

ZumLink™

Covers Models: Z9-P and Z9-PE

Firmware v1.1.2.2

User-Reference Manual



Safety Information

The products described in this manual can fail in a variety of modes due to misuse, age, or malfunction and is not designed or intended for used in systems requiring fail-safe performance, including life safety systems. Systems with the products must be designed to prevent personal injury and property damage during product operation and in the event of product failure.



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-



Warning! The **Z9-P** is sold as a multi-board solution, assembled at the FreeWave factory. Any alteration, including the separation of the individual boards, voids the FreeWave warranty.



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FreeWave Technologies, Inc.
5395 Pearl Parkway, Boulder, CO 80301
303.381.9200
Toll Free: 1.866.923.6168
Fax: 303.786.9948

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Table of Contents

Preface	14
1. Overview	16
1.1. Communication Method	17
1.2. ZumBoost Technology	17
Adaptive Spectrum Learning	17
Forward Error Correction	17
1.2.1. Packet Aggregation	17
Packet Compression	18
1.3. IQ Application Environment	18
2. Included & User-supplied Equipment	19
2.1. Included Equipment	19
2.2. User-supplied Equipment	20
3. Port Connections and Pinout Assignments	21
3.1. Z9-P Port Connections	22
3.2. Z9-PE Port Connections	22
3.3. Z9-PE-GREY Port Connections	23
3.4. Serial and Ethernet Port Details	24
3.5. Serial Pinout Assignments	25
4. Installation	26
5. Firmware Update	29
5.1. Z9-P or Z9-PE	29
5.1.1. Optional: IQ Installation	29
5.2. Download the Z9-P or Z9-PE Update Files	30
5.3. Update from All Previous Firmware Versions	34
5.4. Firmware Update - Drag and Drop	35
5.5. Firmware Update - Web Interface	43
5.5.1. Setup the Computer IP Address Configuration	44
5.5.2. Install the Update File using the Web Interface	48
6. Configuration	53
6.1. Drag and Drop Configuration	54
6.2. CLI Configuration	60
6.2.1. Connect the Z9-P or Z9-PE to the Computer	60
6.2.2. Access the CLI and Change the IP Address and nodeld	61
6.3. Web Interface Configuration	65
6.3.1. Setup the Computer IP Address Configuration	66
6.3.2. Web Interface Configuration - Z9-P or Z9-PE	70
7. Creating a Basic ZumLink Gateway and Endpoint Network	72

8. IQ Application Environment	74
8.1. Download the IQ Application Environment	75
8.2. Drag and Drop Installation of the IQ Application Environment	78
8.3. Web Interface - Installation of IQ Application Environment	82
8.4. CLI Activation of the IQ Application Environment	86
8.4.1. Get the License File from FreeWave	86
8.4.2. Drag and Drop the License File onto the Z9-P or Z9-PE	87
8.4.3. Activate the IQ Application Environment	90
8.4.4. Verify Successful Licensing and Activation	93
8.5. Web Interface Activation of the IQ Application Environment	95
8.5.1. Get the License File from FreeWave	95
8.5.2. Setup the Computer IP Address Configuration	96
8.5.3. Download the License File	100
8.5.4. Activate the IQ Application Environment	103
8.5.5. Verify Successful Licensing and Activation	107
8.6. Access the IQ Linux Environment	109
9. Web Interface - Administration	111
9.1. Setup the Computer IP Address Configuration	112
9.2. Change the COM Parameters	117
9.3. Change the Data Path Parameters	120
9.4. Change the Encryption Parameters	122
9.5. Change the Io Ex Com Parameters	124
9.6. Change the Local Diagnostics - Monitored Node	125
9.7. Change the Modbus Parameters	127
9.8. Change the Network Parameters	129
9.9. Change the NTP Parameters	131
9.10. Change the Radio Settings Parameters - Endpoint	133
9.11. Change the Radio Settings Parameters - Endpoint-Repeater	135
9.12. Change the Radio Settings Parameters - Gateway	137
9.13. Change the Radio Settings Parameters - Gateway-Repeater	140
9.14. Change the Security Parameters	143
9.15. Change the Services Parameters	145
9.16. Change the SNMP Parameters	147
9.17. Change the System Info Parameters	149
9.18. Change the Terminal Server Relay Parameters	151
10. Web Interface - Network Diagnostics	153
10.1. Add a Gateway Device IP Address	154
10.2. Download a Support Bundle	157
10.3. Save Network Diagnostics	160

10.4. Save a Network Diagram Image	163
10.5. Show Table in the Network Diagnostics Window	167
10.6. View the Network Diagnostics - Breadthfirst	169
10.7. View the Network Diagnostics - Cose-bilkent	171
10.8. View the Network Diagnostics - Grid	173
10.9. View the Network Diagnostics - Margin	175
10.10. View the Network Diagnostics - Margin with Neighbors	177
10.11. View the Network Diagnostics - RSSI	180
10.12. View the Network Diagnostics - RSSI with Neighbors	182
10.13. View the Network Diagnostics - Rx Rate	185
10.14. View the Network Diagnostics - Tx Rate	187
11. Change the Passwords	189
11.1. Change the ADMIN Password	190
11.2. Change the DEVUSER Password	190
12. IP Filtering	192
12.1. Example: Network Topology with Traffic at the Gateway	196
13. Repeaters	197
13.1. Repeater - Setup Table	199
13.1.1. Hopping OFF Repeater Setup	199
13.1.2. Hopping ON Repeater Setup	200
13.2. Basic Gateway and Endpoint-Repeater Setup	202
13.2.1. Open a Terminal Emulator Application	203
13.2.2. Hopping On: Gateway and Endpoint-Repeater Setup	206
13.2.3. Hopping Off: Gateway and Endpoint-Repeater Setup	208
13.3. Repeater - Examples	210
13.3.1. Gateway-Repeater	211
13.3.2. Endpoint-Repeater	212
13.3.3. Multiple Repeaters: Gateway-Repeater and Endpoint-Repeater	213
13.3.4. Multiple Repeaters: Four Endpoint-Repeaters	214
13.3.5. Back-to-Back Repeaters	216
14. Mounting the Z9-P or Z9-PE	217
14.1. Z9-P Mounting	218
Mounting Kit - Included Equipment	218
14.2. Z9-PE Mounting	220
Mounting Kit - Included Equipment	220
14.3. Remove the Z9-P or Z9-PE from the DIN Rail	221
15. Approved Antennas	222
15.0.1. Yagi Directional Antennas	222
15.0.2. Omni-directional Antennas	222

15.0.3. Alternative Antennas	223
16. COM Parameters	224
16.1. Baudrate	225
16.2. Break Before Send Us	225
16.3. Connection Drops	226
16.4. Databits	227
16.5. Delay Before Send MS	228
16.6. Duplex	228
16.7. Flow Control	229
16.8. Handler	230
16.9. Mode	232
16.10. Parity	233
16.11. RX Bytes	234
16.12. Stopbits	235
16.13. Terminal Server Port	235
16.14. Terminal Server Time Out	236
16.15. TX Bytes	237
17. Config Parameters	238
17.1. Factory Defaults	239
17.2. License State	239
17.3. Reset	240
17.4. Restore	240
17.5. Save	241
18. Data Path Parameters	242
18.1. Aggregate Enabled	243
18.2. Compression Enabled	244
18.3. FEC Rate	246
18.4. MAC Table Entry Age Timeout	247
18.5. OTA Max Fragment Size	249
18.6. Route Min Signal Margin Thresh	249
19. Date Parameters	251
19.1. DC App StartTime	252
19.2. DC App Uptime	252
19.3. Time	253
19.4. Time String	253
19.5. Up Time	254
19.6. Up Time String	255
20. Encryption Parameters	256
20.1. Active Key	257

20.2. Encryption Mode	258
20.3. Key1 to Key 16	259
21. IO Ex Com Parameters	260
22. Local Diagnostics Parameters	261
22.1. Signal Level	262
22.2. Signal Margin	262
22.3. CNT Bad BCC	263
22.4. CNT Bad Sync	263
22.5. CNT ETX	263
22.6. CNT STX	263
22.7. Get Stats	263
22.8. Interface Bytes Rx	264
22.9. Interface Bytes Tx	264
22.10. Interface Data Rx	264
22.11. Interface Data Tx	264
22.12. Mac Table Clear	264
22.13. Mac Table Show	265
22.14. Monitored Node	265
22.15. Noise Level	266
22.16. Radio Ack Tx	267
22.17. Radio Bad Ack Rx	267
22.18. Radio Bad CRC	267
22.19. Radio Bad Sync	268
22.20. Radio Contention Drop	269
22.21. Radio LL Rx	269
22.22. Radio LL Tx	270
22.23. Radio No Ack Tx	270
22.24. Radio Reliable Rx	270
22.25. Radio Reliable Tx	270
22.26. Radio Rexmit	271
22.27. Radio Rx	271
22.28. Radio Sending Drop	271
22.29. Radio Timed Out	271
22.30. Radio Too Long	271
22.31. Radio Too Short	272
22.32. Radio Tx	272
22.33. Resets Detected	272
22.34. Resets Sent	272
22.35. Reset Stats	272

22.36. Rx Success	273
22.37. Show Channel Diags	273
22.38. Show Node Diags	274
22.39. Supply Voltage	274
22.40. Timestamp	275
22.41. Tx Availability	276
22.42. Tx Success	276
22.43. VSWR (Signal Level)	277
23. Modbus Parameters	278
23.1. Modbus Device ID	279
23.2. Modbus Layout	279
23.3. Modbus RTU Over TCP	280
23.4. Modbus TCP	281
23.5. Read	281
23.6. Read Coils	282
23.7. Write	283
23.8. Write Coils	284
23.9. Modbus Use Cases	285
23.9.1. Connecting to a Device via Modbus	285
Modbus TCP	285
Modbus RTU over TCP	285
Modbus RTU using COM1	286
Modbus RTU using COM2	286
23.10. Reading Local Diagnostics and Radio Settings using Modbus	287
23.10.1. Reading from an External Modbus RTU Serial Device using COM1	287
23.10.2. Reading from the External Modbus RTU Serial Device using COM2	287
24. Network Parameters	288
24.1. Arp Filter Enabled	289
24.2. Gateway	289
24.3. IP Address	290
24.4. MAC Address	290
24.5. MTU	291
24.6. Nameserver Address 1	292
24.7. Nameserver Address 2	293
24.8. Netmask	293
24.9. Netmask Filter Enabled	294
24.10. STP Enabled	295
24.11. Txqueuelen	296
24.12. VLAN MGMT	297

24.13. VLAN Tag	297
25. Network StatsParameters	299
25.1. RX Bytes	300
25.2. RX Dropped	300
25.3. RX Errors	301
25.4. RX Packets	301
25.5. TX Bytes	302
25.6. TX Dropped	302
25.7. TX Errors	303
25.8. TX Packets	303
26. NTP Parameters	305
26.1. NTP Address (1 to 5)	306
26.2. NTP Date	307
26.3. NTP Reference	308
26.4. NTP Restart	309
27. Radio Settings Parameters	310
27.1. Beacon Burst Count	311
27.2. Beacon Interval	312
27.3. Frequency Key	313
27.4. Frequency Masks	315
27.5. LNA Bypass	319
27.6. Max Link Distance in Miles	320
27.7. Network ID	321
27.8. Node ID	322
27.9. Radio Frequency	323
27.10. Radio Hopping Mode	324
27.11. Radio Max Repeaters	327
27.12. Radio Mode	329
27.13. Radio Repeater Slot	330
27.14. RF Data Rate	332
27.15. TX Power	334
28. Radio Settings Helpers Parameters	336
28.1. Frequency Masks Errors	337
29. Runtime Environment Parameters	338
29.1. Rte Installed by Apps Version	339
29.2. Rte Reset	339
29.3. Rte Template Version	340
29.4. Rte Version	341
30. Security Parameters	342

30.1. Enable Ethernet Login	343
30.2. Ethernet PTP Interface	343
31. Services Parameters	345
31.1. Time Out CLI	346
32. SNMP Parameters	347
32.1. RO Community Name	348
32.2. RW Community Name	348
32.3. SNMP User	349
32.4. V1 Enabled	350
32.5. V2C Enabled	351
32.6. V3 Enabled	352
33. System Parameters	353
33.1. dump	354
33.2. dumpFormat	354
33.3. dumpPage	355
33.4. dumpTag	356
33.5. filter	356
33.6. help	356
33.7. login	357
33.8. logout	357
33.9. pages	358
33.10. password	358
33.11. passwordRestoreDefaults	359
33.12. showLayout	359
33.13. tags	359
33.14. whoami	360
34. System Info Parameters	361
34.1. Device Configuration	362
34.2. Device Firmware Version	362
34.3. Device ID	363
34.4. Device Model	363
34.5. Device Name	364
34.6. Hop Table Version	364
34.7. Layout Hash	365
34.8. Licenses	365
34.9. Model Code	366
34.10. Radio Firmware Version	366
34.11. Radio Model	367
34.12. Radio Model Code	367

34.13. Radio Serial Number	368
34.14. Reset Info	368
34.15. Rte Template Version	369
34.16. Rte Version	369
34.17. Serial Number	370
34.18. Theme Version	370
35. Terminal Server Relay Parameters	372
35.1. Remote Termserv IP Address	373
35.2. Termserv Relay Mapping	373
36. Terminal Server Relay Examples	377
36.1. Connected Terminal Servers and Terminal Server Relay	378
36.2. LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM	380
36.3. LOCAL_COM1_TO_REMOTE_COM1	381
36.4. LOCAL_COM2_TO_REMOTE_COM2	382
36.5. LOCAL_BOTH_COM_TO_REMOTE_COM1	383
36.6. LOCAL_BOTH_COM_TO_REMOTE_COM2	384
36.7. LOCAL_COM1_TO_REMOTE_BOTH_COM	385
36.8. LOCAL_COM2_TO_REMOTE_BOTH_COM	386
36.9. Example: Multicast	387
37. Web Interface	388
37.1. COM window	389
37.2. Config window	391
37.3. Data Path window	393
37.4. Date window	395
37.5. Encryption window	397
37.6. File Upload window	399
37.7. Help window	401
37.8. Home window	403
37.9. Io Ex Com window	404
37.10. Local Diagnostics window	406
37.11. Modbus window	408
37.12. Network window	410
37.13. Network Diagnostics window	412
37.14. Network Stats window	417
37.15. NTP window	419
37.16. Radio Settings window - Endpoint	421
37.16.1. Radio Settings window - Endpoint-Repeater	423
37.16.2. Radio Settings window - Gateway	425
37.16.3. Radio Settings window - Gateway-Repeater	427

37.17. Radio Settings Helpers window	429
37.18. Runtime Environment window	431
37.19. Security window	433
37.20. Services window	435
37.21. SNMP window	437
37.22. System Info window	439
37.23. Terminal Server Relay window	441
37.24. User Data - Drag and Drop window	443
38. Release Notes	445
38.1. Version 1.1.2.2	446
38.2. Version 1.1.1.2	447
38.3. Version 1.1.0.1	449
38.4. Version 1.0.7.0	453
38.5. Version 1.0.6.0	456
38.6. Version 1.0.4.2	457
38.7. Version 1.0.4.1	458
38.8. Version 1.0.3.2 (Initial Release)	459
39. Available Accessories	460
39.1. Z9-P or Z9-PE Accessories	460
39.2. Z9-P Only Accessories	461
39.3. Z9-PE Only Accessories	461
40. Mechanical Drawing - Z9-P	462
40.1. Z9-P - Top and Sides	462
40.2. Z9-P - Dimensions	463
41. Mechanical Drawing - Z9-PE	464
41.1. Z9-PE - Top and Sides	464
41.2. Z9-PE - Back	465
42. Z9-P or Z9-PE Hop Tables	466
42.1. Standard Hop Set - 900 MHz Channels	467
42.1.1. RF Data Rate: 115.2 kbps	467
42.1.2. RF Data Rate: 250 kbps	468
42.1.3. RF Data Rate: 500 kbps	468
42.1.4. RF Data Rate: 1 Mbps	468
42.1.5. RF Data Rate: 1.5 Mbps (Beta)	469
42.1.6. RF Data Rate: 4 Mbps	469
42.2. Australia Hop Set - 900 MHz Channels	470
42.2.1. RF Data Rate: 115.2 kbps	470
42.2.2. RF Data Rate: 250 kbps	470
42.2.3. RF Data Rate: 500 kbps	471

42.2.4. RF Data Rate: 1 Mbps	471
42.2.5. RF Data Rate: 1.5 Mbps (Beta)	472
42.2.6. RF Data Rate: 4 Mbps	472
42.3. Brazil Hop Set - 900 MHz Channels	473
42.3.1. RF Data Rate: 115.2 kbps	473
42.3.2. RF Data Rate: 250 kbps	474
42.3.3. RF Data Rate: 500 kbps	474
42.3.4. RF Data Rate: 1 Mbps	474
42.3.5. RF Data Rate: 1.5 Mbps (Beta)	475
42.3.6. RF Data Rate: 4 Mbps	475
43. Z9-P or Z9-PE MIB	476
43.1. CPU Usage	477
43.2. Disk Usage	477
43.3. Memory Usage	479
43.4. FreeWave Technologies - MIB	480
43.5. SNMP Write Access	491
Appendix A: Technical Specifications	493
Computing Resources	494
Data Transmission	494
General Information	495
Interfaces	496
Management	496
Networking	497
Power Requirements	497
Receiver	497
Transmitter	498
Appendix B: OTA Interoperability	499
Appendix C: Firmware & Feature Interoperability	500
Appendix D: LEDs	502
Normal Operation	502
COM LEDs	504
Ethernet LEDs	504
Appendix E: Z9-P or Z9-PE Files and Descriptions	505
Appendix F: Z9-P or Z9-PE Modbus Register Map	507
Appendix G: FreeWave Legal Information	510

Preface

Contact 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 support@freewave.com.

Additional Information

Note: Use the support.freewave.com website to download the latest documentation for the Z9-P or Z9-PE.

Registration is required to use this website.

Document Styles

This document uses these styles:

- Products and 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**.



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.



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.

1. Overview

Thank you for purchasing the FreeWave ZumLink Z9-P or Z9-PE.

ZumLink is the latest generation of radios offered by FreeWave and consists of enclosed and board level radios.

- **Z9-P** is a Board-level 900 MHz Ethernet radio.
- **Z9-PE** is an enclosed 900 MHz Ethernet radio.

The Z9-P or Z9-PE 900 MHz Series:

- Operates in the unlicensed 900 MHz ISM band (902-928 MHz).
- Provides a maximum of 30dBm transmit output power.
- Is FCC compliant as both a Frequency Hopping Spread Spectrum (FHSS) and a Digital Modulating (DM) radio.
- Provides IQ, a Linux-based application environment for the deployment of applications at the edge
- Has one Ethernet port, two serial ports, and one micro USB port.

Note: The frequency hopping capability is available at all bandwidths and the single channel (DM) operation is available for bandwidths of at least 500 kHz.

1.1. Communication Method

The Z9-P or Z9-PE use Listen Before Talk (LBT) and Carrier Sense Multiple Access (CSMA). There are no assigned slots. The radios transmit when the channel is clear.

- The Gateway broadcasts packets to all Endpoints and Endpoint-Repeaters within range.
- Endpoint-Repeaters broadcast packets to all Endpoints and Endpoint-Repeaters within range.
- The Endpoints unicast packets back to the Gateway or downstream Endpoint-Repeaters.
- The Gateway acknowledges the Endpoint or Endpoint-Repeater packets.

FreeWave's traditional protocol has a Gateway Time Slot and an Endpoint Time Slot within a frame.

- The Gateway transmits in its slot and listens in the Endpoint slot.
- The Endpoint transmits its slot and listens in the Gateway slot.

1.2. ZumBoost Technology

ZumLink incorporates ZumBoost technology using four performance-enhancing algorithms used together or independently to improve throughput or link reliability in the most demanding RF environments.

Adaptive Spectrum Learning

- Learns which RF signals are part of the ZumLink network and which are not, reducing bad packets and retransmissions.
- Standard on all **ZumLink** radios, the "Listen Before Talk" algorithm provides spectrum monitoring, delivering network intelligence and increasing throughputs in noisy environments.

Forward Error Correction

- The [FEC Rate \(on page 246\)](#) increases the reliability of the data transferred over the air at the cost of some transmission throughput.
- Improves sensitivity by 3dB to maximize link range in noisy environments.
- Adds redundant information to a data stream to detect packet errors and corrects them to avoid retransmission of the packet.

1.2.1. Packet Aggregation

- The [Aggregate Enabled \(on page 243\)](#) setting increases throughput of small packets by combining multiple packets into a single packet minimizing the number of packets required for transmission.
- Does NOT affect medium and large packets.

Packet Compression

- When the [Compression Enabled \(on page 244\)](#) setting is enabled, the outgoing packets are analyzed and, if the data packet can be compressed, sent compressed to transmit fewer bits over the air.

1.3. IQ Application Environment

ZumLink provides the IQ Application Environment that allows for the development and deployment of Linux-based applications onto the radio. The application has access to the same computing resources as the radio but is in a segregated section of the Z9-P or Z9-PE.

Note: Any application using a Linux-compatible language can be housed in IQ.

2. Included & User-supplied Equipment

2.1. Included Equipment

Included Equipment	
Qty	Description
1	Z9-P or Z9-PE wireless device
1	Power Cable <ul style="list-style-type: none"> • Z9-P: Power Cable with flying leads and 2-pin connector (FreeWave Part Number: ASC2402PT) • Z9-PE: Power Cable with flying leads (FreeWave Part Number: ASC0003ZL) • Z9-PE-GREY: Power Cable with flying leads (FreeWave Part Number: ASC0003TH) Power Cable with flying leads and 2-pin connector

Note: See the [Available Accessories \(on page 460\)](#).

2.2. User-supplied Equipment

This list identifies the equipment the user must provide.

- DC power source
- Power cable
- USB to micro-USB cable
- CAT5e / CAT6 Ethernet cable
- FCC approved antenna **
- Computer

Note: **See [Approved Antennas \(on page 222\)](#) for detailed information.
Approved antennas can be purchased directly from FreeWave.

3. Port Connections and Pinout Assignments

Port Connections

- [Z9-P Port Connections \(on page 22\)](#)
- [Z9-PE Port Connections \(on page 22\)](#)
- [Z9-PE-GREY Port Connections \(on page 23\)](#)
- [Serial and Ethernet Port Details \(on page 24\)](#)

Pinout Assignments

- [Serial Pinout Assignments \(on page 25\)](#)

3.1. Z9-P Port Connections

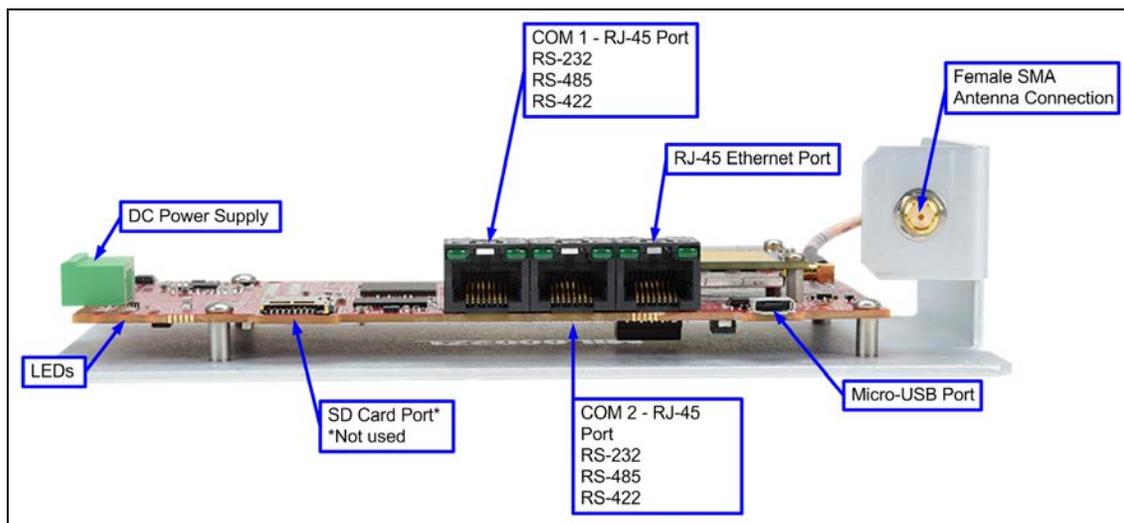


Figure 1: Z9-P Port Connections

3.2. Z9-PE Port Connections

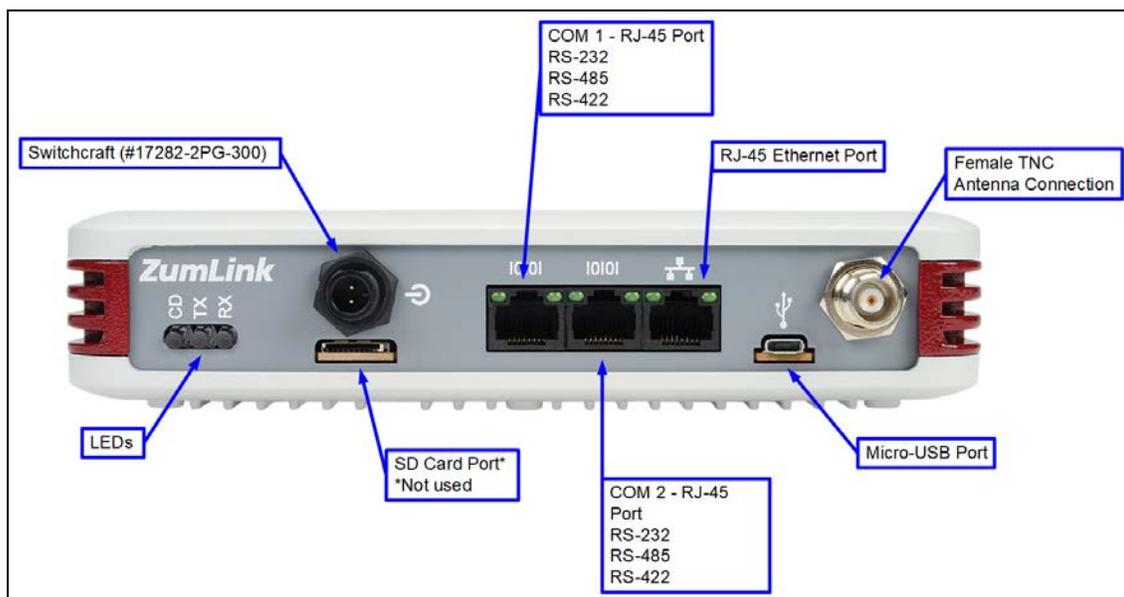


Figure 2: Z9-PE Port Connections

3.3. Z9-PE-GREY Port Connections

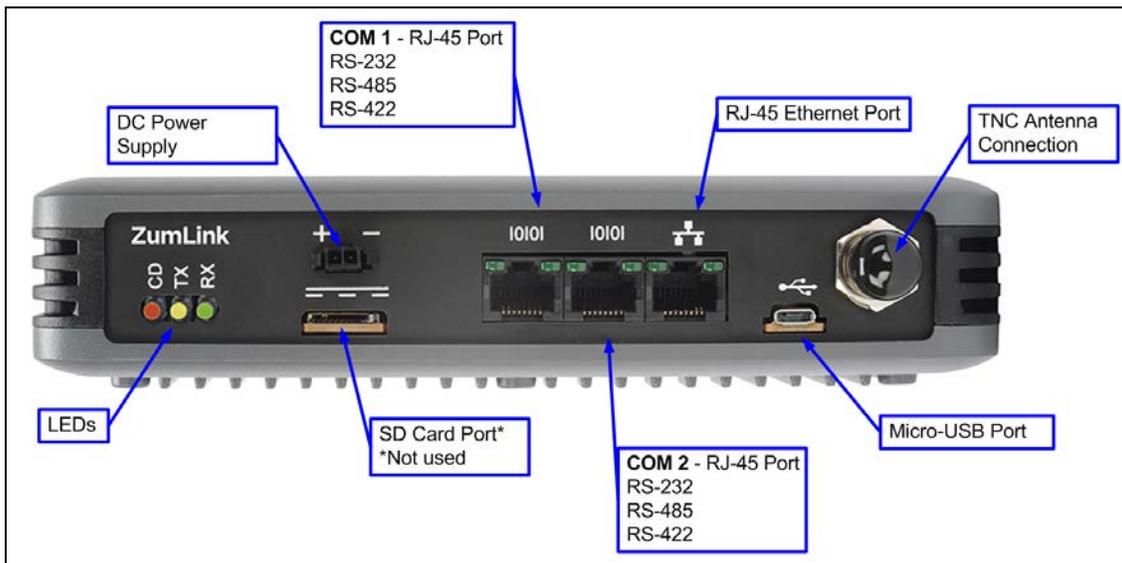


Figure 3: Z9-PE-GREY Port Connections

3.4. Serial and Ethernet Port Details

Note: The RJ-45 Ethernet and the micro USB connectors are standard connectors with industry standard pinout and signals. See the [LEDs \(on page 502\)](#) for additional information.

