
Humidity	0 to 95% non-condensing
Dimensions	50.8mm Long x 35.56mm Wide x 9.65mm High 2" Long x 1.4" Wide x 0.38" High
Weight	15g 0.53oz
Product Safety	
Standards	EN 60079-0:2012 + A11:2013 and EN 60079-15:2010
Labeling Information	 II 3 G Ex nA IIC T6 Gc DEMKO 16 ATEX 1705X