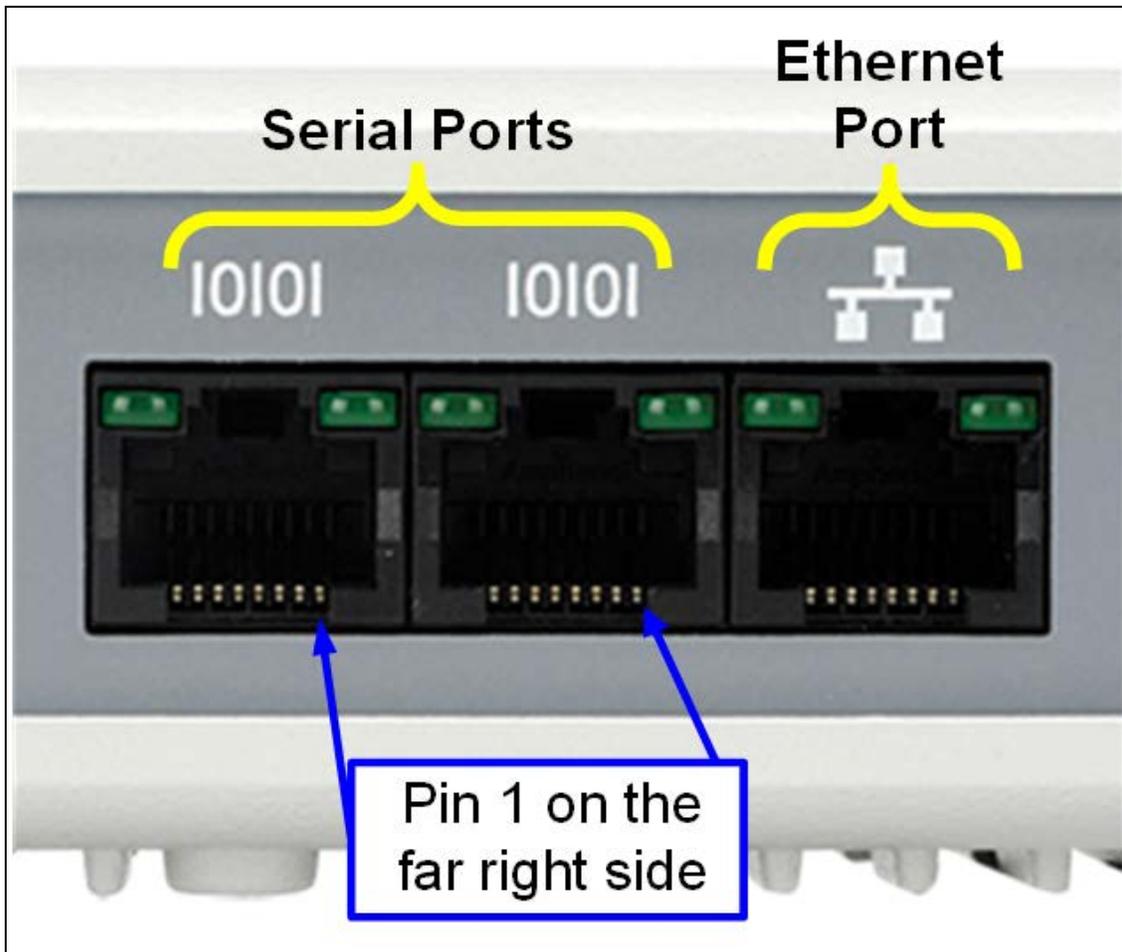


Figure 4: Serial and Ethernet Ports - Z9-P or Z9-PE

3.5. Serial Pinout Assignments

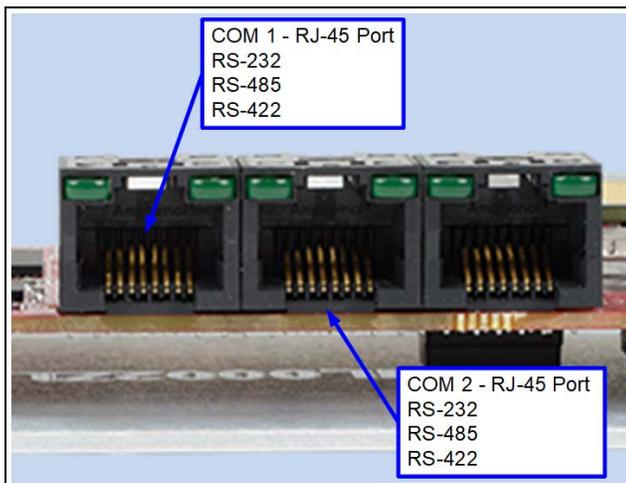


Figure 5: Serial Pinout Assignments

(I) - Input

(O) - Output

(B) - Bidirectional

Serial Pinout Assignments			
Pin Number	RS232	RS485	RS422
1	--	--	--
2	CD --- (O)	--	--
3	DTR --- (I)	--	--
4	GND	GND	GND
5	RXD --- (I)	--	TX+ (A+) --- (O)
6	TXD --- (O)	TX+/RX+ (Y+) --- (B)	RX+ (Y+) --- (I)
7	CTS --- (O)	TX-/RX- (Z-) --- (B)	RX- (Z-) --- (I)
8	RTS --- (I)	--	TX- (B-) --- (O)
***Com1.mode= Com2.mode=	RS232	RS485	RS485
***Com1.duplex= Com2.duplex=	Half or Full	Half	Full

Note: ***See the [COM Parameters \(on page 224\)](#) for detailed information.

Important!: The RTS and CTS signals are **ONLY** available for COM2.
The RTS and CTS signals are **NOT supported for COM1.**

4. Installation

- The Z9-P or Z9-PE is approved to operate with an input voltage range of +6 to +30 VDC that can supply at least 0.8 Amps at 6 VDC.
- See the [Technical Specifications \(on page 493\)](#) for additional information.

FREEWAVE Recommends: All input power supply wires should be at least **20 AWG** wires. A dedicated and stable power supply line is preferred. The power supply used **MUST** provide more current than the amount of current drain listed in the specifications for the product and voltage (at least 355 mA at 12V).



Warning! Use electrostatic discharge (ESD) protectors to protect the Z9-P or Z9-PE from electric shock and provide filtered conditioned power with over-voltage protection.

Note: The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

Procedure

1. Install an FCC-approved antenna.
2. Connect the antenna feed line to the Z9-P or Z9-PE.

Warning! Only FCC approved antennas may be used. See [Approved Antennas \(on page 222\)](#).



The antenna must be professionally installed on a fixed, mounted, and permanent outdoor structure to satisfy RF exposure requirements. Any antenna placed outdoors must be properly grounded. Use extreme caution when installing antennas and follow all instructions included with the antenna.



If installing a directional antenna, preset the antenna's direction appropriately.

3. Connect the Z9-P or Z9-PE to a power supply.
The LEDs (on page 502) blink to show startup.
4. Connect the USB cable to the computer and the Micro USB end to the Z9-P or Z9-PE.

Important!: The USB does NOT power the Z9-P or Z9-PE. It only provides a configuration interface.

Figure 6 is an example of the **Z9-PE** connected to a laptop.

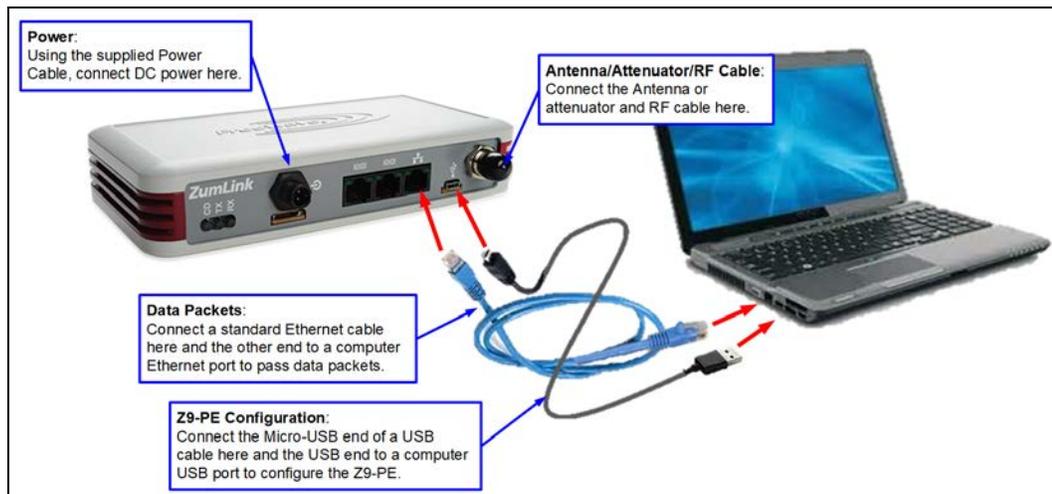


Figure 6: Z9-PE Connected to Laptop

The **FreeWave Drivers** and **ZumLink** windows may open.

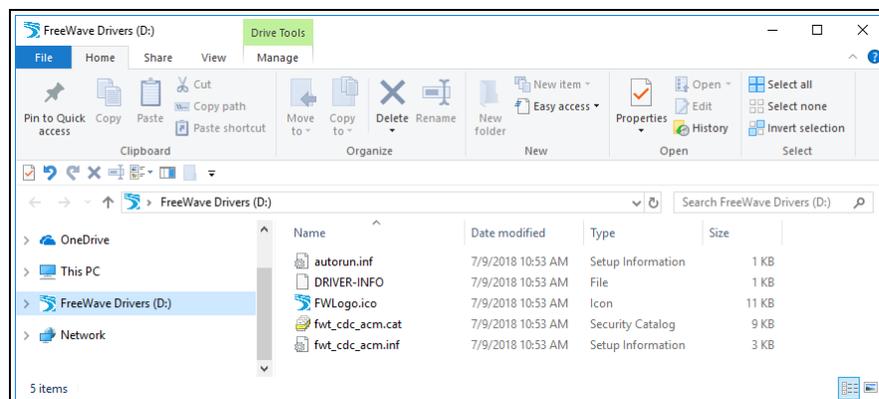


Figure 7: FreeWave Drivers window

Important!: The drivers install automatically.

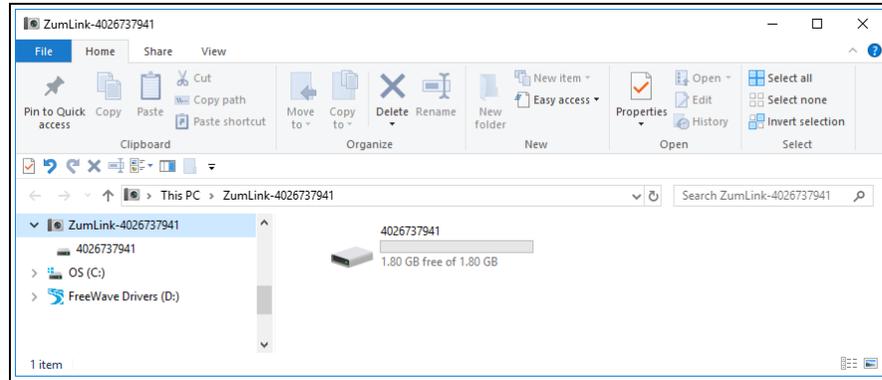


Figure 8: ZumLink window

5. Optional: Use the Ethernet port for data communications.
6. Continue with:
 - [Firmware Update \(on page 29\)](#)
 - [Drag and Drop Configuration \(on page 54\)](#)
 - [CLI Configuration \(on page 60\)](#)
 - [Web Interface Configuration \(on page 65\)](#)

5. Firmware Update

Important! The **Download** procedure must be completed first.

These are the basic steps to update the Z9-P or Z9-PE firmware:

5.1. Z9-P or Z9-PE

- A. [Download the Z9-P or Z9-PE Update Files \(on page 30\)](#)
- B. Review the [Update from All Previous Firmware Versions \(on page 34\)](#) to identify the files used to update from a previous firmware version.
- C. Complete either the:
[Firmware Update - Drag and Drop \(on page 35\)](#) or
[Firmware Update - Web Interface \(on page 43\)](#)

5.1.1. Optional: IQ Installation

- D. [Download the IQ Application Environment \(on page 75\)](#)
- E. Complete either the:
[Drag and Drop Installation of the IQ Application Environment \(on page 78\)](#)
[Web Interface - Installation of IQ Application Environment \(on page 82\)](#)

5.2. Download the Z9-P or Z9-PE Update Files

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Click support.freewave.com.
The **Login** window opens. [Figure 9](#)

Important!: Registration is required to use this website.

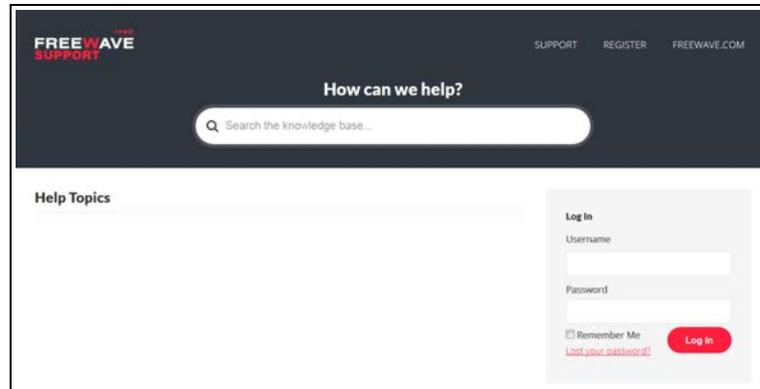
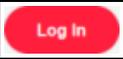


Figure 9: Login window

2. Enter the **User Name** and **Password**.
3. Click .
A successful Login message briefly appears.
The **Help Topics** window opens.
4. Click the **Firmware** link. [Figure 10](#)

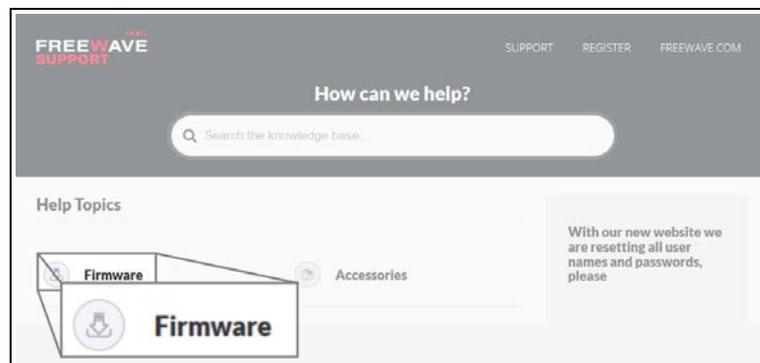


Figure 10: Help Topics window - Firmware link

The **Firmware** window opens.

5. Click the **ZumLink Firmware** link. [Figure 11](#)



Figure 11: Firmware window

The **ZumLink Firmware** window opens. [Figure 12](#)

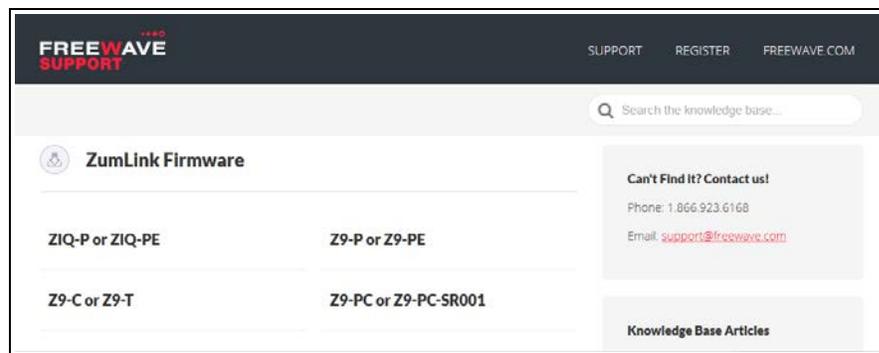


Figure 12: ZumLink Firmware window

6. Click the Z9-P or Z9-PE link.

The released Firmware v1.1.2.2 files appear in the window. [Figure 13](#)

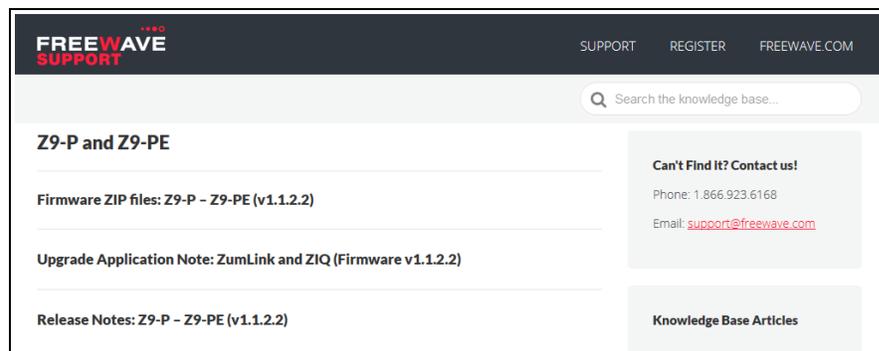


Figure 13: Z9-P or Z9-PE Firmware window

7. Click the **Firmware ZIP files:** link.

The **Firmware ZIP files** window opens for the Z9-P or Z9-PE.

8. Select and click the **Firmware_v1_1_2_2** attachment. [Figure 14](#)

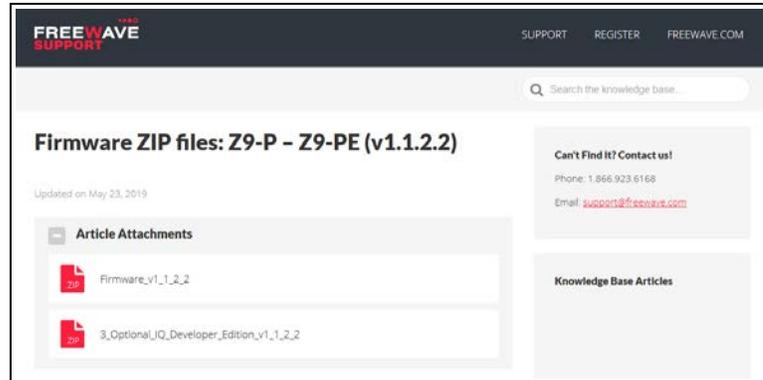


Figure 14: Firmware ZIP files window with the selected `Firmware_v1_1_2_2` Attachment

The **Opening** dialog box opens. [Figure 15](#)

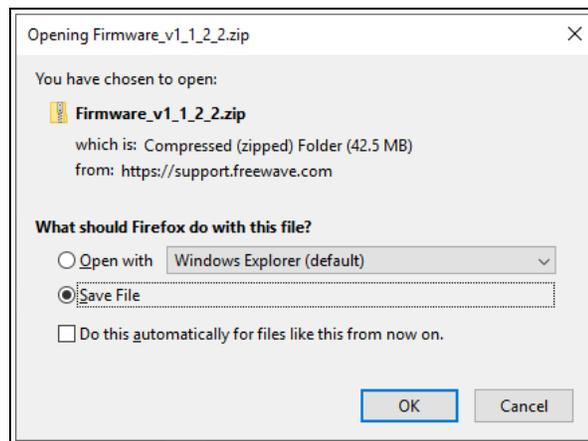


Figure 15: Opening Firmware_v1_1_2_2.zip dialog box

9. Click **OK**.

The **Enter name of file to save to** dialog box opens. [Figure 16](#)

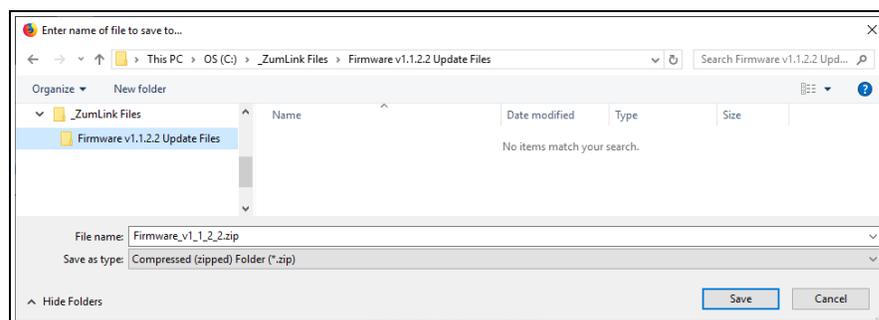


Figure 16: Enter name of file to save to dialog box

10. Search for and select a location to save the **.zip** file to and click **Save**.
The **Enter name of file to save to** dialog box closes.

11. Continue with either:
 - a. [Download the IQ Application Environment \(on page 75\)](#) or
 - b. Open a Windows® Explorer window and find the location where the **.zip** file was saved.
12. Double-click the **.zip** file.
13. Extract the files from the **.zip** file into the parent location.

Note: The **.zip** file includes the **.pkg** and **.fcf** files used in the update process.

14. Continue with [Update from All Previous Firmware Versions \(on page 34\)](#)

5.3. Update from All Previous Firmware Versions

Important! The update file names are numbered 1_, 2_, and 3_ and **MUST BE INSTALLED IN A SPECIFIC NUMERIC ORDER** for a successful update.

Required Files for **ZumLink**

1_Device_Firmware_v1_1_2_2.pkg

2_Radio_Firmware_v1_0_7_1.fcf

Optional: Files for **ZumLink**

3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg

- The **ZumIQ** license is preserved.

Note: For **ZumLink**, the **IQ Application Environment** can be added anytime in the future. Contact [FreeWave Technical Support \(on page 14\)](#) for the license key file.

IQ Developer Edition v1.1.1.2 / v1.1.2.2 Update or Downgrade

- When either updating or downgrading, the **IQ Application Environment** template is changed but NOT the active **IQ Application Environment** runtime application environment version.
 - Active applications will continue to run.
- Performing a [Rte Reset \(on page 339\)](#) to copy in the new FW template erases any existing applications in the original runtime application environment.
- If the new runtime environment is needed, save all applications prior to performing a [runtimeEnvironment.rteReset](#).

FREEWAVE Recommends: Prior to an update or downgrade procedure, save and backup all applications.

After deciding the files needed for the Z9-P or Z9-PE update from its installed firmware version, continue with either:

- [Firmware Update - Drag and Drop \(on page 35\)](#)
- [Firmware Update - Web Interface \(on page 43\)](#)

5.4. Firmware Update - Drag and Drop

This is the drag-and-drop procedure to update the Z9-P or Z9-PE firmware.

Important! The update file names are numbered 1_, 2_, and 3_ and **MUST BE INSTALLED IN A SPECIFIC NUMERIC ORDER** for a successful update.

- Alternatively, use the [Firmware Update - Web Interface \(on page 43\)](#) to update the Z9-P or Z9-PE.
- The images in this procedure are for **Windows® 10** and/or **Firefox®**.

FREEWAVE Recommends: Update to Firmware v1.1.2.2 to use the enhanced features and updated security of the Z9-P or Z9-PE.

Prior to an update or downgrade procedure, save and backup all applications.



Caution: This procedure requires the **Windows® File Explorer** file extension to be visible. See the **Microsoft®** topic [Windows File Name Extensions](#) to view the extensions.

1. Verify the [Download the Z9-P or Z9-PE Update Files \(on page 30\)](#) procedure is complete.
2. Connect the USB cable to the computer and the Micro USB end to the Z9-P or Z9-PE Micro-USB port.

The **FreeWave Drivers** and Z9-P or Z9-PE windows open.

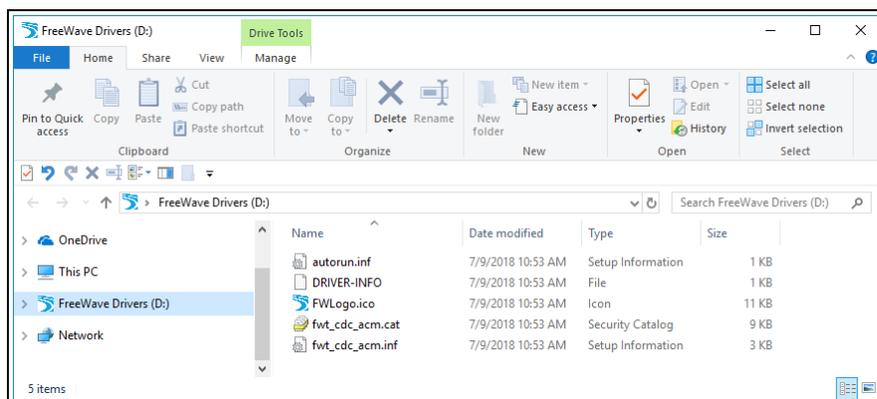


Figure 17: FreeWave Drivers window

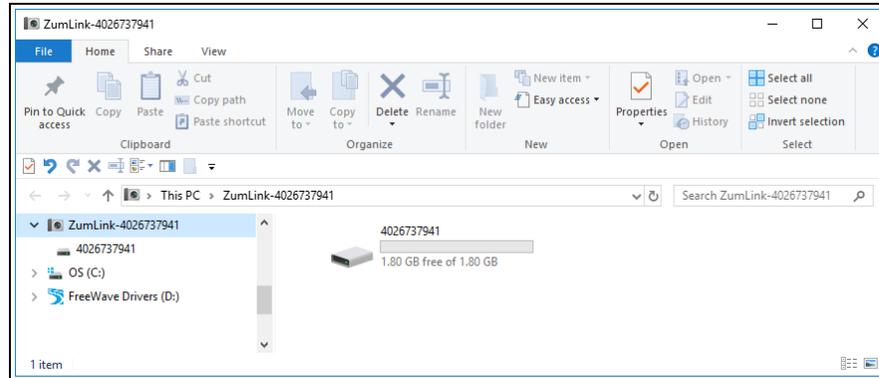


Figure 18: ZumLink window

3. In the Z9-P or Z9-PE window, double-click the connected device.
The files of the Z9-P or Z9-PE appear in the window. [Figure 19](#)

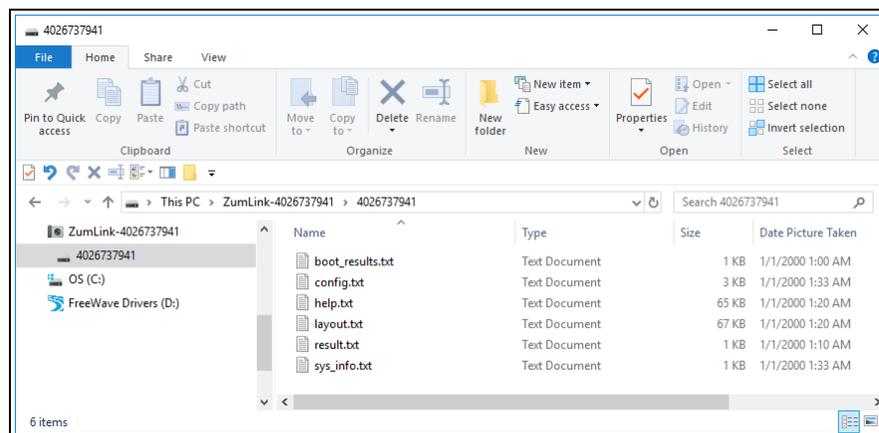


Figure 19: Opened ZumLink window showing the Default Files

4. Optional: Select, copy, and paste the **config.txt** file to a secure location.

Note: This is to backup the current **config.txt** before the update process in case the old **config.txt** file needs to be restored.

5. Locate and select the downloaded **1_Device_Firmware_v1_1_2_2.pkg** update file. [Figure 20](#)

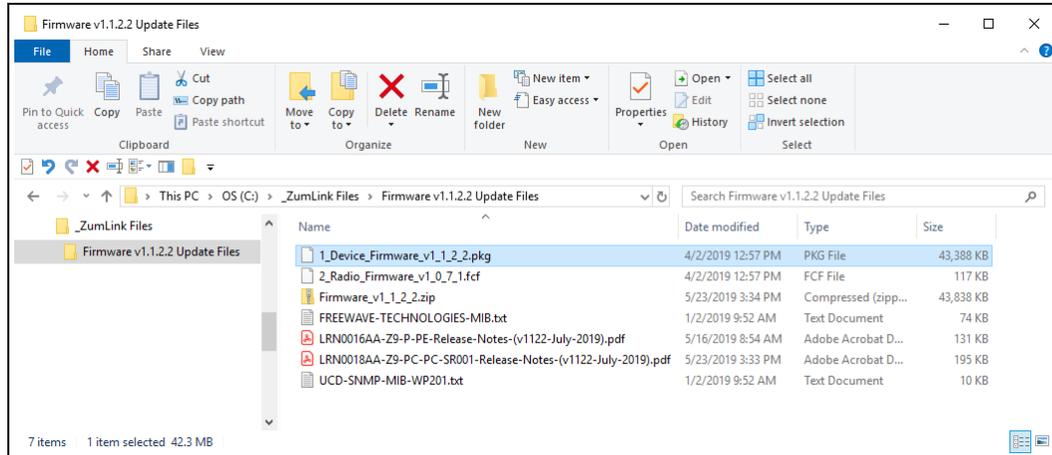


Figure 20: Selected **1_Device_Firmware_v1_1_2_2.pkg** File

6. Drag and drop the **.pkg** file on to the **ZumLink** window. **Figure 21**
The **.pkg** file will disappear after a few minutes.

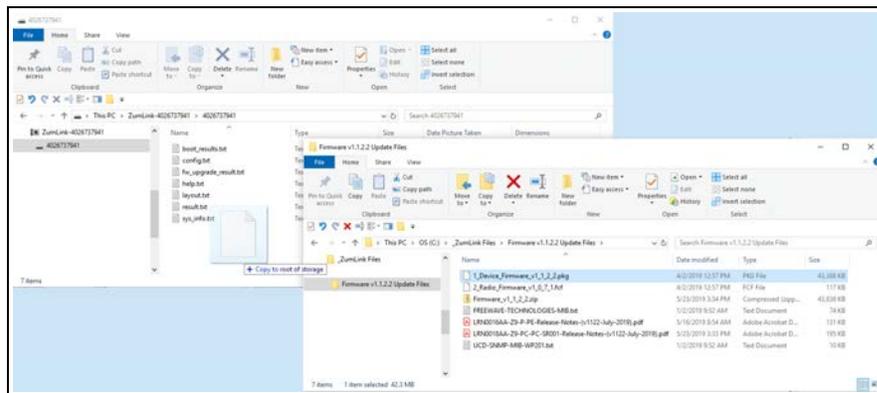


Figure 21: Drag and Drop the **.pkg** file to the **ZumLink** window

Important! If the **.pkg** file is NOT accepted, a **Windows®** error message appears immediately. **Figure 22**

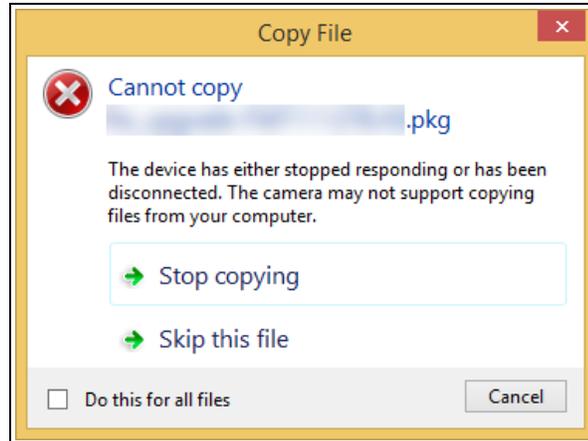


Figure 22: Failed PKG Message dialog box

Important! A **.pkg** or **.fcf** file extension is required for **Windows® 7**.
A **.pkg.txt** or **.fcf.txt** file extension **may be required** for some versions of **Windows® 8, 8.1,** and 10.

- If the **.pkg** file was rejected, change the extension of the **.pkg** file to **.pkg.txt** and select that file.
- Drag and drop the **.pkg.txt** file to the **ZumLink** window.
The **.pkg.txt** file will disappear after a few minutes.

The **Copying** message appears. [Figure 23](#)

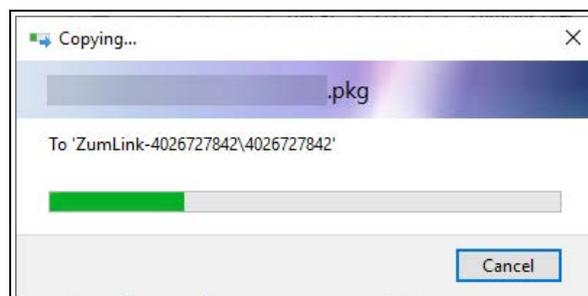


Figure 23: Copying .pkg message



Caution: DO NOT click the **Cancel** button to stop the drag-n-drop process.
If the drag-n-drop process is canceled during the file copy process, the Z9-P or Z9-PE cannot be accessed in **Windows® File Explorer**.
If this happens, reboot the Z9-P or Z9-PE and re-start the drag-n-drop process.

When the file is copied, the Z9-P or Z9-PE window is similar to [Figure 24](#):

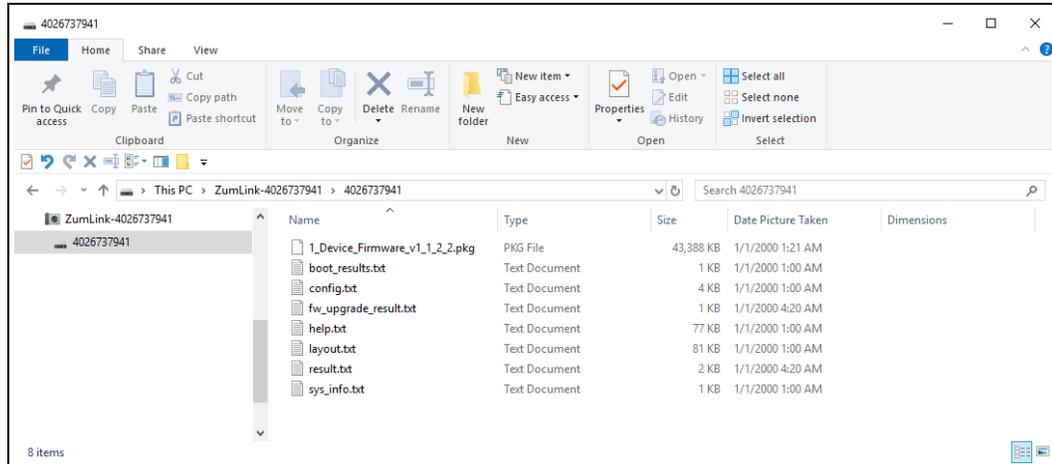


Figure 24: 1_Device_Firmware_v1_1_2_2.pkg File Dropped in the ZumLink window

7. **WAIT** for the **FreeWave Drivers** and **ZumLink** windows to close. The Z9-P or Z9-PE automatically reboots.

Warning! DO NOT remove power from the Z9-P or Z9-PE during or immediately after the firmware update process!

Wait until the [Home window \(on page 403\)](#) Web Interface is accessible before removing power from the Z9-P or Z9-PE device.



If power is removed prematurely during the update process, the Web Interface pages may not be accessible.

To recover from a failed Web Interface update, use the [Firmware Update - Drag and Drop \(on page 35\)](#) procedure to reinstall the **.pkg** file and **WAIT for the file update process to complete**.

DO NOT start another update or configuration change while an update is in progress.

Note: The [LEDs \(on page 502\)](#) LEDs indicated the update process.

The **FreeWave Drivers** and **ZumLink** windows re-open when the **.pkg** or **.pkg.txt** update file is applied.

8. In the Z9-P or Z9-PE window, double-click the connected device. The files of the Z9-P or Z9-PE appear in the window.
9. Locate and select the downloaded **2_Radio_Firmware_v1_0_7_1.fcf** update file. [Figure 25](#)

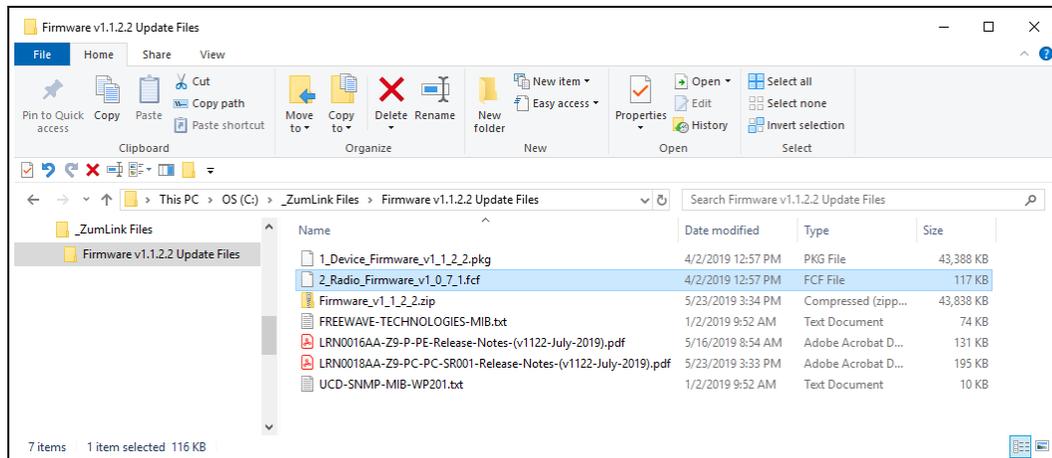


Figure 25: Selected 2_Radio_Firmware_v1_0_7_1.fcf File

10. Drag and drop the **.fcf** file on to the **ZumLink** window. **Figure 27**
The **.fcf** file will disappear.

Important! If the **.fcf** file is NOT accepted, a **Windows®** error message appears immediately. **Figure 26**

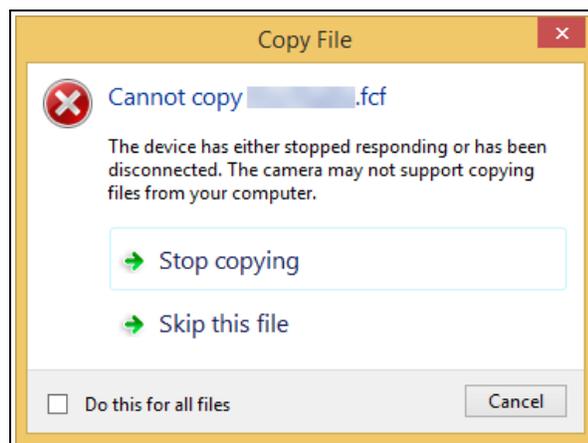


Figure 26: Failed FCF Message dialog box

Important! A **.pkg** or **.fcf** file extension is required for **Windows® 7**.
A **.pkg.txt** or **.fcf.txt** file extension **may be required** for some versions of **Windows® 8, 8.1,** and 10.

- If the **.fcf** file was rejected, change the extension of the **.fcf** file to **.fcf.txt** and select that file.
- Drag and drop the **.fcf.txt** file on to the **ZumLink** window.
The **.fcf.txt** file will disappear.

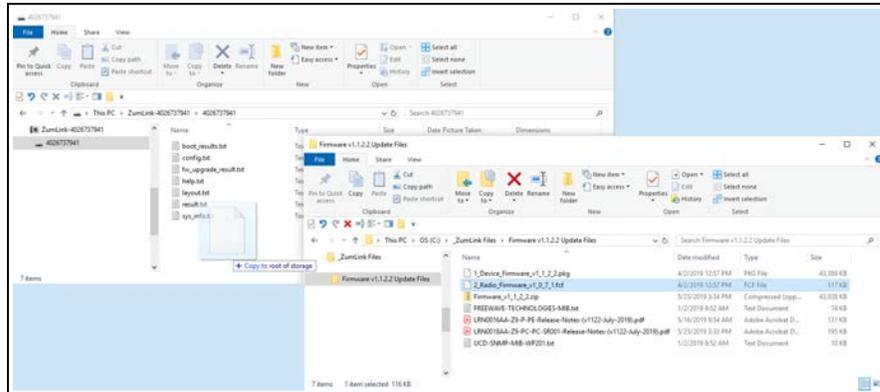


Figure 27: Drag and Drop the **.fcf** file to the **ZumLink** window

11. Wait for the **.fcf** or **.fcf.txt** file to be applied.
DO NOT start another update or configuration change while an update is in progress.



The **LEDs** (on page 502) LEDs indicated the update process.

12. Optional: Open the **sys.info.txt** file to verify the update information. [Figure 28](#)

Important! The image provides example information only.
Each Z9-P or Z9-PE provides its own unique information.

```

sys_info.txt - Notepad
File Edit Format View Help
[[Page=systemInfo]
systemInfo.serialNumber=4026737941
systemInfo.modelCode=0
systemInfo.radioModel=AMT0100AA
systemInfo.radioModelCode=0
systemInfo.radioFirmwareVersion=FWT1071TR.42
systemInfo.radioSerialNumber=4026737941
systemInfo.deviceName=
systemInfo.deviceModel=Z9-
systemInfo.deviceConfiguration=R1
systemInfo.deviceFirmwareVersion=FWT1122TB.66
systemInfo.deviceId=1
systemInfo.layoutHash=325426040
systemInfo.resetInfo=
systemInfo.hopTableVersion=SET0101HT
systemInfo.rteVersion=FWT1112TP.55
systemInfo.rteTemplateVersion=FWT1112TP.55
systemInfo.licenses=Custom Apps
systemInfo.themeVersion=FWT1122TB.66
  
```

Figure 28: **sys.info.txt** file with Updated Firmware

Important! For the v1.1.2.2 update, these parameters should have this information:
systemInfo.radioFirmwareVersion=FWT1071TR.42.
Web Interface - Radio Firmware Version is FWT1071TR.42.
systemInfo.deviceFirmwareVersion=FWT1122TB.66
Web Interface - Device Firmware Version is FWT1122TB.66
If these versions are NOT listed in their respective parameters, repeat the update procedure.

13. Continue with:

- [Drag and Drop Configuration \(on page 54\)](#)
- [CLI Configuration \(on page 60\)](#)

5.5. Firmware Update - Web Interface

This procedure uses a web browser window to update the Z9-P or Z9-PE firmware.

Important! The update file names are numbered 1_, 2_, and 3_ and **MUST BE INSTALLED IN A SPECIFIC NUMERIC ORDER** for a successful update.

- Alternatively, use the [Firmware Update - Drag and Drop \(on page 35\)](#) to update the Z9-P or Z9-PE.
- The images in this procedure are for **Windows® 10** and/or **Firefox®**.

FREEWAVE Recommends: Update to Firmware v1.1.2.2 to use the enhanced features and updated security of the Z9-P or Z9-PE.

Prior to an update or downgrade procedure, save and backup all applications.



Caution: This procedure requires the **Windows® File Explorer** file extension to be visible. See the **Microsoft®** topic [Windows File Name Extensions](#) to view the extensions.

The Z9-P or Z9-PE update process requires these basic steps:

- A. [Download the Z9-P or Z9-PE Update Files \(on page 30\)](#)
- B. [Setup the Computer IP Address Configuration \(on page 44\)](#)
- C. [Install the Update File using the Web Interface \(on page 48\)](#)

Note: This method is used for computers running **Windows® 7** and later.

5.5.1. Setup the Computer IP Address Configuration

Note: This procedure is required to access the Web Interface of the Z9-P or Z9-PE.
The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Connect the CAT5e / CAT6 Ethernet cable to the Z9-P or Z9-PE Ethernet port and the Ethernet port on the computer.
2. On the computer, open the **Windows® Control Panel**.
3. View the **Control Panel** window by **Category** and click **Network and Sharing Center**.
[Figure 29](#)

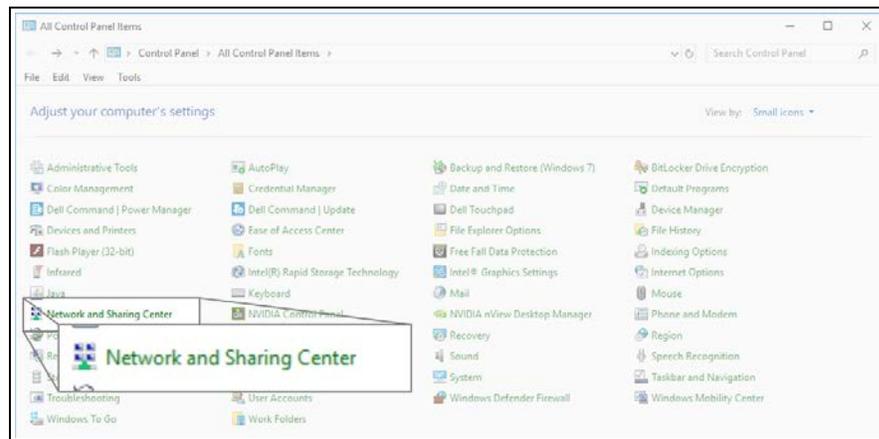


Figure 29: Control Panel > Network and Sharing Center

The **Network and Sharing Center** window opens.

4. Click the **Change Adapter Settings** link. [Figure 30](#)

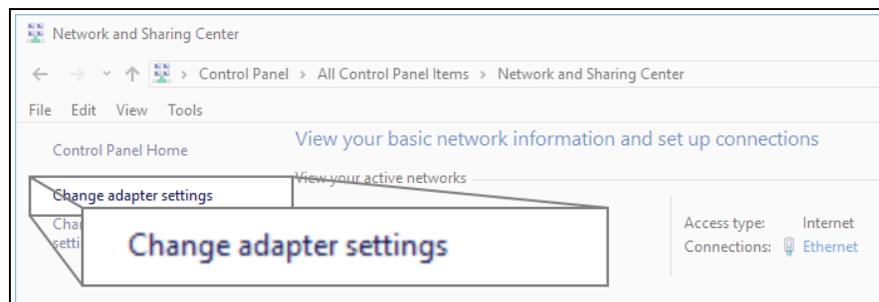


Figure 30: Change Adapter Settings Link

The **Network Connections** window opens. [Figure 31](#)

5. Double-click the **Local Area Connection** link or the connected **Network Connection**.

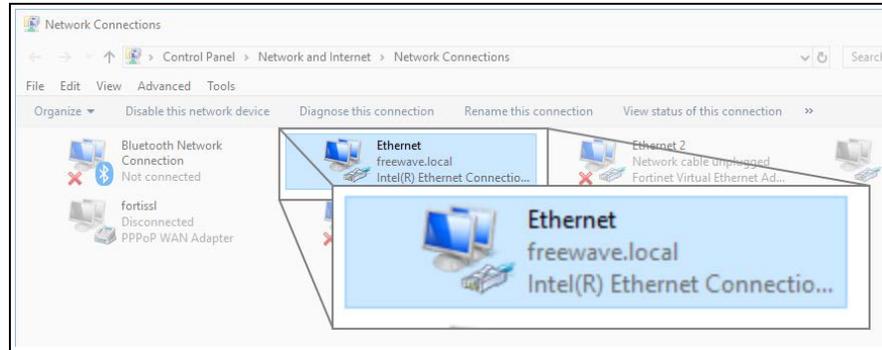


Figure 31: Network Connections window

The **Ethernet Status** dialog box opens. [Figure 32](#)

6. Click the **Properties** button.

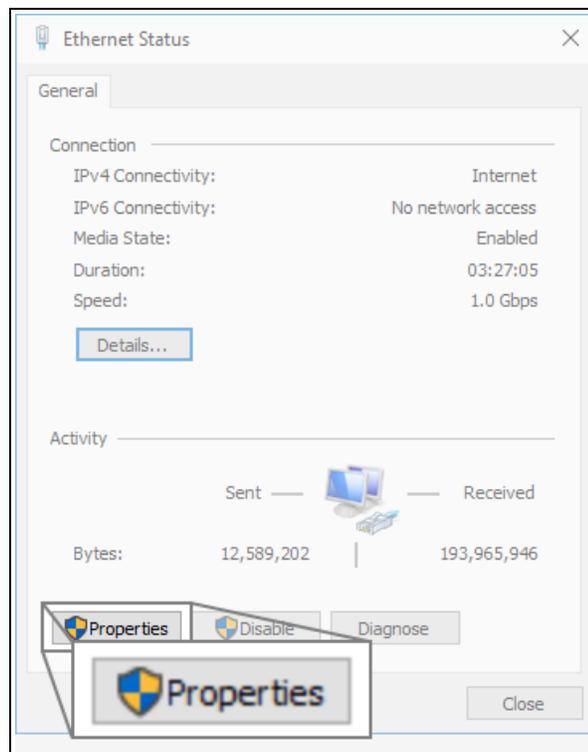


Figure 32: Ethernet Status dialog box

The **Ethernet Properties** dialog box opens.

7. Select the **Internet Protocol Version 4 (TCP/IPv4)** option. [Figure 33](#)
8. Click the **Properties** button.

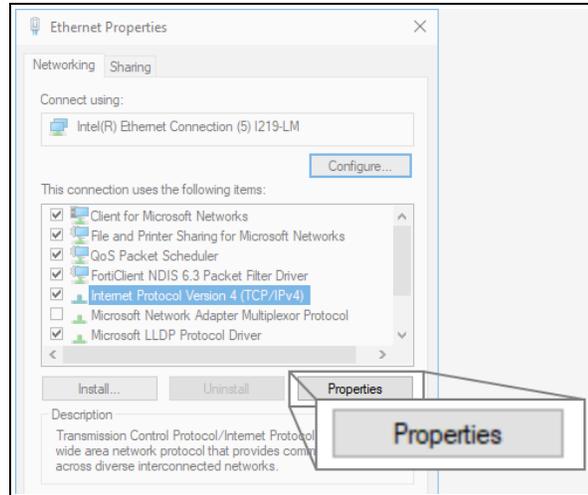


Figure 33: Ethernet Properties dialog box

- The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens. [Figure 34](#)
9. **IMPORTANT:** Make a note of the current settings (to reverse this procedure later).

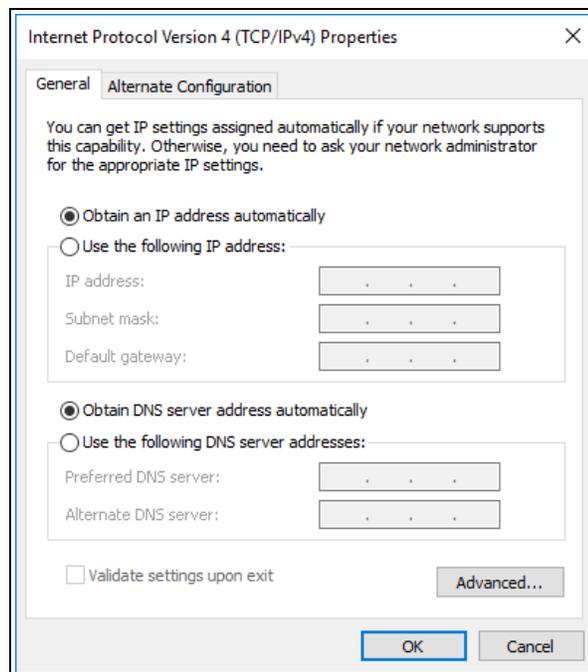


Figure 34: Default Example of Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

10. Select the **Use the following IP address** option button.
11. In the **IP Address** text box, enter an IP Address that is **in the same subnet range but a DIFFERENT IP Address** than the Z9-P or Z9-PE or all other units in the network. [Figure 35](#)

Example: Enter an **IP Address** from **192.168.111.1** to **192.168.111.254** (but NOT **192.168.111.100**) and the **Subnet Mask** to **255.255.255.0**.

Note: The default Z9-P or Z9-PE IP Address is **192.168.111.100**.
The default subnet mask is **255.255.255.0**.

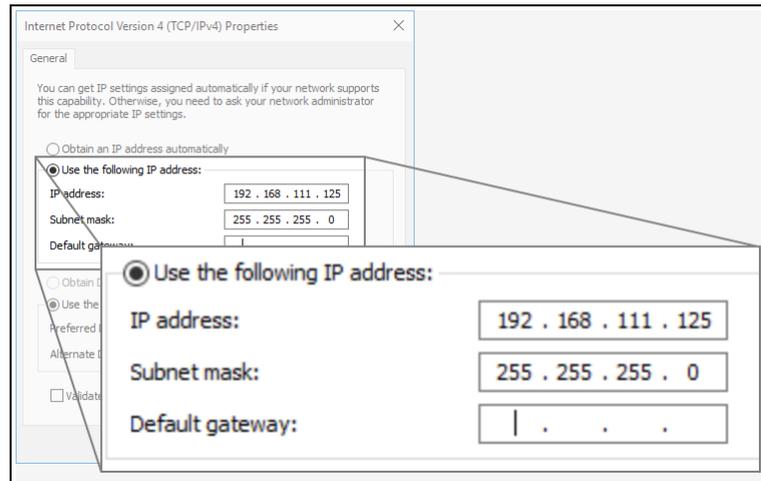


Figure 35: Changed Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

Note: An IP Address is NOT required in the **Default Gateway** text box.

12. Click **OK** to save the changes and close the dialog box.
13. Click **Close** twice to close the **Local Area Connection Properties** and **Local Area Connection Status** dialog boxes.
14. Continue with [Install the Update File using the Web Interface \(on page 48\)](#).

5.5.2. Install the Update File using the Web Interface



Caution: This procedure requires the **Windows® File Explorer** file extension to be visible. See the **Microsoft®** topic [Windows File Name Extensions](#) to view the extensions.

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Verify these procedures are completed:
 - a. [Download the Z9-P or Z9-PE Update Files \(on page 30\)](#)
 - b. [Setup the Computer IP Address Configuration \(on page 44\)](#)
2. Using a CAT5e / CAT6 Ethernet cable, connect the Z9-P or Z9-PE Ethernet port to the computer's Ethernet port.
3. Open a web browser.
4. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>. The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.

5. On the **Menu** list, click the **File Upload** link. [Figure 36](#)

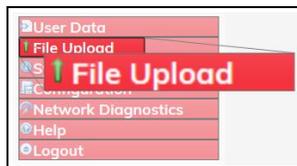


Figure 36: File Upload link

The **Authentication Required** (Login) dialog box opens.

6. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **File Upload window** opens. [Figure 37](#)

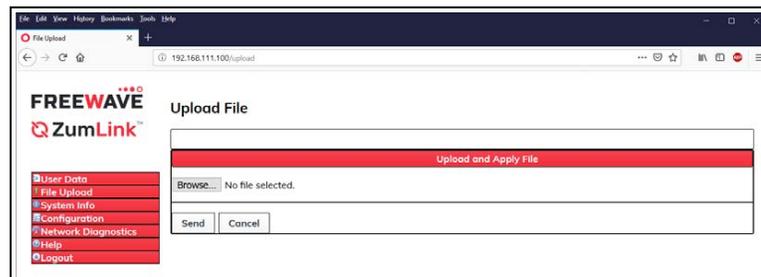
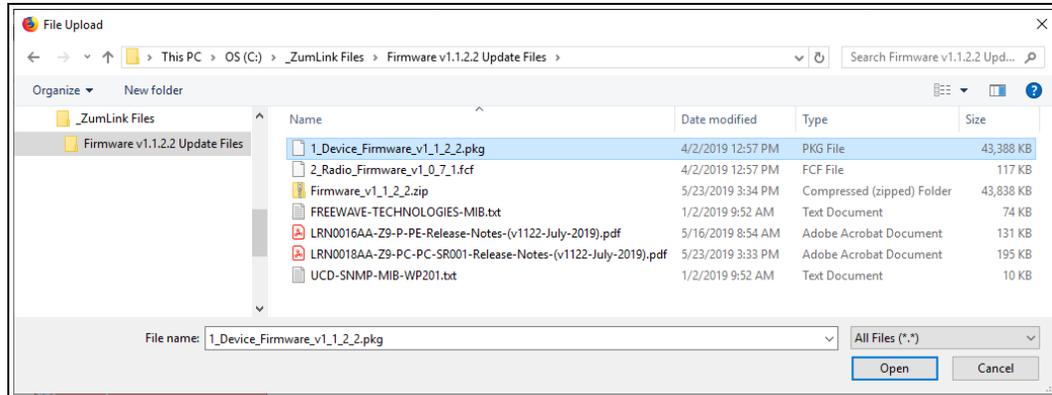


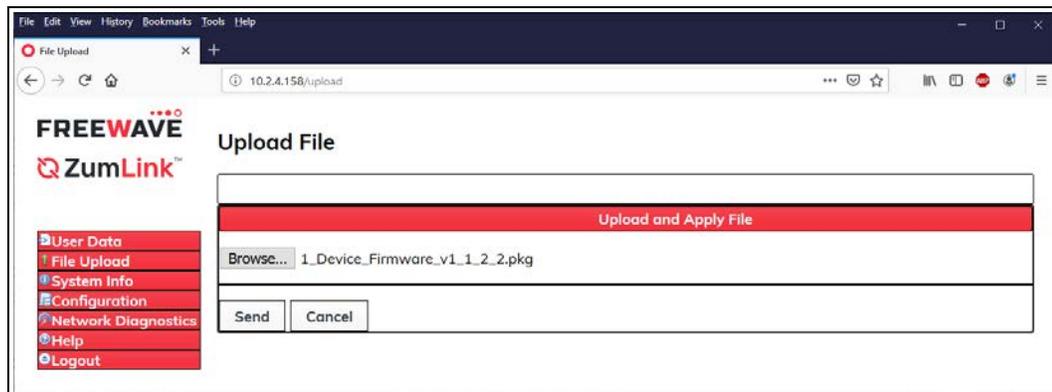
Figure 37: File Upload window

7. Click the **Browse** button.
The **File Upload** dialog box opens.
8. Locate and select the downloaded **1_Device_Firmware_v1_1_2_2.pkg** update file. [Figure 38](#)



**Figure 38: File Upload dialog box with Selected
1_Device_Firmware_v1_1_2_2.pkg File**

9. Click **Open**.
The dialog box closes and the **File Upload** window returns showing the selected file. [Figure 39](#)



**Figure 39: File Upload window with Selected
1_Device_Firmware_v1_1_2_2.pkg File**

10. Click **Send**.
The **File Upload** window refreshes and shows the uploaded file.

Note: When using the Web Interface on a computer with **Windows® 8** or **Windows® 10**, clicking **Cancel** does **not** halt the upload process.

11. Wait for the **.pkg** file to be applied.
The Z9-P or Z9-PE automatically reboots.

Warning! DO NOT remove power from the Z9-P or Z9-PE during or immediately after the firmware update process!

Wait until the [Home window \(on page 403\)](#) Web Interface is accessible before removing power from the Z9-P or Z9-PE device.



If power is removed prematurely during the update process, the Web Interface pages may not be accessible.

To recover from a failed Web Interface update, use the [Firmware Update - Drag and Drop \(on page 35\)](#) procedure to reinstall the **.pkg** file and **WAIT for the file update process to complete**.

DO NOT start another update or configuration change while an update is in progress.



The [LEDs \(on page 502\)](#) LEDs indicated the update process.

12. Refresh the browser window (press <F5>).
13. Click the **File Upload** link.
The **Authentication Required** (Login) dialog box opens.
14. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **File Upload window** opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

15. Click the **Browse** button.
The **File Upload** dialog box opens.
16. Locate and select the downloaded **2_Radio_Firmware_v1_0_7_1.fcf** update file.
[Figure 40](#)

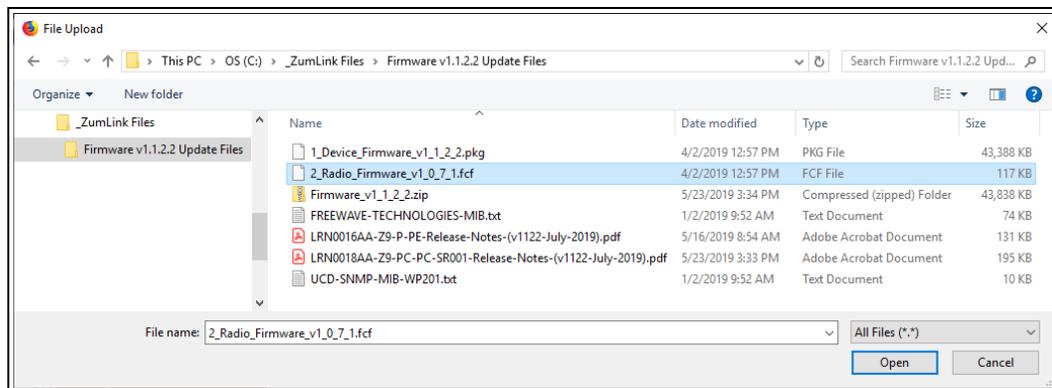


Figure 40: File Upload dialog box with Selected .fcf File

17. Click **Open**.
The dialog box closes and the **File Upload** window returns showing the selected file.
[Figure 41](#)



Figure 41: File Upload window with Selected .fcf File

18. Click **Send**.

The **File Upload** window refreshes and shows the uploaded file.

Note: When using the Web Interface on a computer with **Windows® 8** or **Windows® 10**, clicking **Cancel** does **not** halt the upload process.

19. Wait for the **.fcf** file to be applied.

DO NOT start another update or configuration change while an update is in progress.



The **LEDs** (on page 502) LEDs indicated the update process.

20. On the **Menu** list, click the **System Info** link. [Figure 42](#)



Figure 42: System Info link

The [System Info window](#) opens showing the updated firmware on the Z9-P or Z9-PE. [Figure 43](#)

Important! The image provides example information only. Each Z9-P or Z9-PE provides its own unique information.

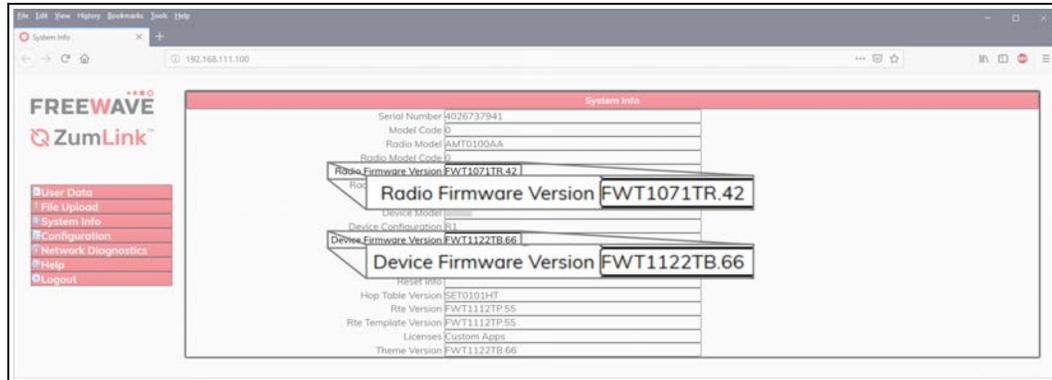


Figure 43: System Info window

Important!: For the v1.1.2.2 update, these parameters should have this information:
 systemInfo.radioFirmwareVersion=FWT1071TR.42.
 Web Interface - Radio Firmware Version is FWT1071TR.42.
 systemInfo.deviceFirmwareVersion=FWT1122TB.66
 Web Interface - Device Firmware Version is FWT1122TB.66
 If these versions are NOT listed in their respective parameters, repeat the update procedure.

- Optional: Continue with [Web Interface Configuration \(on page 65\)](#).

6. Configuration

- [Drag and Drop Configuration \(on page 54\)](#)
- [CLI Configuration \(on page 60\)](#)
- [Web Interface Configuration \(on page 65\)](#)

6.1. Drag and Drop Configuration



Caution: This procedure requires the **Windows® File Explorer** file extension to be visible. See the **Microsoft®** topic [Windows File Name Extensions](#) to view the extensions.

Important!: Windows® 7 or later is required to use the USB Drag and Drop.

Note: The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

Procedure

1. Connect the USB cable to the computer and the Micro USB end to the Z9-P or Z9-PE. The **FreeWave Drivers** and **ZumLink** windows may open. (Figure 44 and Figure 45)

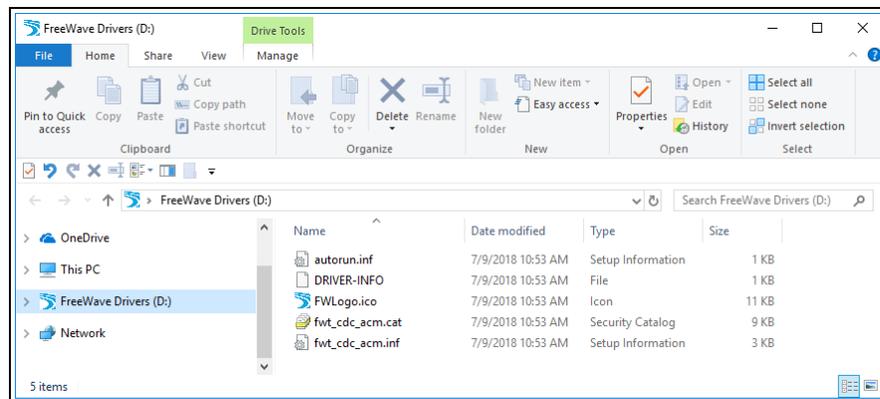


Figure 44: FreeWave Drivers window

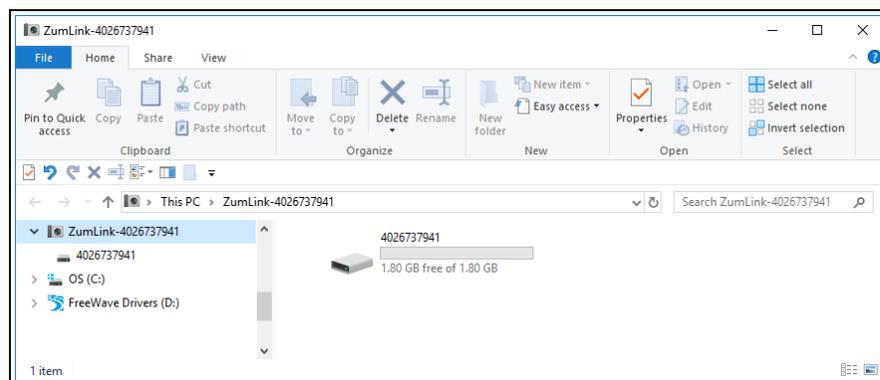


Figure 45: ZumLink window

2. In the **ZumLink** window, double-click the connected Z9-P or Z9-PE. The files of the Z9-P or Z9-PE appear in the window.
3. Select the **config.txt** file and copy it to the clipboard (press <Ctrl+C>). Figure 46

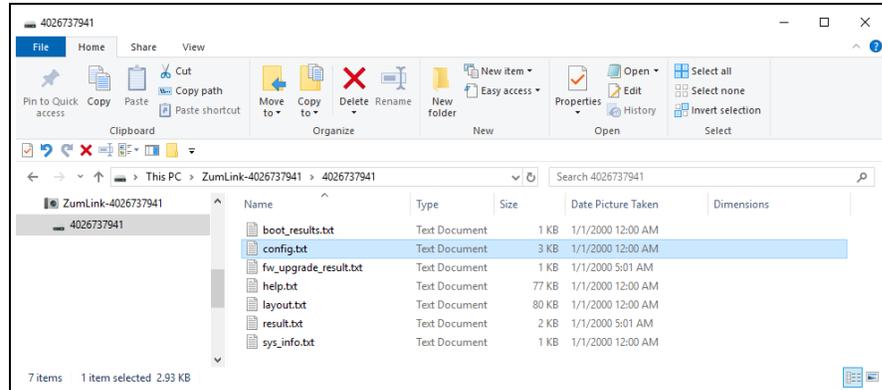


Figure 46: Opened ZumLink window Showing the Default Files

4. Leave the **ZumLink** window open - it is used later in the procedures.
5. Open a **Windows® File Explorer** window and create a designated folder for changed configuration files.

Example: C:\ZumLink Config File.

6. Paste (press <Ctrl+V>) the copied **config.txt** file into the designated folder.

Important!: The **txt** file must be copied to a separate location on the computer to edit. The file **CANNOT** be changed directly in the **ZumLink** folder.

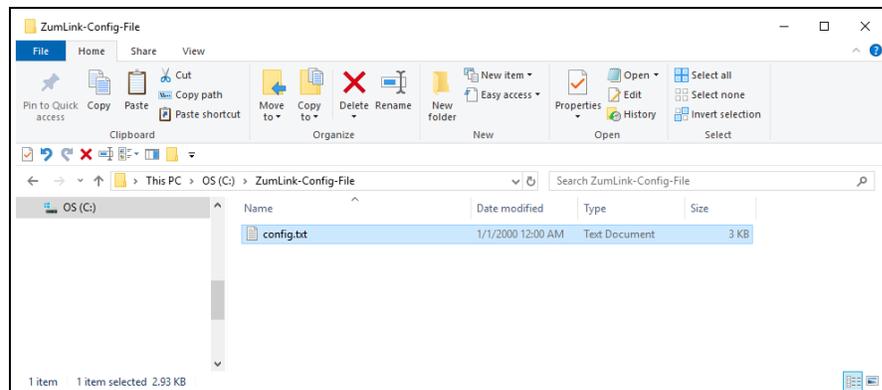


Figure 47: Copied config.txt File in the Designated Configuration Folder

7. Double-click the **config.txt** to open it in the default text editor.

Note: This example uses **Notepad®**.

8. Click the **Notepad® File** menu and click **Save As**. [Figure 48](#)



Figure 48: Notepad® window - File > Save As Menu

The **Save As** dialog box opens.

11. In the **File Name** text box, enter a file name with either the **.cfg** or **.cfg.txt** extension.

Note: The file name used in this example is for illustration purposes only. Any name can be used. NO SPACES are allowed in the file name.

Important! A **.cfg** file extension is required for **Windows® 7**. A **.cfg.txt** file extension may be required for some versions of **Windows® 8** and **Windows® 10**.

Failure to save the file with the correct extension type results in the file **NOT** being able to integrate with the **ZumLink config.txt** file when copied to the **ZumLink** window.

12. Click the **Save as type** list box arrow and select **All Files**.

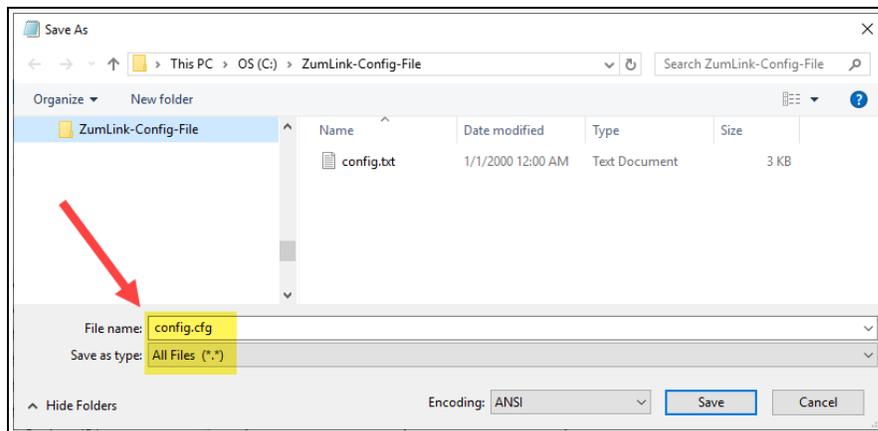


Figure 49: Save As dialog box with All Files (*.*) selected.

13. Click **Save**.
The dialog box closes and the text editor returns with the new **.cfg** or **.cfg.txt** file open.
14. As applicable, change these general settings:
 - [Page=systemInfo]
 - **systemInfo.deviceName**
 - systemInfo.deviceId

Note: See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

- [Page=radioSettings]
 - radioSettings.txPower
 - radioSettings.rfDataRate***
 - radioSettings.radioMode
 - radioSettings.networkId***
 - radioSettings.nodeId**
 - radioSettings.radioFrequency***
 - radioSettings.radioHoppingMode***
 - radioSettings.beaconInterval

Note: See [Radio Settings Parameters \(on page 310\)](#) for detailed information about these settings.

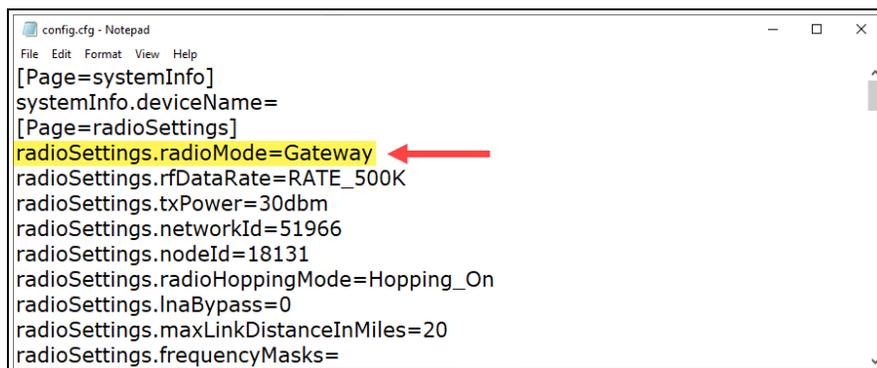
Each radio with the same **networkId must have a UNIQUE **nodeId**.

A unique nodeId is required so that only one node will unicast an acknowledgment. Otherwise, two or more nodes will unicast an acknowledgment that may collide.

***These are the **Golden Settings** and they MUST match between all radios with the same **networkId**.

Important! With **radioHoppingMode** enabled, only one radio can be designated as a Gateway or Gateway-Repeater. All other radios MUST be designated as Endpoints or Endpoint-Repeaters. For detailed information, see the [Radio Settings Parameters \(on page 310\)](#).

15. For illustration, the **radioSettings.radioMode** was changed from **Endpoint** to **Gateway**.
Figure 50



```

config.cfg - Notepad
File Edit Format View Help
[Page=systemInfo]
systemInfo.deviceName=
[Page=radioSettings]
radioSettings.radioMode=Gateway
radioSettings.rfDataRate=RATE_500K
radioSettings.txPower=30dbm
radioSettings.networkId=51966
radioSettings.nodeId=18131
radioSettings.radioHoppingMode=Hopping_On
radioSettings.lnaBypass=0
radioSettings.maxLinkDistanceInMiles=20
radioSettings.frequencyMasks=
  
```

Figure 50: radioSettings.radioMode Changed from Endpoint to Gateway

16. After changes are completed, press <Ctrl+S> or, on the **File** menu, click **Save** to save the updated file.

17. Close the text editor.
18. Locate and open the **ZumLink** window so it is side-by-side with the changed configuration file window.
19. Open the **Windows® File Explorer** designated folder for changed configuration files.
20. Select the changed **.cfg** or **.cfg.txt** file. **Figure 51**

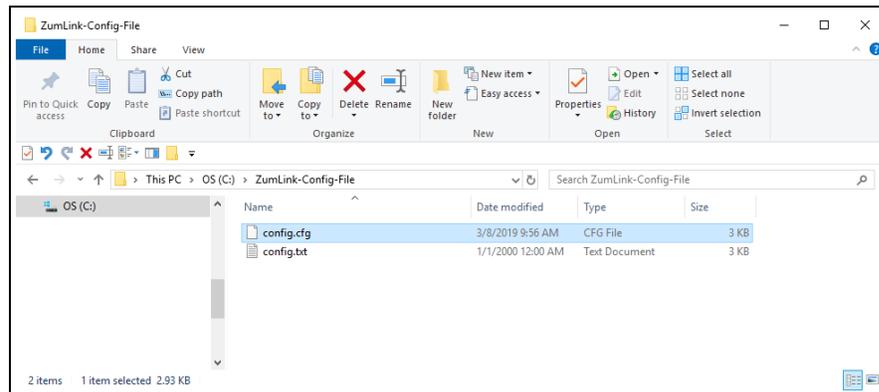


Figure 51: Select the Changed .cfg File

21. Drag and drop the **.cfg** or **.cfg.txt** file to the **ZumLink** window. **Figure 52**

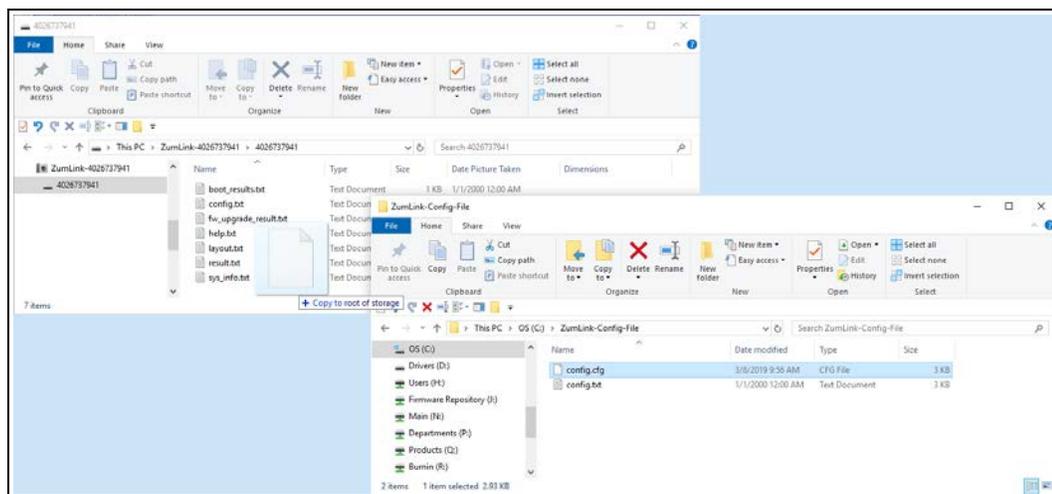


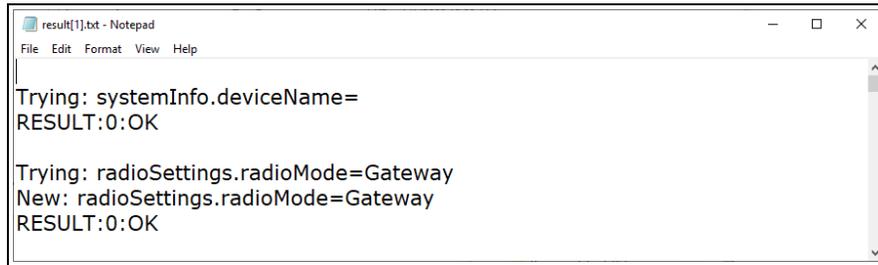
Figure 52: Drag and Drop the .cfg File to the ZumLink Window

22. Wait for the **.cfg** or **.cfg.txt** file to integrate with the **ZumLink config.txt** file.

Note: The more changes made in the **.cfg** or **.cfg.txt** file, the longer the Z9-P or Z9-PE takes to process the file and update the **config.txt** file.
If very few changes are made, the **.cfg** or **.cfg.txt** file does not appear in the window.

When the **config.txt** is updated, the changed **.cfg** or **.cfg.txt** file is removed from the list of files in the **ZumLink** window.

23. Double-click the **result.txt** file to verify there are **No errors Detected** with the identified changes in the file. [Figure 53](#)



```
result[1].txt - Notepad
File Edit Format View Help

Trying: systemInfo.deviceName=
RESULT:0:OK

Trying: radioSettings.radioMode=Gateway
New: radioSettings.radioMode=Gateway
RESULT:0:OK
```

Figure 53: Opened **result.txt File**

Note: If an error is detected, the **result.txt** file will indicate that errors are present.

24. As appropriate, repeat the Drag and Drop procedure to correct any errors.
25. Optional: Double-click the **config.txt** file to view and verify the new Z9-P or Z9-PE configuration.
26. Optional: [Change the Passwords \(on page 189\)](#).

6.2. CLI Configuration

This procedure provides a **Tera Term** terminal connection to the FreeWave CLI. Other terminal emulators (e.g., **HyperTerminal**, **PuTTY**) may be used.

The basic steps are:

- A. [Connect the Z9-P or Z9-PE to the Computer \(on page 60\)](#)
- B. [Access the CLI and Change the IP Address and nodelid \(on page 61\)](#)

Note: The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

6.2.1. Connect the Z9-P or Z9-PE to the Computer

1. Connect the USB cable to the computer and the Micro USB end to the Z9-P or Z9-PE. The **FreeWave Drivers** and **ZumLink** windows may open.

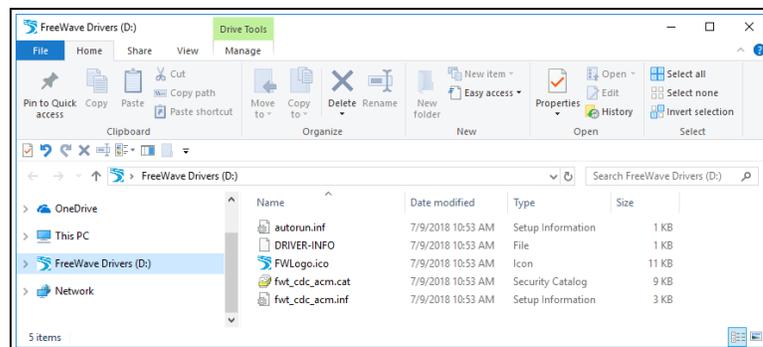


Figure 54: FreeWave Drivers window

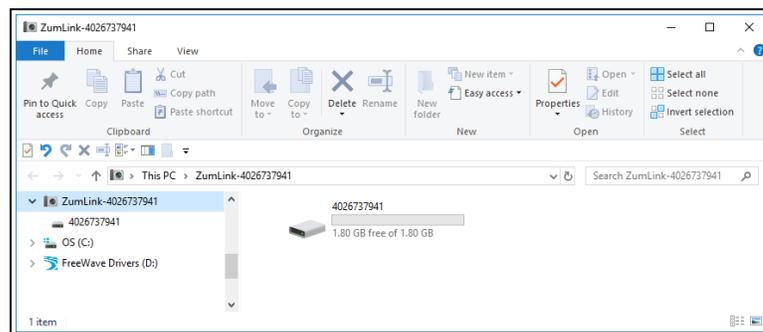


Figure 55: ZumLink window

2. Continue with [Access the CLI and Change the IP Address and nodelid \(on page 61\)](#).

6.2.2. Access the CLI and Change the IP Address and nodeld

Note: This procedure provides a **Tera Term** terminal connection to the FreeWave CLI. Other terminal emulators (e.g., **HyperTerminal**, **puTTY**) may be used. The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

1. On the computer connected to the Z9-P or Z9-PE, open a terminal program (e.g., **Tera Term** <http://ttssh2.osdn.jp/>).
2. In **Tera Term**, click the **File** menu and select **New Connection**. [Figure 56](#)

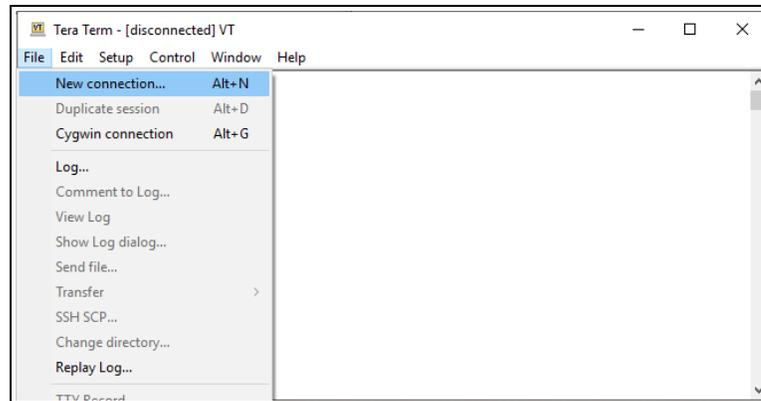


Figure 56: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P or Z9-PE is connected to. [Figure 57](#)

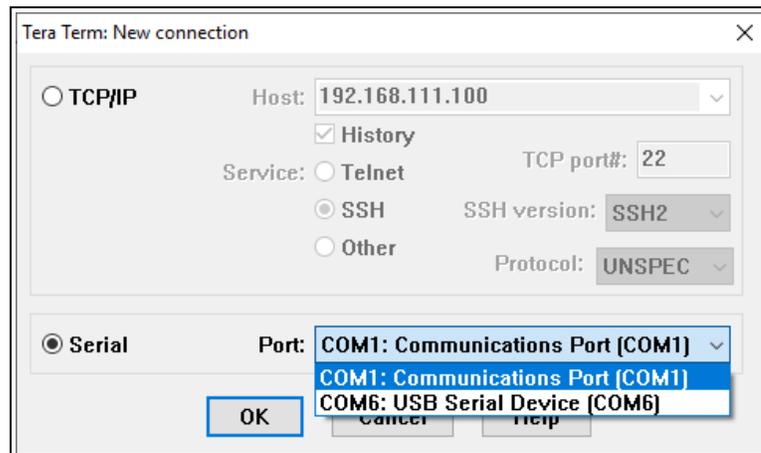


Figure 57: Select the Z9-P or Z9-PE COM Port

Important! The **Port** assignment varies from computer to computer.

4. 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.
5. In the **Tera Term** window, click the **Setup** menu and select **Serial Port**. [Figure 58](#)

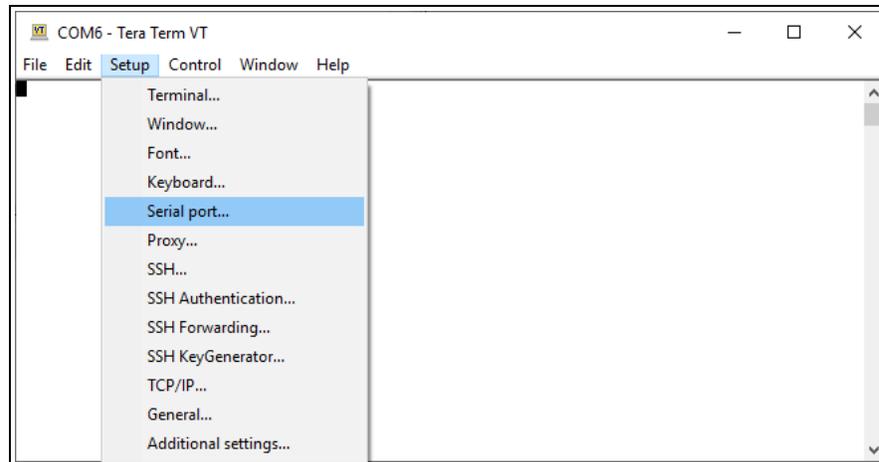


Figure 58: Setup menu > Serial Port

The **Tera Term: Serial Port Setup** dialog box opens. [Figure 59](#)

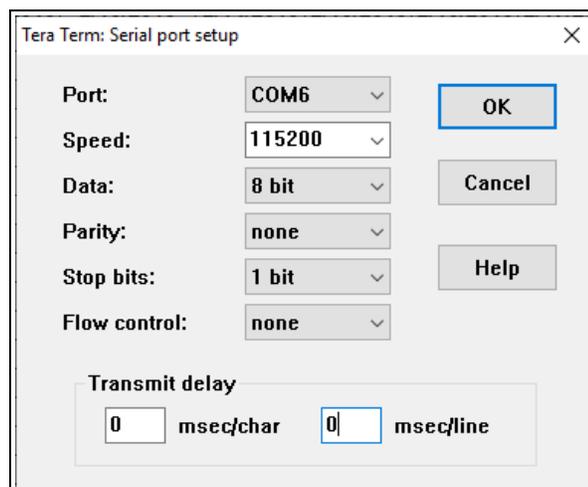


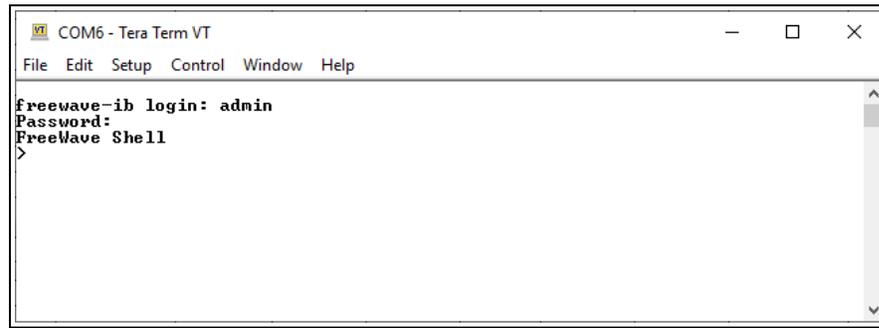
Figure 59: Tera Term: Serial Port Setup dialog box with Default Settings

6. Using [Figure 59](#) as the example, verify the COM port settings are:
 - Speed** (Baud Rate): 115200
 - Data** (Databits): 8 bit
 - Parity**: none
 - Stop bits**: 1 bit
7. Click **OK** to save the changes and close the dialog box.
8. In the **Tera Term** window, press <Enter>.
The FreeWave CLI Login returns.
9. Enter **admin** for the **Username** and press <Enter>.

10. Enter **admin** for the **Password** and press <Enter>.

Note: The default username and password is **admin**.
If the **User Name** or **Password** were changed, enter the applicable information.
The password does not appear when typing - it looks blank.

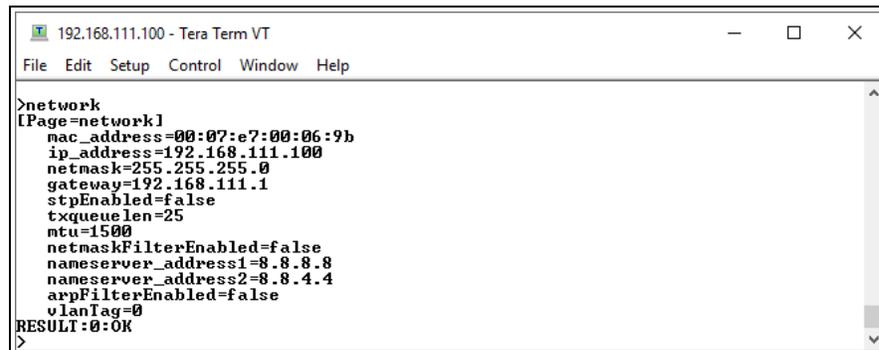
The **FreeWave Shell** opens. [Figure 60](#)



```
COM6 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login: admin
Password:
FreeWave Shell
>
```

Figure 60: FreeWave Shell

11. At the > prompt, type **network** and press <Enter>.
The Z9-P or Z9-PE **network** settings appear. [Figure 61](#)



```
192.168.111.100 - Tera Term VT
File Edit Setup Control Window Help
>network
[Page=network]
mac_address=00:07:e7:00:06:9b
ip_address=192.168.111.100
netmask=255.255.255.0
gateway=192.168.111.1
stpEnabled=false
txqueueLen=25
mtu=1500
netmaskFilterEnabled=false
nameserver_address1=8.8.8.8
nameserver_address2=8.8.4.4
arpFilterEnabled=false
vlanTag=0
RESULT:0:OK
>
```

Figure 61: network Page window

Note: Steps 12 to 15 make the **IP Address** and **nodeId** unique.

12. At the > prompt, type **ip_address=nnn.nnn.nnn.nnn** and press <Enter>.

Note: Where **nnn.nnn.nnn.nnn** is the IP Address assigned to each Z9-P or Z9-PE.

13. Optional: Change the [Gateway \(on page 289\)](#) and the [Netmask \(on page 293\)](#) addresses, if required.
14. At the > prompt, type **nodeId=nnn** and press <Enter>.

Note: Where **nnn** = a 1 to 5 digit number, unique to the connected radio.
The **nodeId** MUST be unique on each radio within the same **networkId**.

15. At the > prompt, type **save** and press <Enter>.
16. Continue with:
 - [Change the Passwords \(on page 189\)](#).
 - Upgrade to the latest firmware using the [Firmware Update \(on page 29\)](#) procedure.

Note: Go to support.freewave.com to login and download the latest firmware for the Z9-P or Z9-PE.
Registration is required to use this website.

6.3. Web Interface Configuration

This procedure provides a Web Interface connection to the Z9-P or Z9-PE.

The basic steps are:

- A. [Setup the Computer IP Address Configuration \(on page 66\)](#)
- B. [Setup the Computer IP Address Configuration \(on page 66\)](#)

6.3.1. Setup the Computer IP Address Configuration

Note: This procedure is required to access the Web Interface of the Z9-P or Z9-PE.
The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Connect the CAT5e / CAT6 Ethernet cable to the Z9-P or Z9-PE Ethernet port and the Ethernet port on the computer.
2. On the computer, open the **Windows® Control Panel**.
3. View the **Control Panel** window by **Category** and click **Network and Sharing Center**.
[Figure 62](#)

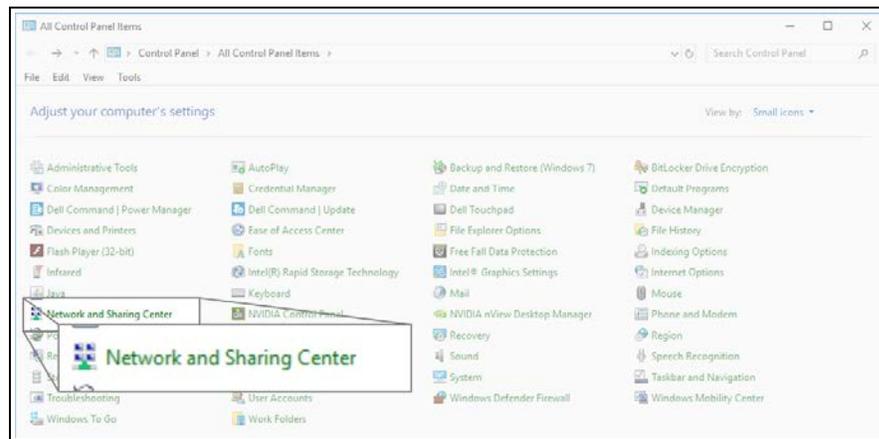


Figure 62: Control Panel > Network and Sharing Center

The **Network and Sharing Center** window opens.

4. Click the **Change Adapter Settings** link. [Figure 63](#)

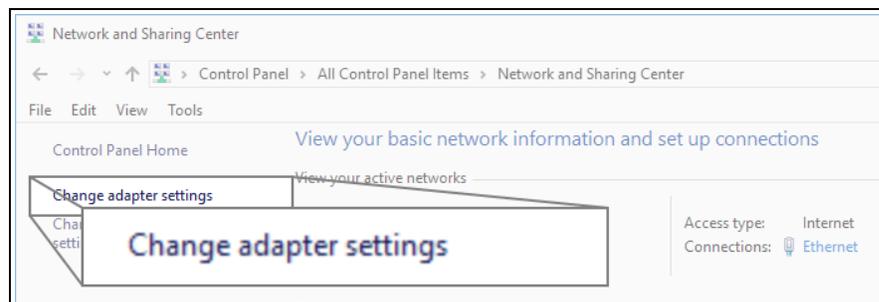


Figure 63: Change Adapter Settings Link

The **Network Connections** window opens. [Figure 64](#)

5. Double-click the **Local Area Connection** link or the connected **Network Connection**.

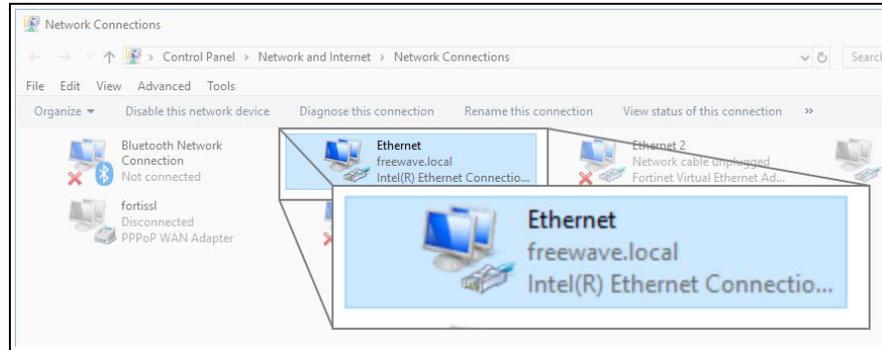


Figure 64: Network Connections window

The **Ethernet Status** dialog box opens. [Figure 65](#)

6. Click the **Properties** button.

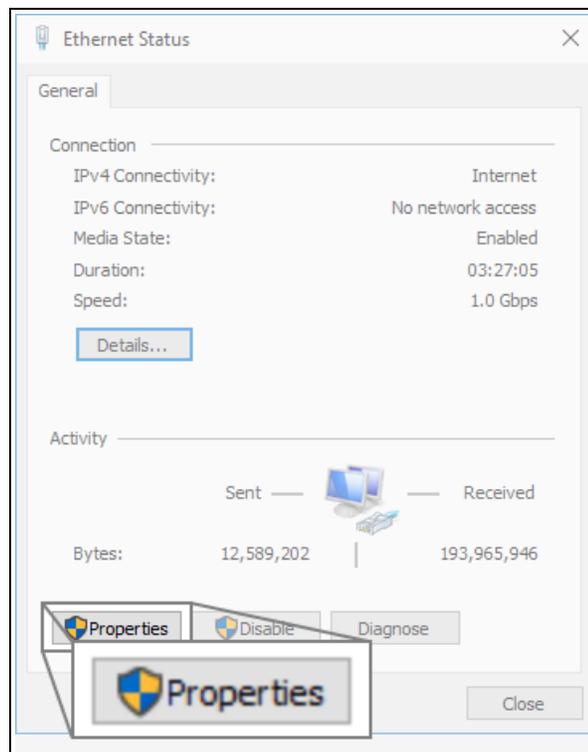


Figure 65: Ethernet Status dialog box

The **Ethernet Properties** dialog box opens.

7. Select the **Internet Protocol Version 4 (TCP/IPv4)** option. [Figure 66](#)
8. Click the **Properties** button.

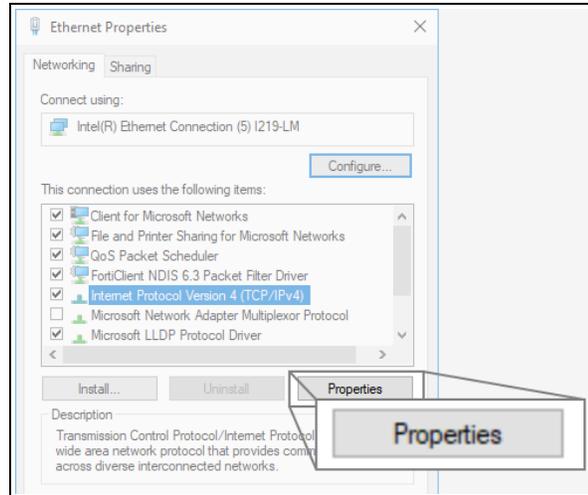


Figure 66: Ethernet Properties dialog box

The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens. [Figure 67](#)

9. **IMPORTANT:** Make a note of the current settings (to reverse this procedure later).

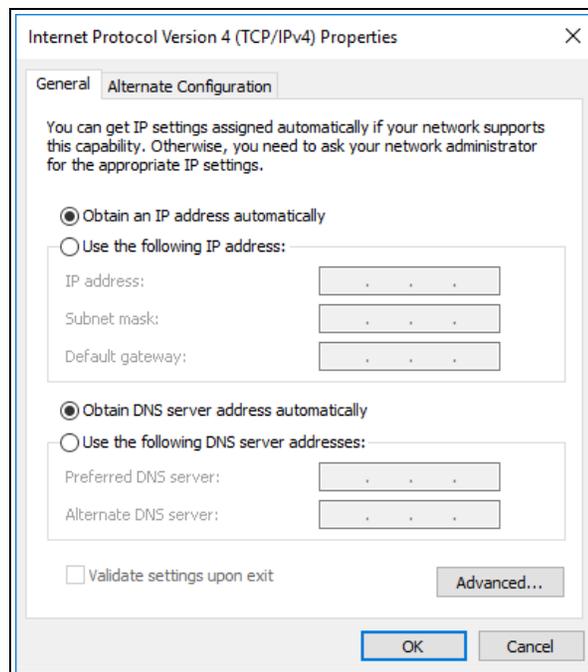


Figure 67: Default Example of Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

10. Select the **Use the following IP address** option button.
11. In the **IP Address** text box, enter an IP Address that is **in the same subnet range but a DIFFERENT IP Address** than the Z9-P or Z9-PE or all other units in the network. [Figure 68](#)

Example: Enter an **IP Address** from **192.168.111.1** to **192.168.111.254** (but NOT **192.168.111.100**) and the **Subnet Mask** to **255.255.255.0**.

Note: The default Z9-P or Z9-PE IP Address is **192.168.111.100**.
The default subnet mask is **255.255.255.0**.

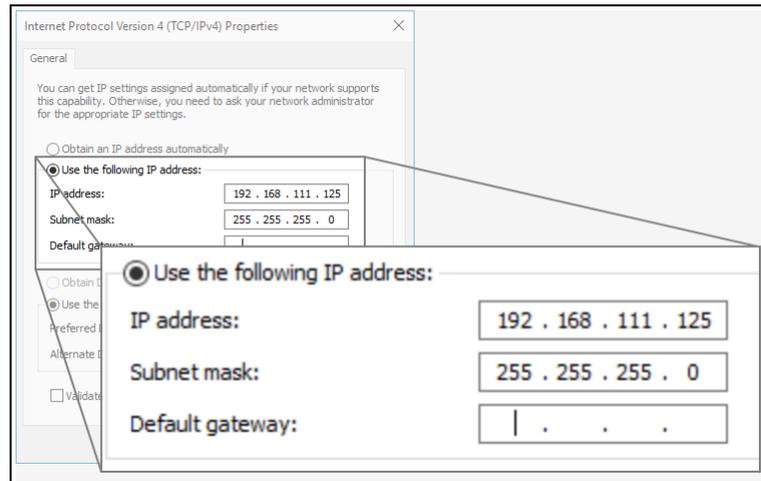


Figure 68: Changed Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

Note: An IP Address is NOT required in the **Default Gateway** text box.

12. Click **OK** to save the changes and close the dialog box.
13. Click **Close** twice to close the **Local Area Connection Properties** and **Local Area Connection Status** dialog boxes.
14. Continue with [Web Interface Configuration - Z9-P or Z9-PE](#) (on page 70).

6.3.2. Web Interface Configuration - Z9-P or Z9-PE

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Verify the [Setup the Computer IP Address Configuration \(on page 66\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 69](#)

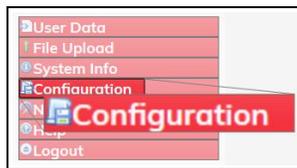


Figure 69: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. In the **Configuration** window, click the **Network** tab.
The **Network** parameters are shown in [Figure 70](#):

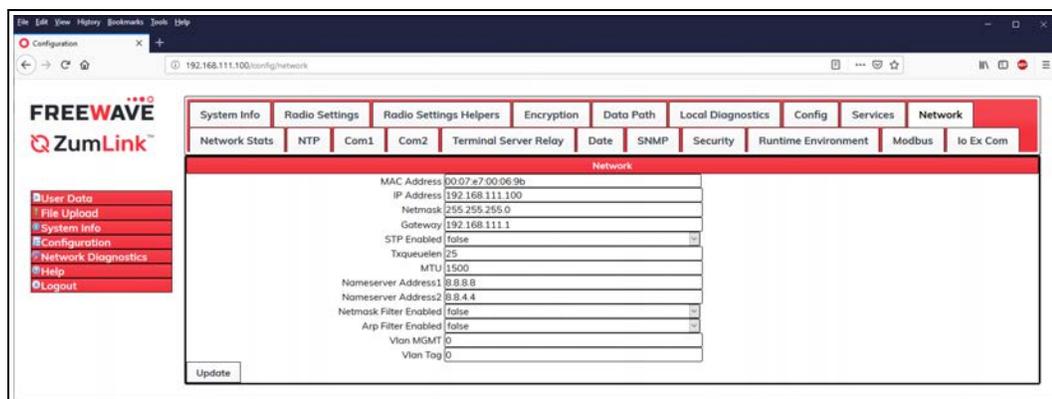


Figure 70: Network window

Note: Steps 7 to 9 make the **IP Address** and **nodeid** unique.
Other values may be defined as long as they are unique to each Z9-P or Z9-PE.

- In the **IP Address** text box, enter the new IP Address for the Z9-P or Z9-PE.

Note: Where `nnn.nnn.nnn.nnn` is the IP Address assigned to each Z9-P or Z9-PE.

- Optional: Change the [Gateway \(on page 289\)](#) and the [Netmask \(on page 293\)](#) addresses, if required.
- Click the **Update** button to save the changed information.



Warning! At this point, for Ethernet connections, the connection to the Z9-P or Z9-PE is disabled.

- Re-connect to the Z9-P or Z9-PE using the new IP Address entered in Step 7.
- In the **Configuration** window, click the **Radio Settings** tab.
The **Radio Settings** parameters are shown in [Figure 71](#):

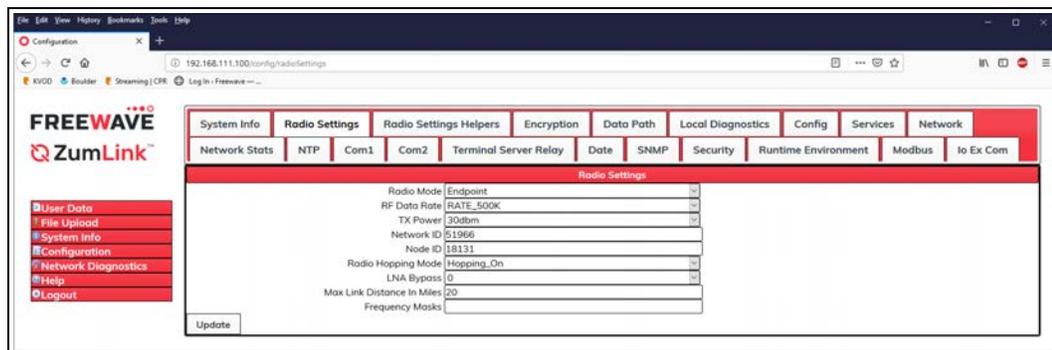


Figure 71: Radio Settings window

Important!: Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

- In the **Node ID** text box, enter the same unique 3-digit number **used in the last octet** of the IP Address entered in Step 7.
- Click the **Update** button to save the changed information.
- Continue with:
 - [Change the Passwords \(on page 189\)](#).
 - Upgrade to the latest firmware using the [Firmware Update \(on page 29\)](#) procedure.

7. Creating a Basic ZumLink Gateway and Endpoint Network

Note: The basic network described in this procedure is created by using either the [Drag and Drop Configuration \(on page 54\)](#), the [CLI Configuration \(on page 60\)](#), or the [Web Interface Configuration \(on page 65\)](#) procedure.

Figure 72 shows a basic network setup for the ZumLink device.

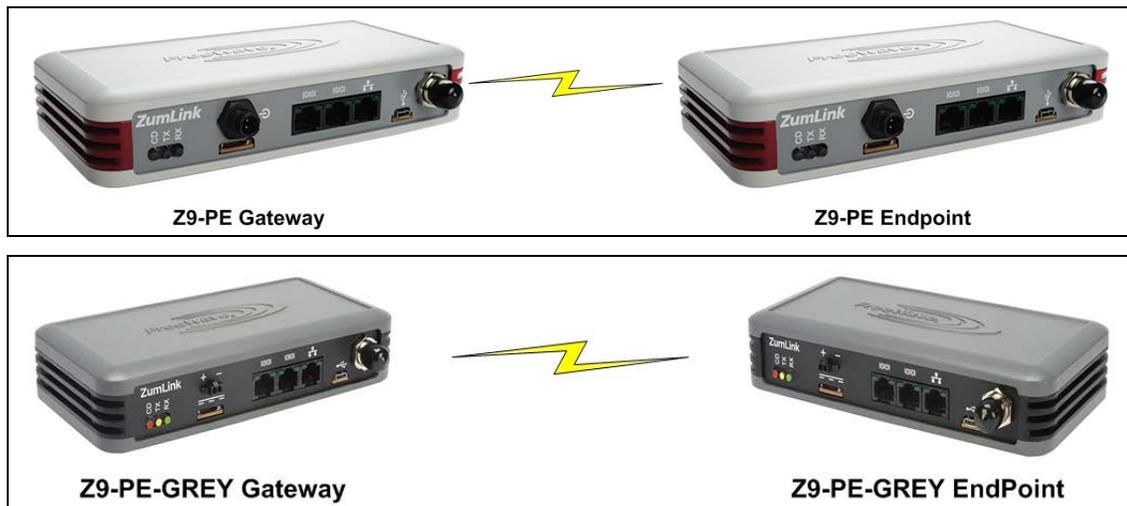


Figure 72: A Basic ZumLink Network

Procedure

Note: This example procedure is specific for CLI configuration.

1. Connect and apply power to the **ZumLink** devices in the network.
2. Optional: Upgrade the devices using one of these procedures:
 - [Firmware Update - Drag and Drop \(on page 35\)](#)
 - [Firmware Update - Web Interface \(on page 43\)](#)
3. Complete the [CLI Configuration \(on page 60\)](#) procedure.
4. Select one radio and, at the > prompt, type `radioSettings.radioMode=Gateway` and press <Enter>.
5. At the > prompt, type a setting between `10 and 30` for the `radioSettings.txPower` and press <Enter>.

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



Entering `txpower=0` or `radiosettings.txpower=0` changes the output power to the minimum or 10 dB.

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information.

6. For the other radio in the network, at the > prompt, type `radioSettings.radioMode=Endpoint` and press <Enter>.
7. Verify the `radioSettings.networkId=` setting is the same on ALL radios in the network.

Note: For Endpoints, the `radioSettings.nodeID` is set automatically.

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

8. At the > prompt, type `save` and press <Enter>.
A Solid Green ■ CD LED indicates that the radios are linked.

Note: See [LEDs \(on page 502\)](#) for additional information.

9. Type `logout` and press <Enter> to exit the FreeWave Shell.

8. IQ Application Environment

The Z9-P or Z9-PE employs the **IQ Application Environment** to provide application deployment.

Download and Install

- a. [Download the IQ Application Environment \(on page 75\)](#)
- b. [Drag and Drop Installation of the IQ Application Environment \(on page 78\)](#)
- c. [Web Interface - Installation of IQ Application Environment \(on page 82\)](#)

Activation and Usage

- a. [CLI Activation of the IQ Application Environment \(on page 86\)](#)
- b. [Web Interface Activation of the IQ Application Environment \(on page 95\)](#)
- c. [Access the IQ Linux Environment \(on page 109\)](#)

8.1. Download the IQ Application Environment

Complete this procedure if installing the **IQ Application Environment**.

Notes

- **Zum** products shipped from FreeWave with version v1.1.2.2 firmware have the **IQ Application Environment** pre-installed but it is not licensed or activated.
- If currently using an **IQ Application Environment**, an update to **3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg** is NOT required.
- The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

Procedure

1. On the support.freewave.com web page, open the **Firmware** window for the Z9-P or Z9-PE.

Important! If continuing from the [Download the Z9-P or Z9-PE Update Files \(on page 30\)](#) procedure for the **Firmware_v1_1_2_2.zip** file, return to the **Firmware** window. [Figure 73](#)

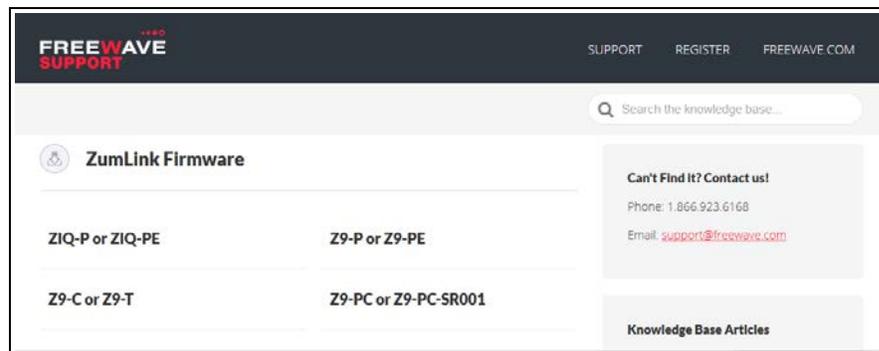


Figure 73: Firmware window

2. Click the **ZIQ-P** or **ZIQ-PE** link.
The released Firmware v1.1.2.2 files appear in the window. [Figure 74](#)

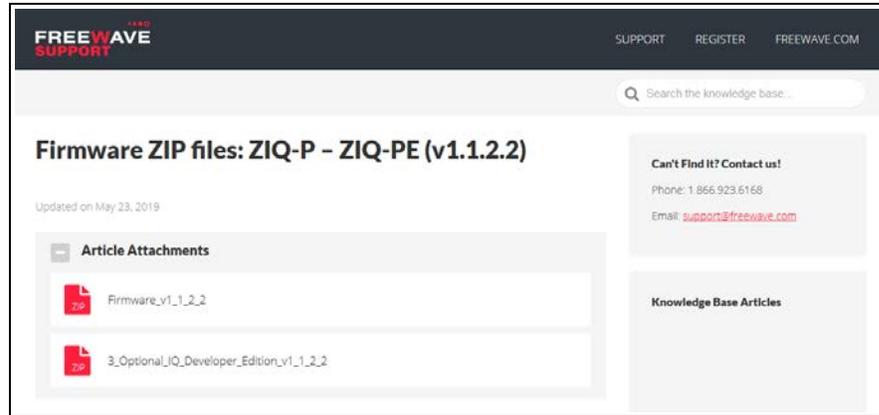


Figure 74: Z9-P or Z9-PE Firmware Upgrade window

3. Select and click the **3_Optional_IQ_Developer_Edition_v1_1_2_2.zip** attachment. The **Opening** dialog box opens. [Figure 75](#)

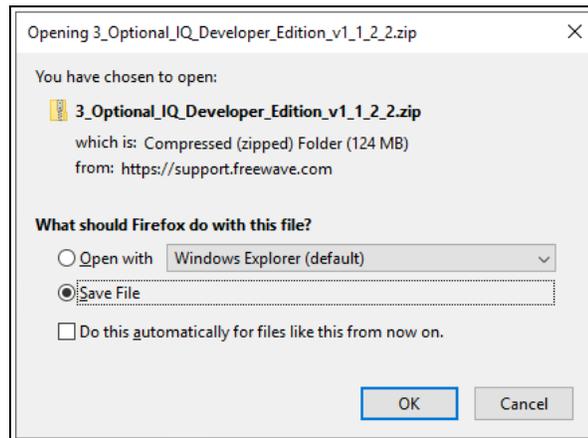


Figure 75: Opening 3_Optional_IQ_Developer_Edition_v1_1_2_2.zip dialog box

4. Click **OK**. The **Enter name of file to save to** dialog box opens. [Figure 76](#)

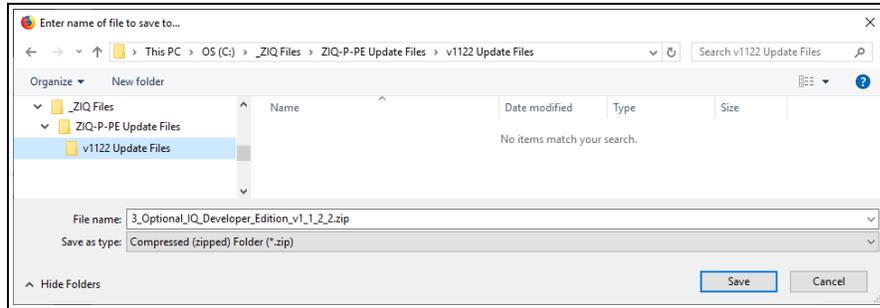


Figure 76: Enter name of file to save to dialog box

5. Search for and select a location to save the **.zip** file to and click **Save**.
The **Enter name of file to save to** dialog box closes.
6. Open a Windows® Explorer window and find the location where the **.zip** file was saved.
7. Double-click the **.zip** file.
8. Extract the files from the **.zip** file into the parent location.

Note: The file includes the **.pkg** file used for the **IQ Application Environment** installation.

9. Continue with:
 - [Drag and Drop Installation of the IQ Application Environment \(on page 78\)](#)
 - [Web Interface - Installation of IQ Application Environment \(on page 82\)](#)

8.2. Drag and Drop Installation of the IQ Application Environment

FREEWAVE Recommends: If currently using an **IQ Application Environment**, an update is not required. All existing IQ environments will work with v1.1.2.2 device firmware.

1. Verify the [Download the IQ Application Environment \(on page 75\)](#) procedure is completed.
2. **IMPORTANT:** Install the **1_Device_Firmware_v1_1_2_2.pkg** file first. See [Firmware Update - Drag and Drop \(on page 35\)](#).
3. Locate and select the downloaded **3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg** upgrade file. [Figure 77](#)

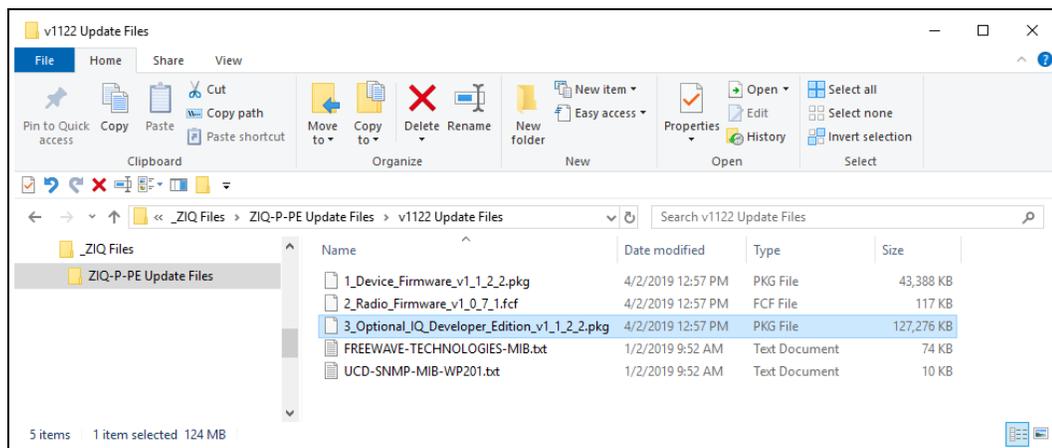


Figure 77: Selected 3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg File

4. Drag and drop the **.pkg** file on to the **ZumLink** window. [Figure 78](#)
The **.pkg** file will disappear after a few minutes.

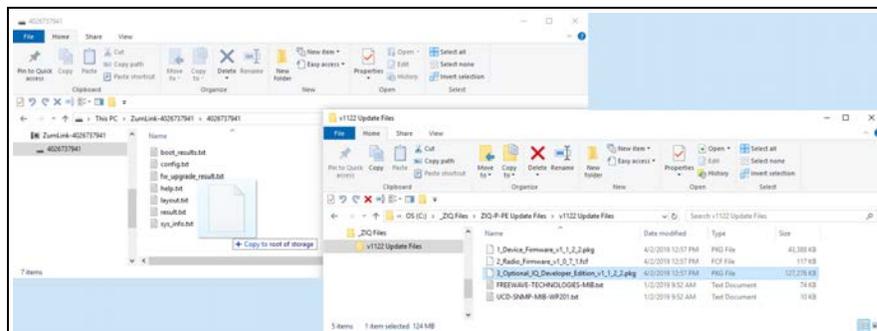


Figure 78: Drag and Drop the 3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg File to the ZumLink window

Important! If the **.pkg** file is NOT accepted, a **Windows®** error message appears immediately. [Figure 79](#)

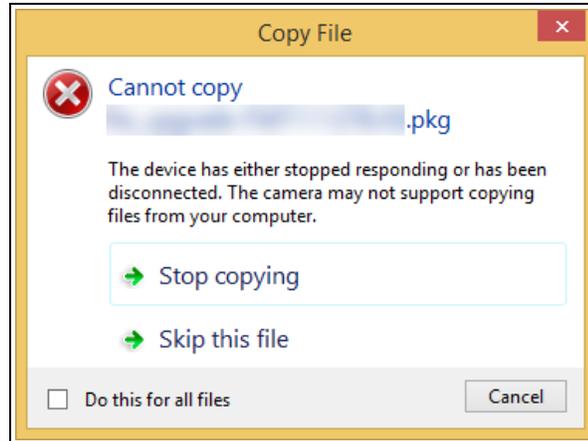


Figure 79: Failed PKG Message dialog box

Important! A **.pkg** or **.fcf** file extension is required for **Windows® 7**.
A **.pkg.txt** or **.fcf.txt** file extension **may be required** for some versions of **Windows® 8, 8.1,** and 10.

- If the **.pkg** file was rejected, change the extension of the **.pkg** file to **.pkg.txt** and select that file.
- Drag and drop the **.pkg.txt** file to the **ZumLink** window.
The **.pkg.txt** file will disappear after a few minutes.

The **Copying** message appears. [Figure 80](#)



Figure 80: Copying .pkg message

Caution: DO NOT click the **Cancel** button to stop the drag-n-drop process. If the drag-n-drop process is canceled during the file copy process, the Z9-P or Z9-PE cannot be accessed in **Windows® File Explorer**. If this happens, reboot the Z9-P or Z9-PE and re-start the drag-n-drop process.

When the file is copied, the Z9-P or Z9-PE window is similar to [Figure 81](#):

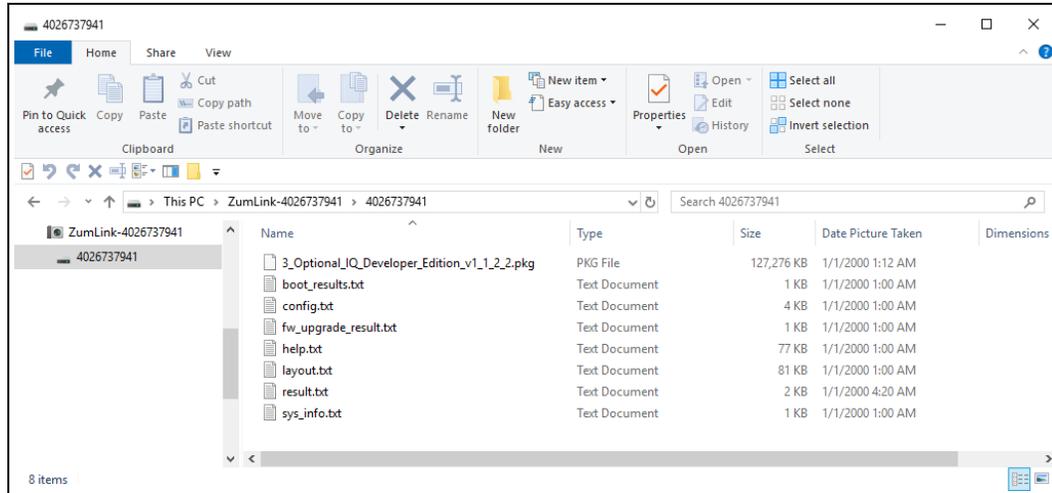


Figure 81: 3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg File Dropped in the ZumLink window

Note: If, after 6-10 minutes, the **.pkg** file has NOT disappeared, refresh the **ZumLink** window.

Warning! DO NOT remove power from the Z9-P or Z9-PE during or immediately after the firmware update process!
Wait until the [Home window \(on page 403\)](#) Web Interface is accessible before removing power from the Z9-P or Z9-PE device.

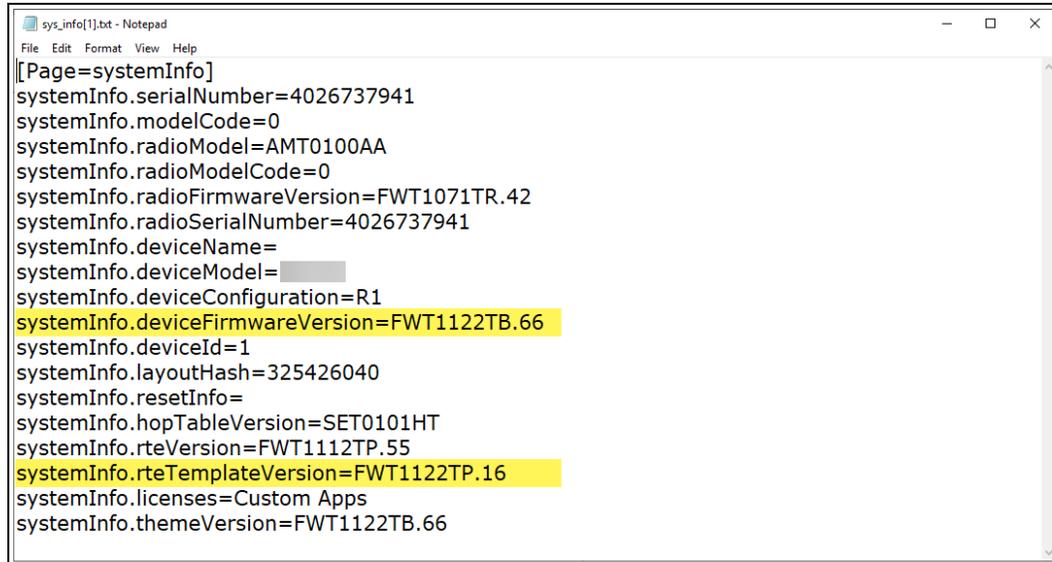


If power is removed prematurely during the update process, the Web Interface pages may not be accessible.
To recover from a failed Web Interface update, use the [Firmware Update - Drag and Drop \(on page 35\)](#) procedure to reinstall the **.pkg** file and **WAIT for the file update process to complete**.

DO NOT start another update or configuration change while an update is in progress.

- Optional: View the updated [Rte Template Version \(on page 340\)](#) in the **sys.info.txt** file to verify the update information. [Figure 82](#)

Important! The image provides example information only.
Each Z9-P or Z9-PE provides its own unique information.



```
sys_info[1].txt - Notepad
File Edit Format View Help
[[Page=systemInfo]
systemInfo.serialNumber=4026737941
systemInfo.modelCode=0
systemInfo.radioModel=AMT0100AA
systemInfo.radioModelCode=0
systemInfo.radioFirmwareVersion=FWT1071TR.42
systemInfo.radioSerialNumber=4026737941
systemInfo.deviceName=
systemInfo.deviceModel=
systemInfo.deviceConfiguration=R1
systemInfo.deviceFirmwareVersion=FWT1122TB.66
systemInfo.deviceId=1
systemInfo.layoutHash=325426040
systemInfo.resetInfo=
systemInfo.hopTableVersion=SET0101HT
systemInfo.rteVersion=FWT112TP.55
systemInfo.rteTemplateVersion=FWT1122TP.16
systemInfo.licenses=Custom Apps
systemInfo.themeVersion=FWT1122TB.66
```

Figure 82: sys.info.txt file with Updated Firmware

Important! For the v1.1.2.2 update, these settings should have this information:
systemInfo.deviceFirmwareVersion=FWT1122TB.66
Web Interface - Device Firmware Version is FWT1122TB.66
systemInfo.rteTemplateVersion=FWT1122TP.16
Web Interface - Rte Template Version is FWT1122TP.16
If neither of these are listed in their respective settings, repeat the upgrade procedure.

6. [Contact FreeWave Technical Support \(on page 14\)](#) for the license key file.
7. Continue with:
 - [CLI Activation of the IQ Application Environment \(on page 86\)](#)
 - [Web Interface Activation of the IQ Application Environment \(on page 95\)](#)

8.3. Web Interface - Installation of IQ Application Environment

FREEWAVE Recommends: If currently using an **IQ Application Environment**, an update is not required. All existing IQ environments will work with v1.1.2.2 device firmware.

1. Verify the [Download the IQ Application Environment \(on page 75\)](#) procedure is completed.
2. **IMPORTANT:** Install the **1_Device_Firmware_v1_1_2_2.pkg** file first. See [Firmware Update - Drag and Drop \(on page 35\)](#).

Important! If continuing from the [Firmware Update - Web Interface \(on page 43\)](#) procedure for the **Firmware_v1_1_1_2.zip** file, go to Step 6.

3. Using a CAT5e / CAT6 Ethernet cable, connect the Z9-P or Z9-PE Ethernet port to the computer's Ethernet port.
4. Open a web browser.
5. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.

The [Home window \(on page 403\)](#) opens.

6. On the **Menu** list, click the **File Upload** link. [Figure 83](#)

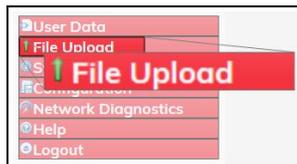


Figure 83: File Upload link

The **Authentication Required (Login)** dialog box opens.

7. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the [File Upload window](#) opens. [Figure 84](#)

Note: If the **User Name** or **Password** were changed, enter the applicable information.

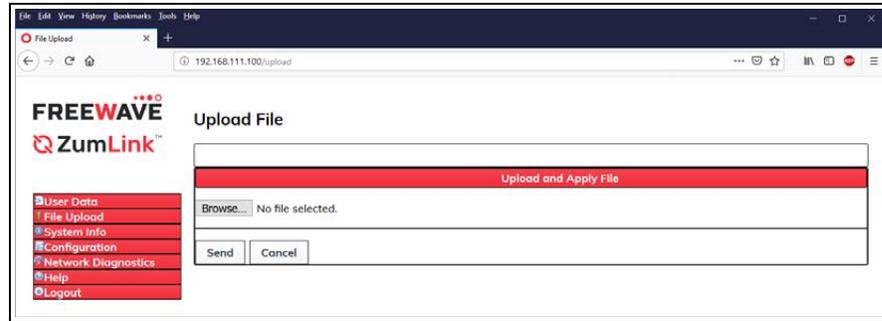
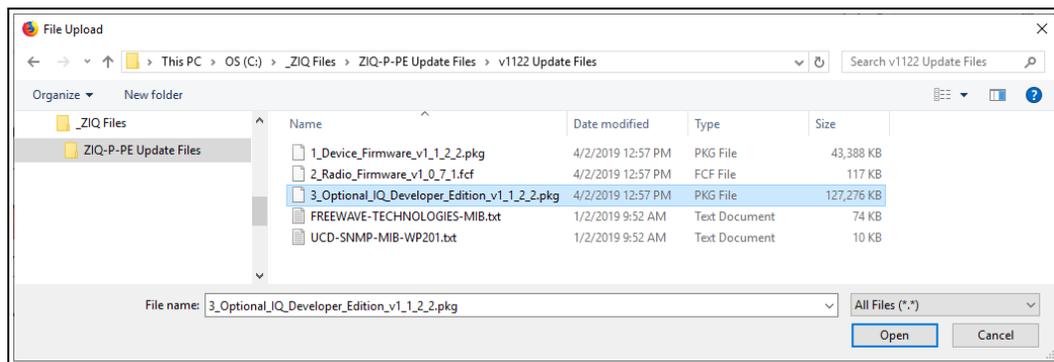


Figure 84: File Upload window

8. Click the **Browse** button.
The **File Upload** dialog box opens.
9. Locate and select the downloaded **3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg** upgrade file. [Figure 85](#)



**Figure 85: File Upload dialog box with Selected
3_Optional_IQ_Developer_Edition_v1_1_2_2.pkg File**

10. Click **Open**.
The dialog box closes and the **File Upload** window returns showing the selected file. [Figure 86](#)



Figure 86: File Upload window with Selected .pkg File

11. Click **Send**.

The **File Upload** window changes to show the upload percentage to the Z9-P or Z9-PE.

Note: When using the Web Interface on a computer with **Windows® 8** or **Windows® 10**, clicking **Cancel** does **not** halt the upload process.

The **File Upload** window refreshes and shows the uploaded file.

Warning! DO NOT remove power from the Z9-P or Z9-PE during or immediately after the firmware update process!

Wait until the [Home window \(on page 403\)](#) Web Interface is accessible before removing power from the Z9-P or Z9-PE device.



If power is removed prematurely during the update process, the Web Interface pages may not be accessible.

To recover from a failed Web Interface update, use the [Firmware Update - Drag and Drop \(on page 35\)](#) procedure to reinstall the **.pkg** file and **WAIT for the file update process to complete**.

DO NOT start another update or configuration change while an update is in progress.

12. Refresh the browser window (press <F5>).

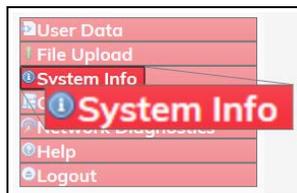
13. On the **Menu** list, click the **System Info** link. [Figure 87](#)

Figure 87: System Info link

The [System Info window](#) opens showing the updated firmware on the Z9-P or Z9-PE. [Figure 88](#)

Important! The image provides example information only. Each Z9-P or Z9-PE provides its own unique information.

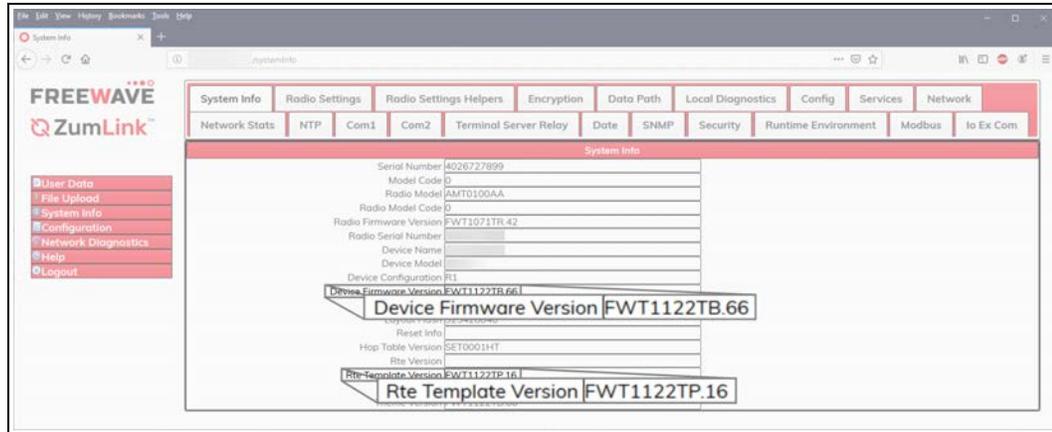


Figure 88: System Info window

Important! For the v1.1.2.2 update, these settings should have this information:
 systemInfo.deviceFirmwareVersion=FWT1122TB.66
 Web Interface - Device Firmware Version is FWT1122TB.66
 systemInfo.rteTemplateVersion=FWT1122TP.16
 Web Interface - Rte Template Version is FWT1122TP.16
 If neither of these are listed in their respective settings, repeat the upgrade procedure.

14. [Contact FreeWave Technical Support \(on page 14\)](#) for the license key file.
15. Continue with:
 - [CLI Activation of the IQ Application Environment \(on page 86\)](#)
 - [Web Interface Activation of the IQ Application Environment \(on page 95\)](#)

8.4. CLI Activation of the IQ Application Environment

This procedure uses the CLI to activate the **IQ Application Environment** for all **ZumLink** and **ZIQ** products.

Note: See the [Web Interface Activation of the IQ Application Environment \(on page 95\)](#) to use the Web Interface to activate the **IQ Application Environment**

Warning! The process of activating IQ Application Environment activates a fresh copy of the IQ environment.



If IQ has already been activated, this procedure will erase any user-generated content and settings in the existing Linux development environment.

These are the basic steps to license and activate the **IQ Application Environment**:

- A. [Get the License File from FreeWave \(on page 86\)](#)
- B. [Drag and Drop the License File onto the Z9-P or Z9-PE \(on page 87\)](#)
- C. [Activate the IQ Application Environment \(on page 90\)](#)
- D. [Verify Successful Licensing and Activation \(on page 93\)](#)

8.4.1. Get the License File from FreeWave

The Z9-P or Z9-PE must be licensed to activate the **IQ Application Environment**. Licensing can be added in the factory or after purchase.

1. Locate the Serial number on the Z9-P or Z9-PE product label.
2. [Contact FreeWave Technical Support \(on page 14\)](#) for the license key file.
3. Tech Support will ask for the Serial number and an email address to send the license information to.
4. An email is sent to the provided address with a **License_nnnnnnnnnn.LIC** file attached.

Note: Where **nnnnnnnnnn** is the 10-digit Serial number of the Z9-P or Z9-PE.

5. Search for and select a location to save the **.LIC** file to.
6. Continue with [Drag and Drop the License File onto the Z9-P or Z9-PE \(on page 87\)](#).

8.4.2. Drag and Drop the License File onto the Z9-P or Z9-PE

Note: The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

1. Connect the USB cable to the computer and the Micro USB end to the Z9-P or Z9-PE. The **FreeWave Drivers** and Z9-P or Z9-PE windows open. [Figure 89](#) and [Figure 90](#)

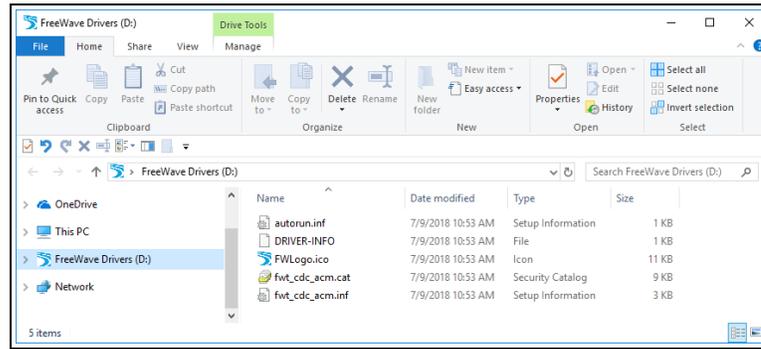


Figure 89: FreeWave Drivers window

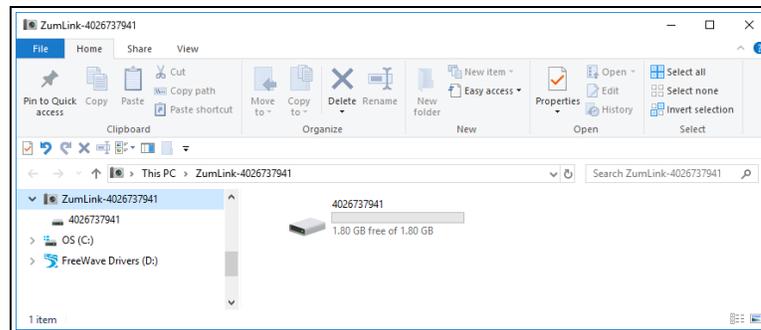


Figure 90: ZumLink window

2. In the Z9-P or Z9-PE window, double-click the connected device. The files of the Z9-P or Z9-PE appear in the window. [Figure 91](#)

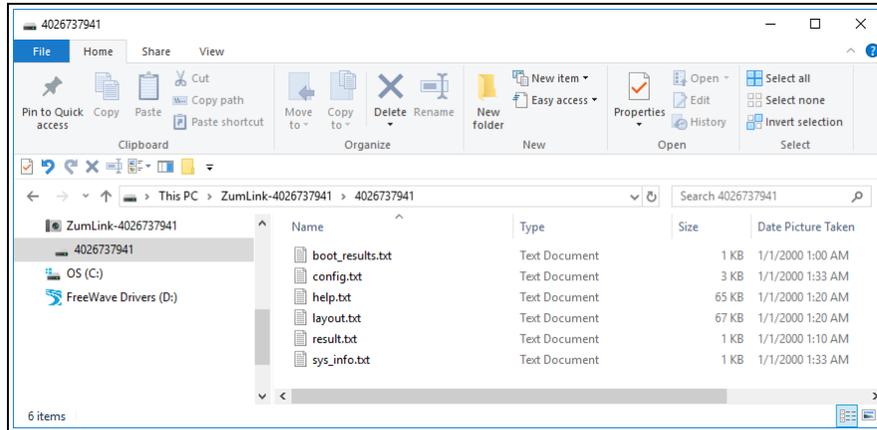


Figure 91: Opened ZumLink window showing the Default Files

3. Locate and select the saved **License_nnnnnnnnnn.LIC** file. Figure 92

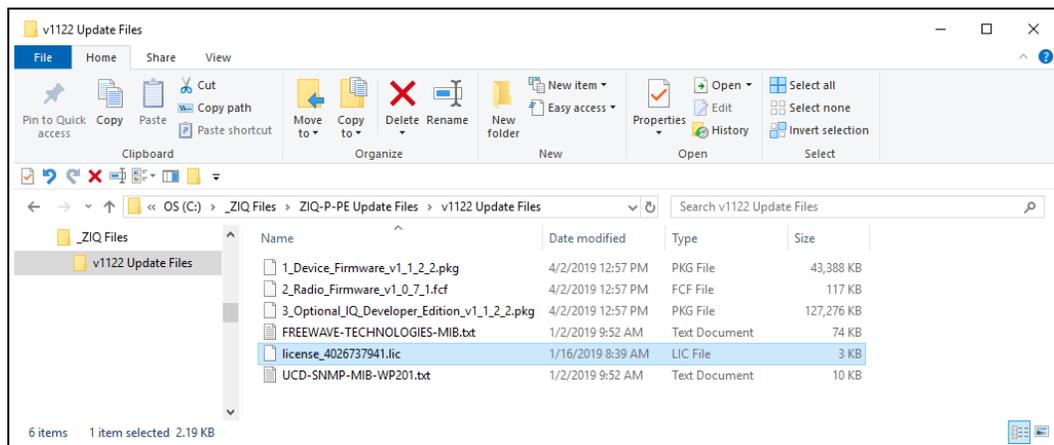


Figure 92: Selected **License_nnnnnnnnnn.LIC** File

4. Drag and drop the **License_nnnnnnnnnn.LIC** file on to the **ZumLink** window. Figure 93

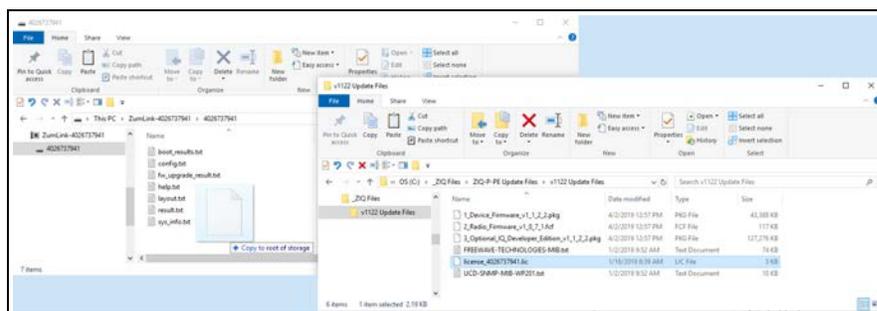
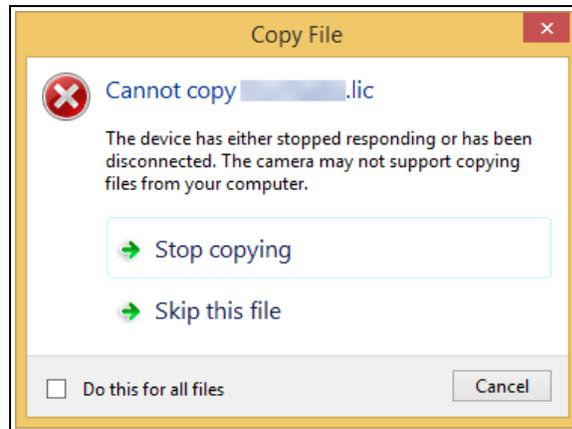


Figure 93: Drag and Drop the **License_nnnnnnnnnn.LIC** file on to the **ZumLink** window

Important! If the `License_nnnnnnnnnn.LIC` file is NOT accepted, a Windows® error message appears immediately. [Figure 94](#)



5.

Figure 94: Failed .LIC Message dialog box

Important! A `.LIC` file extension is required for Windows® 7. A `.LIC.txt` file extension **may be required** for some versions of Windows® 8, 8.1, and 10.

- a. If the `.LIC` file was rejected, change the extension of the `.LIC` file to `.LIC.txt` and select that file.
- b. Drag and drop the `.LIC.txt` file to the `ZumLink` window.

Note: The Z9-P or Z9-PE loads the `License_nnnnnnnnnn.LIC` file immediately.



Caution: Do NOT unplug the Z9-P or Z9-PE to reboot.

The `rteReset=Hard` and `reset=now` commands are **required** to reboot of the Z9-P or Z9-PE.

6. Continue with [Activate the IQ Application Environment \(on page 90\)](#).

8.4.3. Activate the IQ Application Environment

Note: This procedure provides a **Tera Term** terminal connection to the FreeWave CLI. Other terminal emulators (e.g., **HyperTerminal**, **PuTTY**) may be used.

1. Open a terminal emulator application (e.g., **Tera Term** <http://tssh2.osdn.jp/>).
2. Select the **Serial** option button.
3. Click the **Port** list box arrow and select the COM port the Z9-P or Z9-PE is connected to. [Figure 95](#)

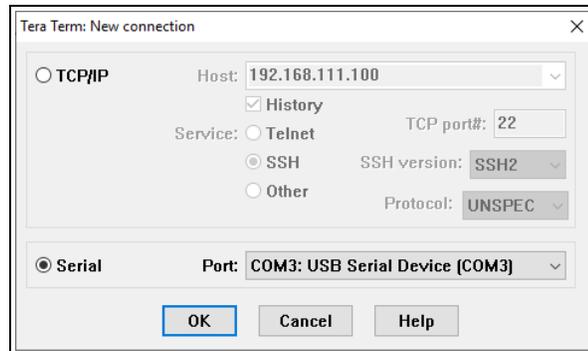
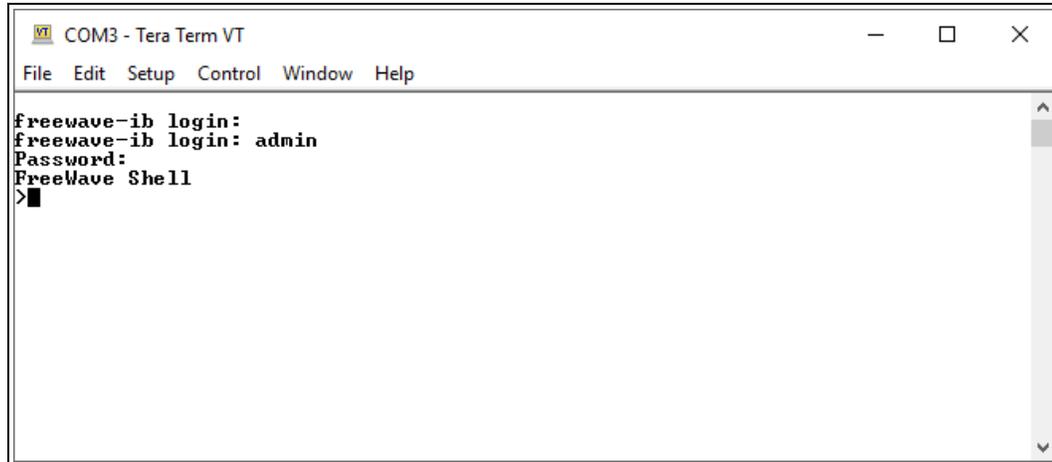


Figure 95: Tera Term: New Connection window

4. Click **OK**.
The **Tera Term New Connection** dialog box closes.
The **Tera Term** window opens.
5. In the **Tera Term** window, press <Enter>.
The FreeWave CLI Login returns.
6. Enter **admin** for the **Username** and press <Enter>.
7. Enter **admin** for the **Password** and press <Enter>.

Note: If the **User Name** or **Password** were changed, enter the applicable information.
The password does not appear when typing - it looks blank.

The **FreeWave Shell** returns. [Figure 96](#)



```
COM3 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login:
freewave-ib login: admin
Password:
FreeWave Shell
>
```

Figure 96: FreeWave Shell window

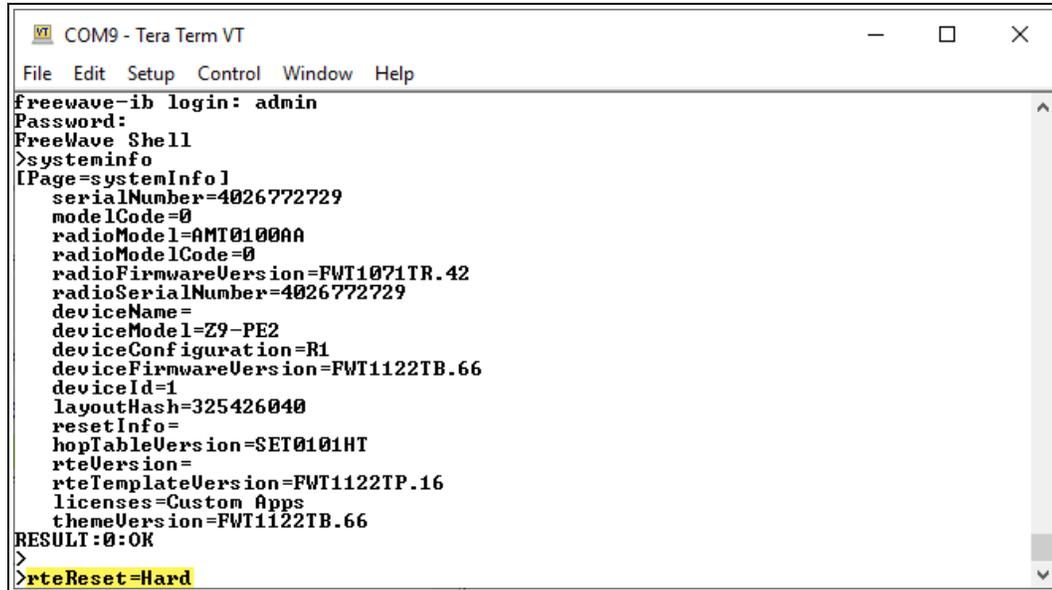
- At the > prompt, type, **systemInfo** and press <Enter>.
- Verify the [Licenses \(on page 365\)](#) parameter is **licenses=Custom Apps**. [Figure 97](#)



```
COM9 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login: admin
Password:
FreeWave Shell
>systeminfo
[Page=systemInfo]
serialNumber=4026772729
modelCode=0
radioModel=AMT0100AA
radioModelCode=0
radioFirmwareVersion=FWT1071TR.42
radioSerialNumber=4026772729
deviceName=
deviceModel=Z9-PE2
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>
```

Figure 97: licenses=Custom Apps

- Type **rteReset=Hard** and press <Enter>. [Figure 98](#)



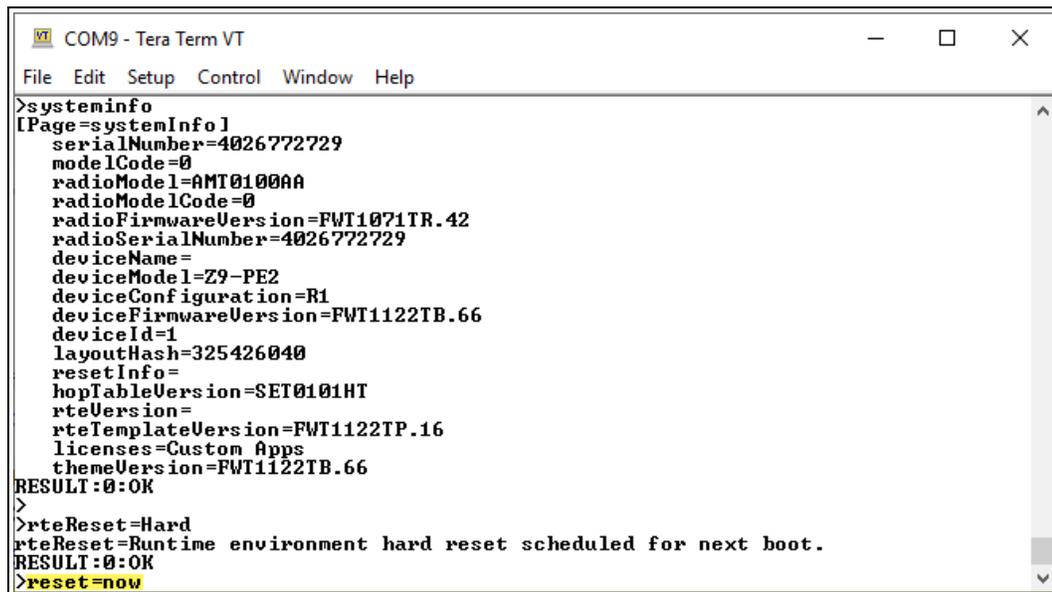
```

COM9 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login: admin
Password:
FreeWave Shell
>systeminfo
[Page=systemInfo]
serialNumber=4026772729
modelCode=0
radioModel=AMT0100AA
radioModelCode=0
radioFirmwareVersion=FWT1071TR.42
radioSerialNumber=4026772729
deviceName=
deviceModel=Z9-PE2
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>
>rteReset=Hard

```

Figure 98: rteReset=Hard window

11. Type `reset=now` and press <Enter>. [Figure 99](#)
The Z9-P or Z9-PE reboots.



```

COM9 - Tera Term VT
File Edit Setup Control Window Help
>systeminfo
[Page=systemInfo]
serialNumber=4026772729
modelCode=0
radioModel=AMT0100AA
radioModelCode=0
radioFirmwareVersion=FWT1071TR.42
radioSerialNumber=4026772729
deviceName=
deviceModel=Z9-PE2
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>
>rteReset=Hard
rteReset=Runtime environment hard reset scheduled for next boot.
RESULT:0:OK
>reset=now

```

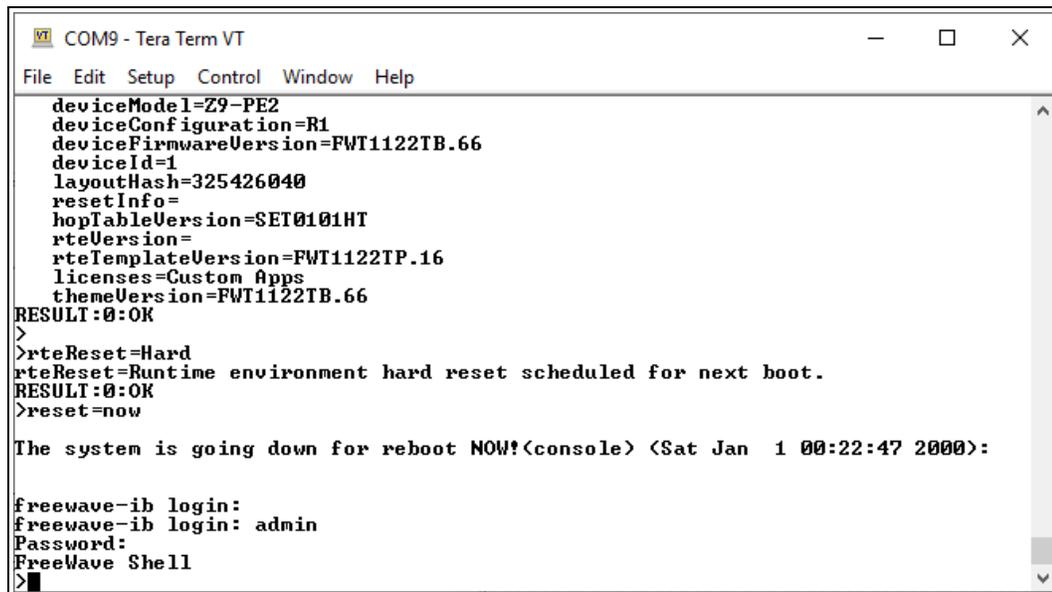
Figure 99: reset=Now window

The **FreeWave Drivers** and Z9-P or Z9-PE windows open.

12. Continue with [Verify Successful Licensing and Activation \(on page 93\)](#).

8.4.4. Verify Successful Licensing and Activation

1. Re-open the terminal emulator application.



```

COM9 - Tera Term VT
File Edit Setup Control Window Help
deviceModel=Z9-PE2
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>
>rteReset=Hard
rteReset=Runtime environment hard reset scheduled for next boot.
RESULT:0:OK
>reset=now

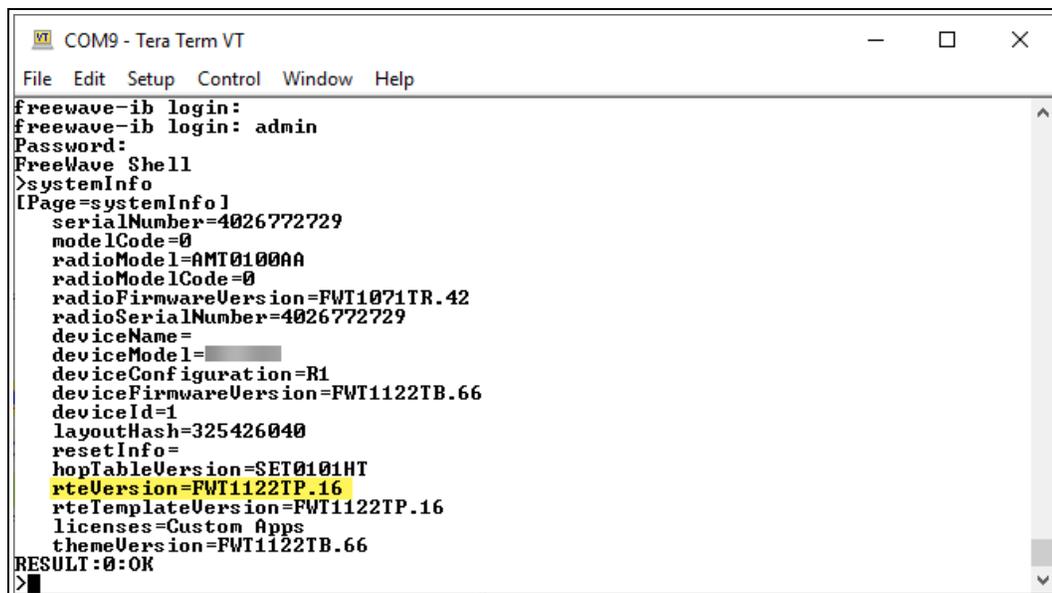
The system is going down for reboot NOW!(console) (Sat Jan 1 00:22:47 2000):

freewave-ib login:
freewave-ib login: admin
Password:
FreeWave Shell
>

```

Figure 100: FreeWave Shell window

2. At the > prompt, type `systeminfo` and press <Enter>. Figure 101



```

COM9 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login:
freewave-ib login: admin
Password:
FreeWave Shell
>systemInfo
[Page=systemInfo]
serialNumber=4026772729
modelCode=0
radioModel=AMT0100AA
radioModelCode=0
radioFirmwareVersion=FWT1071TR.42
radioSerialNumber=4026772729
deviceName=
deviceModel=
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=FWT1122TP.16
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>

```

Figure 101: The rteVersion is FWT1122TP.16

Important! The image provides example information only.
Each Z9-P or Z9-PE provides its own unique information.

3. Verify these parameters have these values:

Verification Settings	
Parameter	Value
Radio Firmware Version (on page 366)	FWT1071TR.42
Device Firmware Version (on page 362)	FWT1122TB.66
Rte Version (on page 369)	FWT1122TP.16
Rte Template Version (on page 369)	FWT1122TP.16
Licenses (on page 365)	Custom Apps

4. Continue with [Access the IQ Linux Environment \(on page 109\)](#).

8.5. Web Interface Activation of the IQ Application Environment

This procedure uses the Web Interface and the CLI to activate the **IQ Application Environment**.

Note: See the [CLI Activation of the IQ Application Environment \(on page 86\)](#) to use the CLI to activate the **IQ Application Environment**.

Warning! The process of activating IQ Application Environment activates a fresh copy of the IQ environment.



If IQ has already been activated, this procedure will erase any user-generated content and settings in the existing Linux development environment.

These are the basic steps to license and activate the **IQ Application Environment**:

- A. [Get the License File from FreeWave \(on page 95\)](#)
- B. [Setup the Computer IP Address Configuration \(on page 96\)](#)
- C. [Download the License File \(on page 100\)](#)
- D. [Activate the IQ Application Environment \(on page 103\)](#)
- E. [Verify Successful Licensing and Activation \(on page 107\)](#)

8.5.1. Get the License File from FreeWave

The Z9-P or Z9-PE must be licensed to activate the **IQ Application Environment**. Licensing can be added in the factory or after purchase.

1. Locate the Serial number on the Z9-P or Z9-PE product label.
2. [Contact FreeWave Technical Support \(on page 14\)](#) for the license key file.
3. Tech Support will ask for the Serial number and an email address to send the license information to.
4. An email is sent to the provided address with a **License_nnnnnnnnnn.LIC** file attached.

Note: Where **nnnnnnnnnn** is the 10-digit Serial number of the Z9-P or Z9-PE.

5. Search for and select a location to save the **.LIC** file to.
6. Continue with [Setup the Computer IP Address Configuration \(on page 96\)](#).

8.5.2. Setup the Computer IP Address Configuration

Note: This procedure is required to access the Web Interface of the Z9-P or Z9-PE.
The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Connect the CAT5e / CAT6 Ethernet cable to the Z9-P or Z9-PE Ethernet port and the Ethernet port on the computer.
2. On the computer, open the **Windows® Control Panel**.
3. View the **Control Panel** window by **Category** and click **Network and Sharing Center**.
[Figure 102](#)

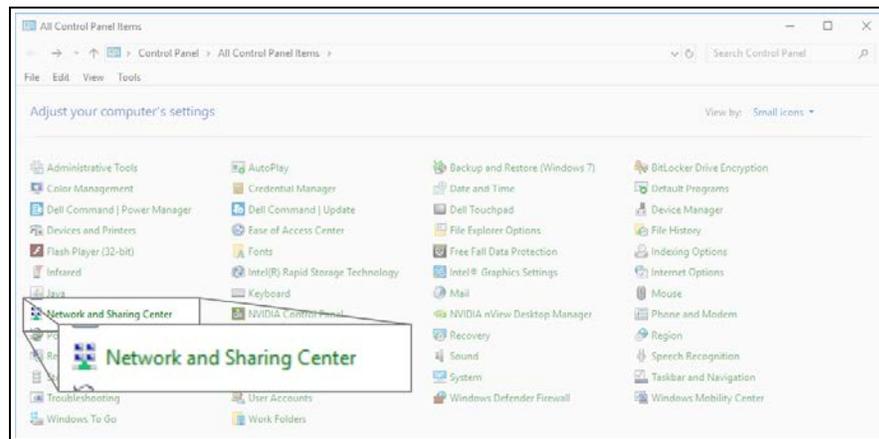


Figure 102: Control Panel > Network and Sharing Center

The **Network and Sharing Center** window opens.

4. Click the **Change Adapter Settings** link. [Figure 103](#)

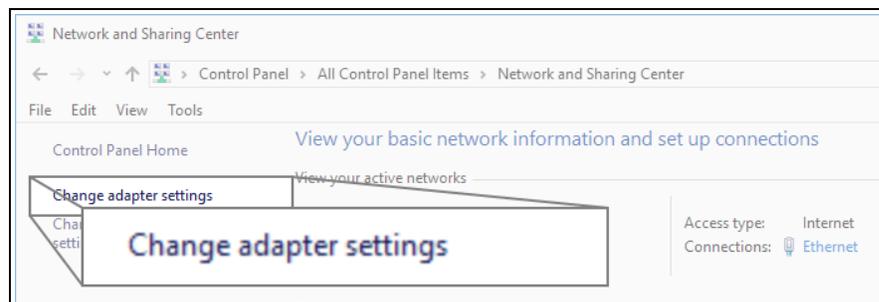


Figure 103: Change Adapter Settings Link

The **Network Connections** window opens. [Figure 104](#)

5. Double-click the **Local Area Connection** link or the connected **Network Connection**.

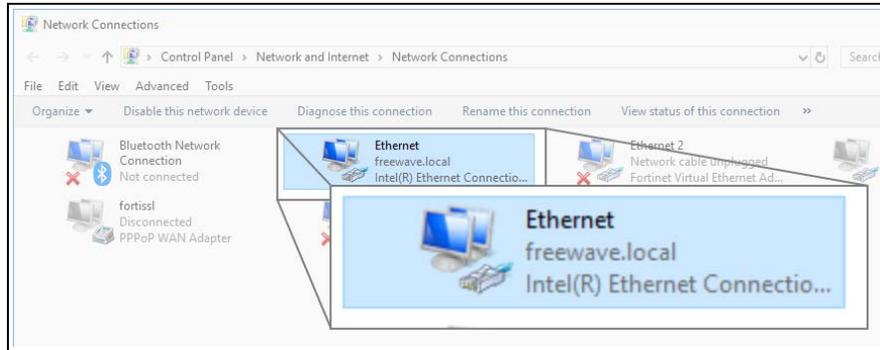


Figure 104: Network Connections window

The **Ethernet Status** dialog box opens. [Figure 105](#)

6. Click the **Properties** button.

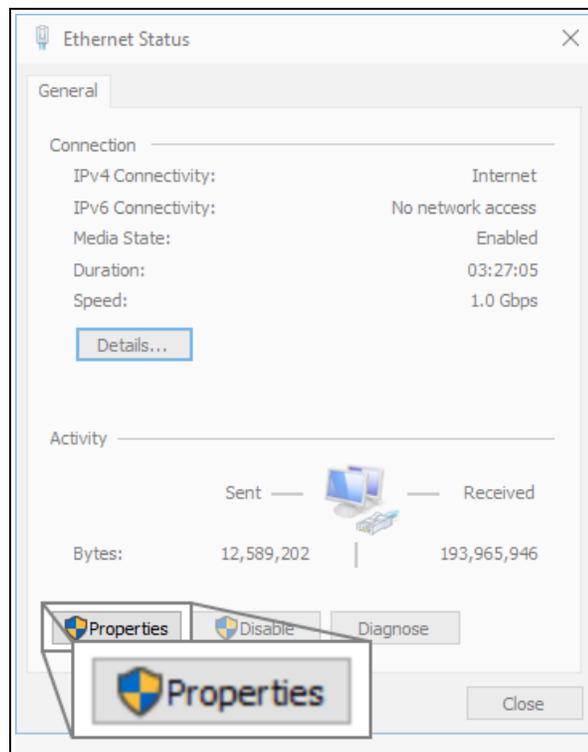


Figure 105: Ethernet Status dialog box

The **Ethernet Properties** dialog box opens.

7. Select the **Internet Protocol Version 4 (TCP/IPv4)** option. [Figure 106](#)
8. Click the **Properties** button.

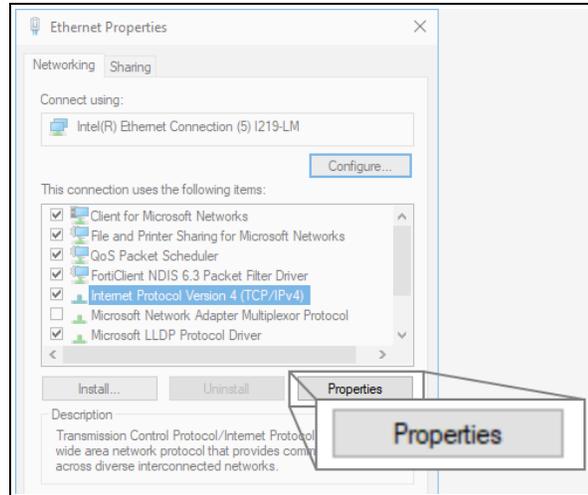


Figure 106: Ethernet Properties dialog box

The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens. [Figure 107](#)

9. **IMPORTANT:** Make a note of the current settings (to reverse this procedure later).

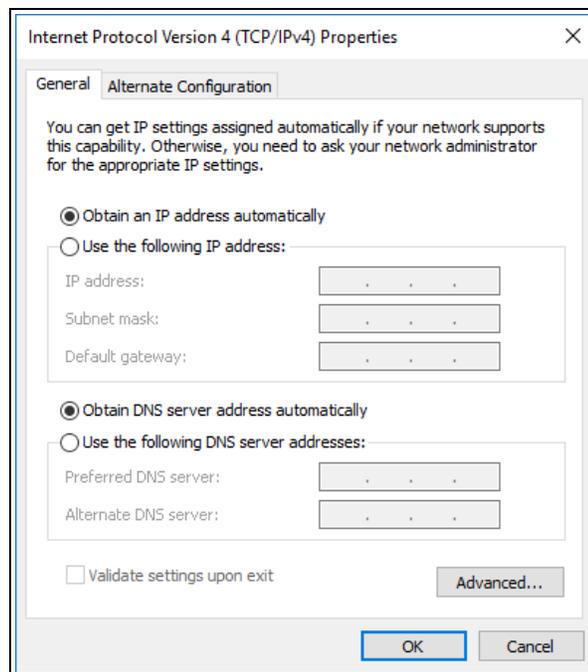


Figure 107: Default Example of Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

10. Select the **Use the following IP address** option button.
11. In the **IP Address** text box, enter an IP Address that is **in the same subnet range but a DIFFERENT IP Address** than the Z9-P or Z9-PE or all other units in the network. [Figure 108](#)

Example: Enter an **IP Address** from **192.168.111.1** to **192.168.111.254** (but NOT **192.168.111.100**) and the **Subnet Mask** to **255.255.255.0**.

Note: The default Z9-P or Z9-PE IP Address is **192.168.111.100**.
The default subnet mask is **255.255.255.0**.

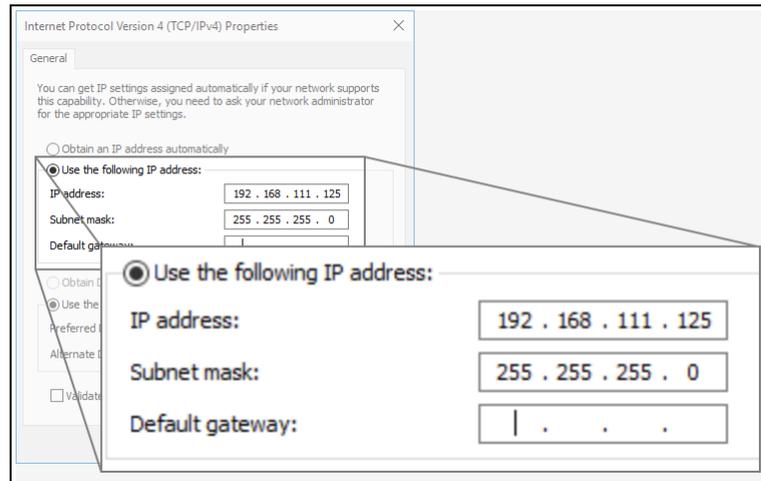


Figure 108: Changed Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

Note: An IP Address is NOT required in the **Default Gateway** text box.

12. Click **OK** to save the changes and close the dialog box.
13. Click **Close** twice to close the **Local Area Connection Properties** and **Local Area Connection Status** dialog boxes.
14. Continue with [Download the License File \(on page 100\)](#).

8.5.3. Download the License File

Note: The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

1. Verify these procedures are completed:
 - a. [Get the License File from FreeWave \(on page 95\)](#)
 - b. [Setup the Computer IP Address Configuration \(on page 96\)](#)
2. Using a CAT5e / CAT6 Ethernet cable, connect the Z9-P or Z9-PE Ethernet port to the computer's Ethernet port.
3. Open a web browser.
4. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of

192.168.111.100.

If the IP address was changed, enter that IP Address.

4. On the **Menu** list, click the **File Upload** link. [Figure 109](#)

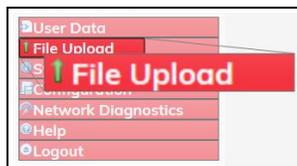


Figure 109: File Upload link

The **Authentication Required (Login)** dialog box opens.

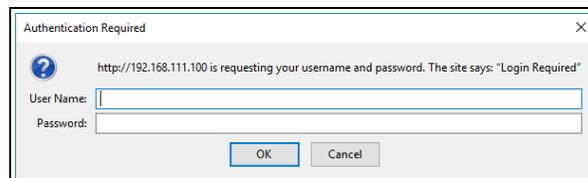


Figure 110: Authentication Required (Login) dialog box

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The [File Upload window](#) opens. [Figure 111](#)

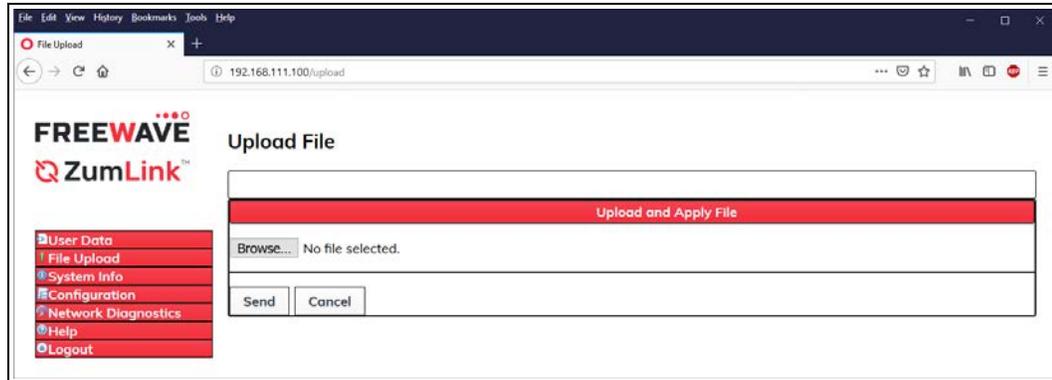


Figure 111: File Upload window

6. Click the **Browse** button.
The **File Upload** dialog box opens.
7. Locate and select the saved **License_nnnnnnnnnn.LIC** file. [Figure 112](#)

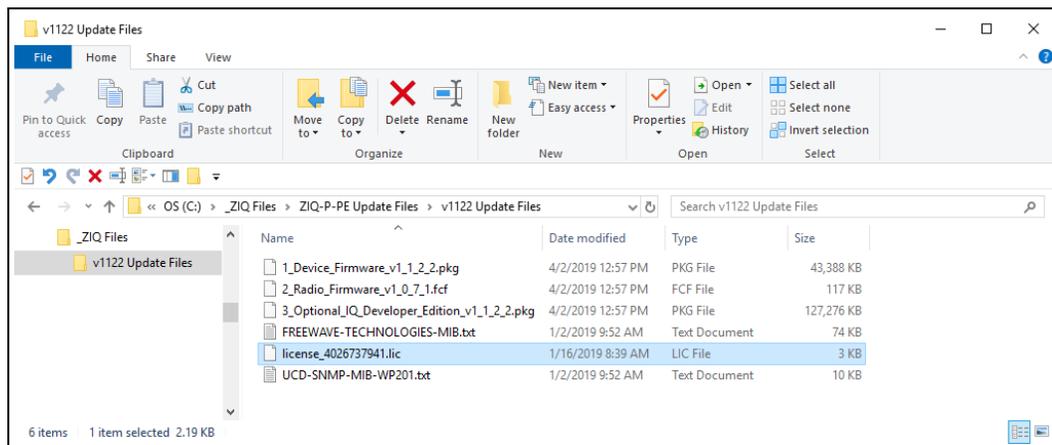
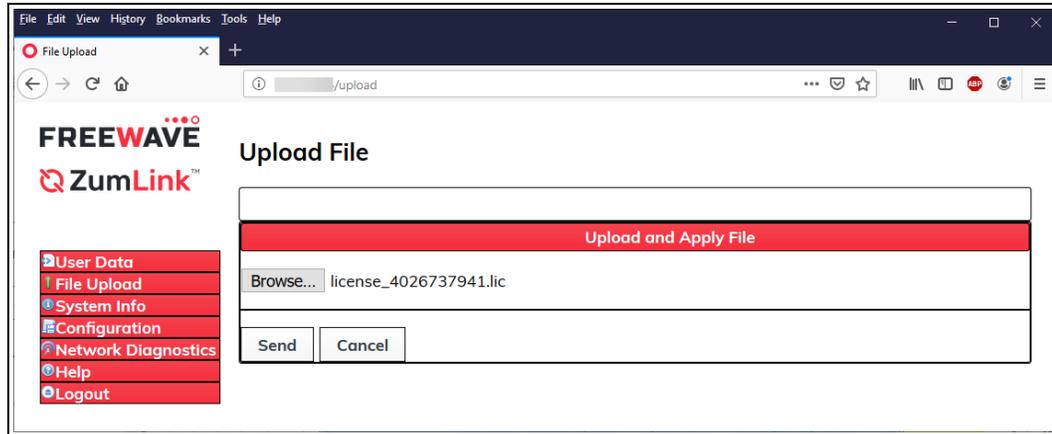


Figure 112: Selected License_nnnnnnnnnn.LIC File

8. Click **Open**.
The dialog box closes and the **File Upload** window returns showing the selected file. [Figure 113](#)



**Figure 113: File Upload window with Selected
License_nnnnnnnnnn.LIC File**

9. Click **Send**.
The **File Upload** window refreshes and shows the uploaded file.
10. Continue with [Activate the IQ Application Environment \(on page 103\)](#).

8.5.4. Activate the IQ Application Environment

Note: This procedure provides a **Tera Term** terminal connection to the FreeWave CLI. Other terminal emulators (e.g., **HyperTerminal**, **PuTTY**) may be used.

1. Open a terminal emulator application (e.g., **Tera Term** <http://tssh2.osdn.jp/>). The **Security Warning** dialog box opens. [Figure 114](#)

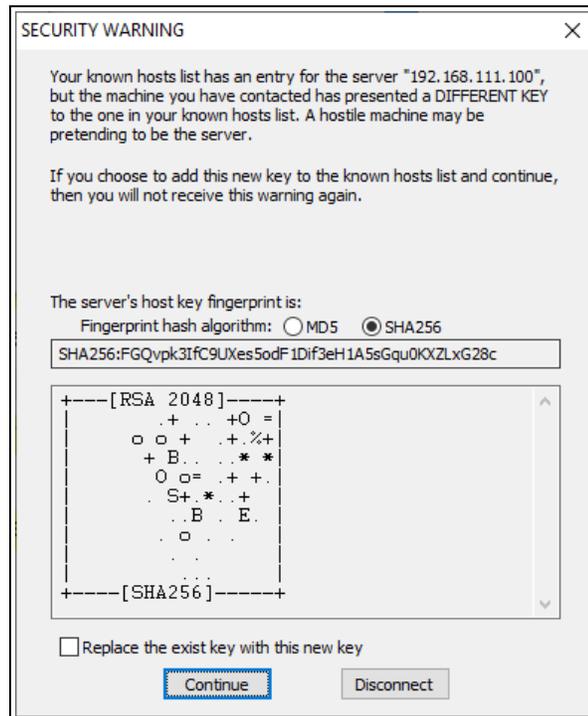


Figure 114: Security Warning dialog box

2. Click **Continue**. The **Tera Term: New Connection** window opens. [Figure 115](#)

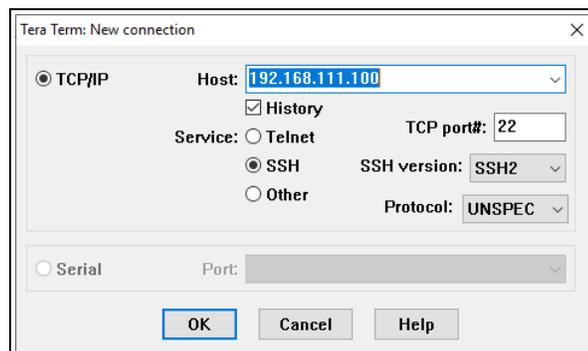


Figure 115: Tera Term: New Connection window

3. Click **OK**.
The **Tera Term New Connection** dialog box closes.
The **SSH Authentication** window opens. [Figure 116](#)

SSH Authentication

Logging in to 192.168.111.100

Authentication required.

User name: admin

Passphrase: ●●●●●

Remember password in memory

Forward agent

Use plain password to log in

Use RSA/DSA/ECDSA/ED25519 key to log in Private key file:

Use rhosts to log in (SSH1) Local user name:

Host private key file:

Use keyboard-interactive to log in

Use Pageant to log in

OK Disconnect

4.

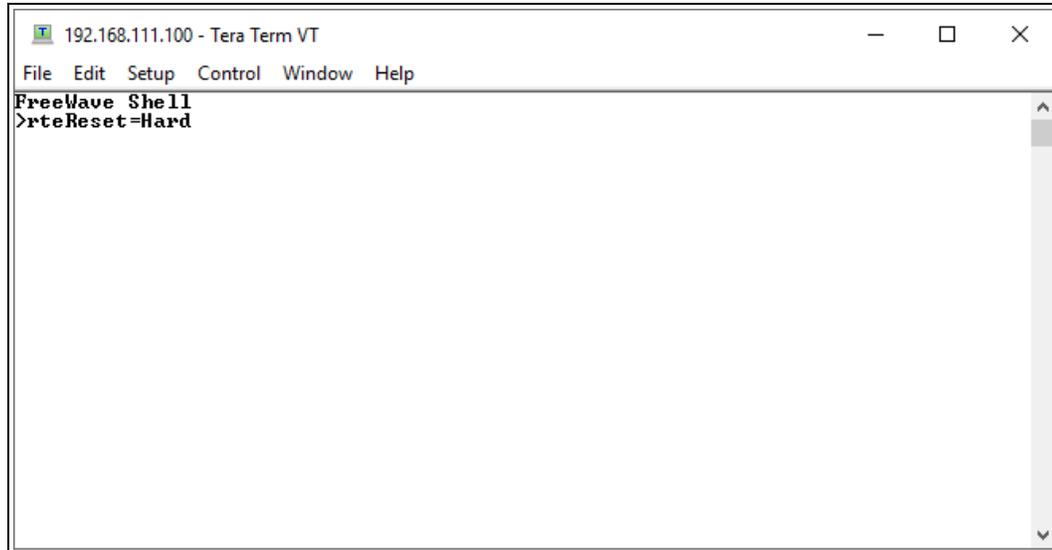
Figure 116: SSH Authentication window

5. Enter **admin** for the **User name** and **Passphrase**.

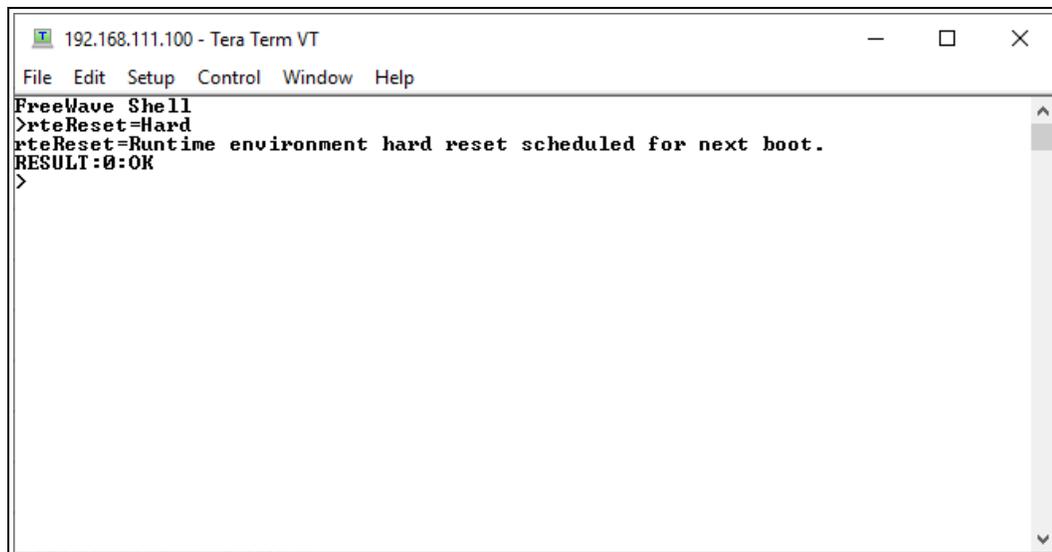
Note: If the **User Name** or **Password** were changed, enter the applicable information.
The password does not appear when typing - it looks blank.

The **FreeWave Shell** returns.

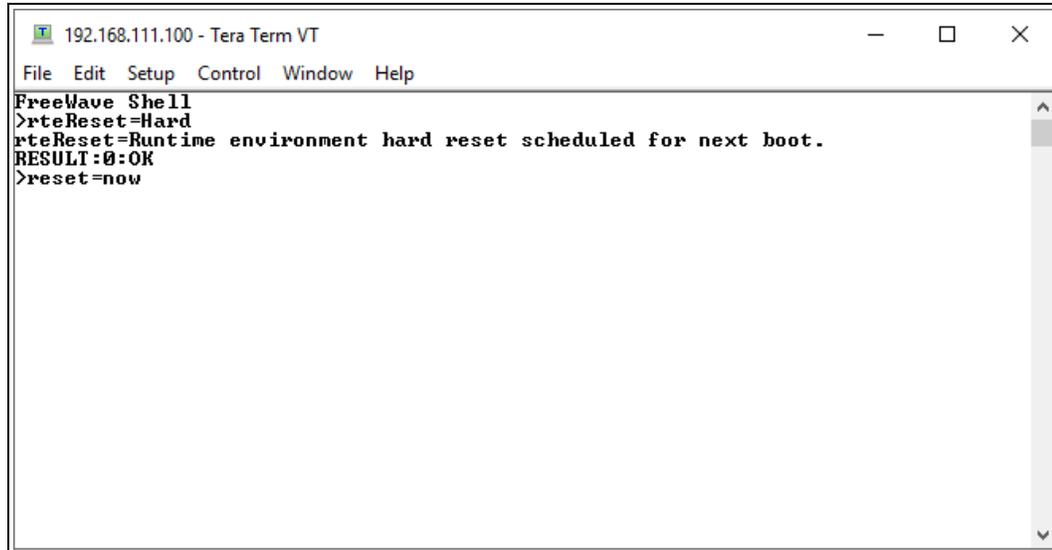
6. Type **rteReset=Hard** and press <Enter>. [Figure 117](#)

**Figure 117: FreeWave Shell window**

The **rteReset** message appears. [Figure 118](#)

**Figure 118: rteReset message**

7. Type **reset=now** and press <Enter>. [Figure 119](#)



```
192.168.111.100 - Tera Term VT
File Edit Setup Control Window Help
FreeWave Shell
>rteReset=Hard
rteReset=Runtime environment hard reset scheduled for next boot.
RESULT:0:OK
>reset=now
```

Figure 119: reset=Now window

The Z9-P or Z9-PE reboots.

The **FreeWave Drivers** and Z9-P or Z9-PE windows open.

12. Enter **admin** for the **Username** and press <Enter>.
13. Enter **admin** for the **Password** and press <Enter>.

The **FreeWave Shell** returns.



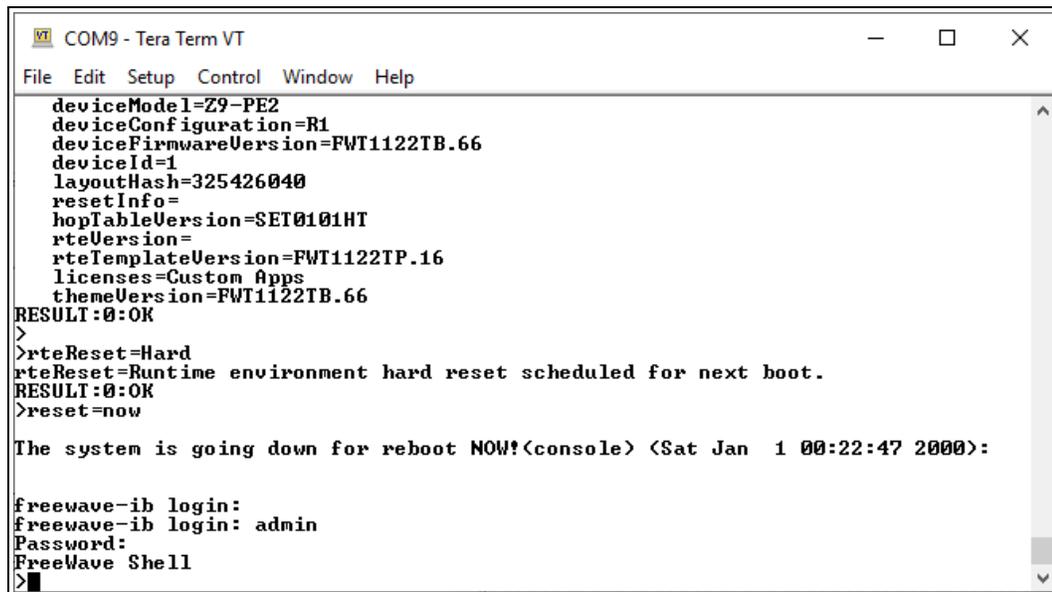
```
COM3 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login:
freewave-ib login: admin
Password:
FreeWave Shell
>
```

Figure 120: FreeWave Shell window

14. Continue with [Verify Successful Licensing and Activation \(on page 107\)](#).

8.5.5. Verify Successful Licensing and Activation

1. Re-open the terminal emulator application.



```

COM9 - Tera Term VT
File Edit Setup Control Window Help
deviceModel=Z9-PE2
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>
>rteReset=Hard
rteReset=Runtime environment hard reset scheduled for next boot.
RESULT:0:OK
>reset=now

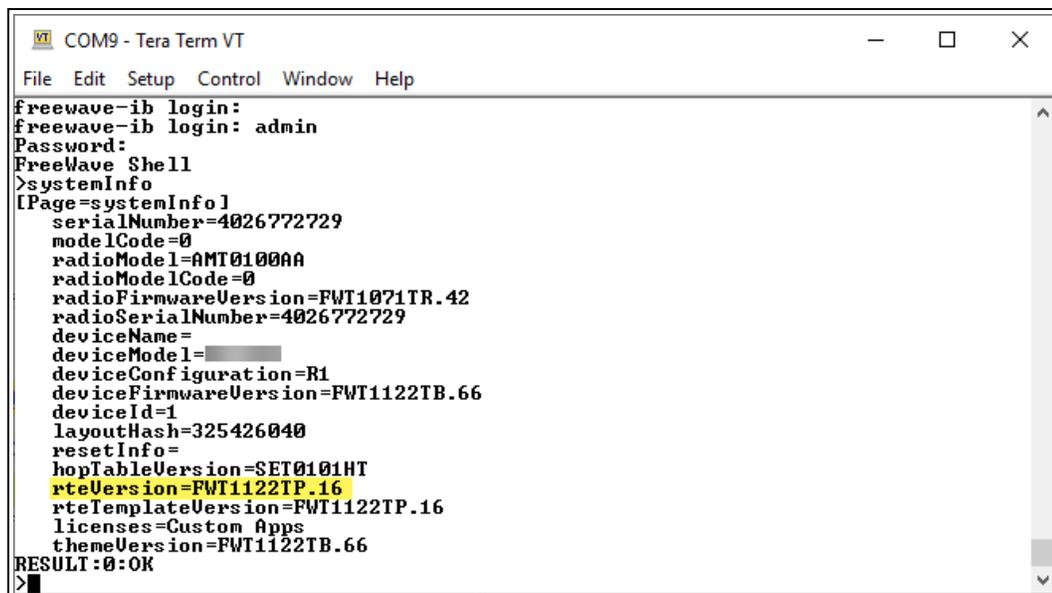
The system is going down for reboot NOW!(console) (Sat Jan 1 00:22:47 2000):

freewave-ib login:
freewave-ib login: admin
Password:
FreeWave Shell
>

```

Figure 121: FreeWave Shell window

2. At the > prompt, type `systeminfo` and press <Enter>. [Figure 122](#)



```

COM9 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login:
freewave-ib login: admin
Password:
FreeWave Shell
>systemInfo
[Page=systemInfo]
serialNumber=4026772729
modelCode=0
radioModel=AMT0100AA
radioModelCode=0
radioFirmwareVersion=FWT1071TR.42
radioSerialNumber=4026772729
deviceName=
deviceModel=
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=FWT1122TP.16
rteTemplateVersion=FWT1122TP.16
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>

```

Figure 122: The rteVersion is FWT1122TP.16

Important! The image provides example information only.
Each Z9-P or Z9-PE provides its own unique information.

3. Verify these parameters have these values:

Verification Settings	
Parameter	Value
Radio Firmware Version (on page 366)	FWT1071TR.42
Device Firmware Version (on page 362)	FWT1122TB.66
Rte Version (on page 369)	FWT1122TP.16
Rte Template Version (on page 369)	FWT1122TP.16
Licenses (on page 365)	Custom Apps

4. Continue with [Access the IQ Linux Environment \(on page 109\)](#).

8.6. Access the IQ Linux Environment

Note: The **Developer Edition IQ Application Environment** is the standard installation on all **Zum** products.

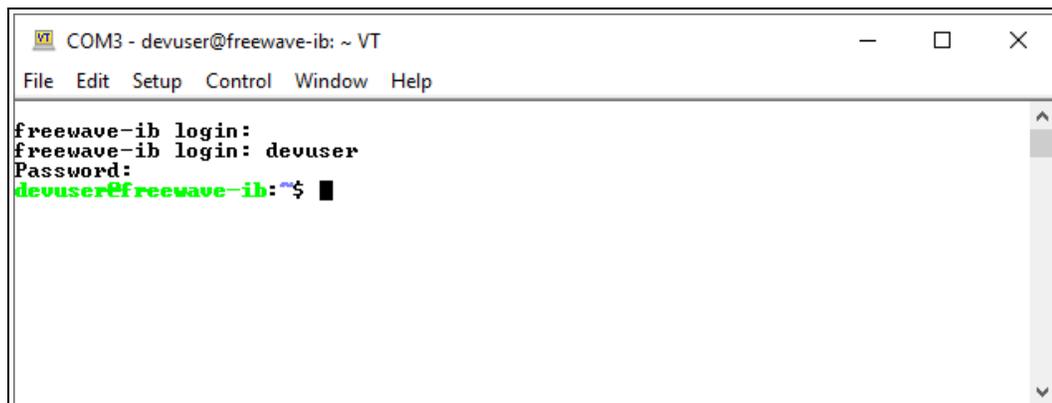
There are different Editions of IQ available that incorporate developer tools and/or 3rd-party software. All IQ Editions allow access to the Linux environment through the **devuser** login.

Once a developer is ready to integrate an application into IQ or build an application within IQ, they should first visit FreeWave's GitHub wiki environment that provides guidance on a wide range of topics. (<https://github.com/FreeWaveTechnologies/ZumIQ>)

Procedure

1. [Verify Successful Licensing and Activation \(on page 107\)](#) is completed.
2. Log in to the FreeWave CLI as **devuser**.
The default password is **devuser**.
A Linux Bash prompt appears. [Figure 123](#)

Note: A unique password can be added at the time of purchase.
[Contact FreeWave Technical Support \(on page 14\)](#) for this password.



```
COM3 - devuser@freewave-ib: ~ VT
File Edit Setup Control Window Help
freewave-ib login:
freewave-ib login: devuser
Password:
devuser@freewave-ib:~$
```

Figure 123: Linux Bash Prompt for the Z9-P or Z9-PE DEVUSER

3. Open a web browser.
4. Go to: <https://github.com/FreeWaveTechnologies/ZumIQ>.
The FreeWave Github IQ Main Page opens. [Figure 124](#)

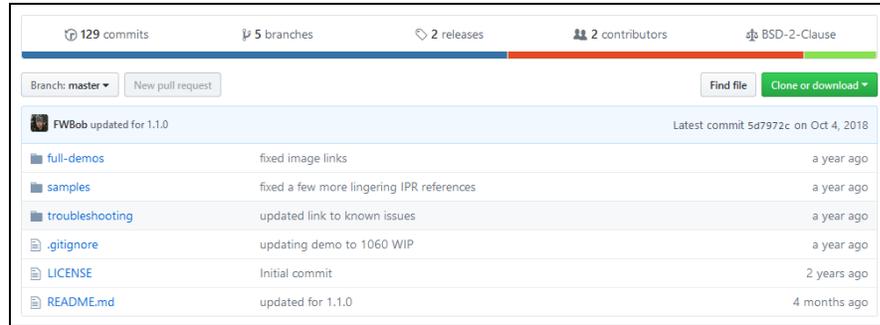


Figure 124: FreeWave GitHub IQ Main Page

Note: The IQ GitHub site contains many valuable tools including demonstrations, sample applications, troubleshooting guides and other information that can be very useful.

5. Scroll to the bottom of the **Main** page and click the Wiki link for IQ app development information. [Figure 125](#)

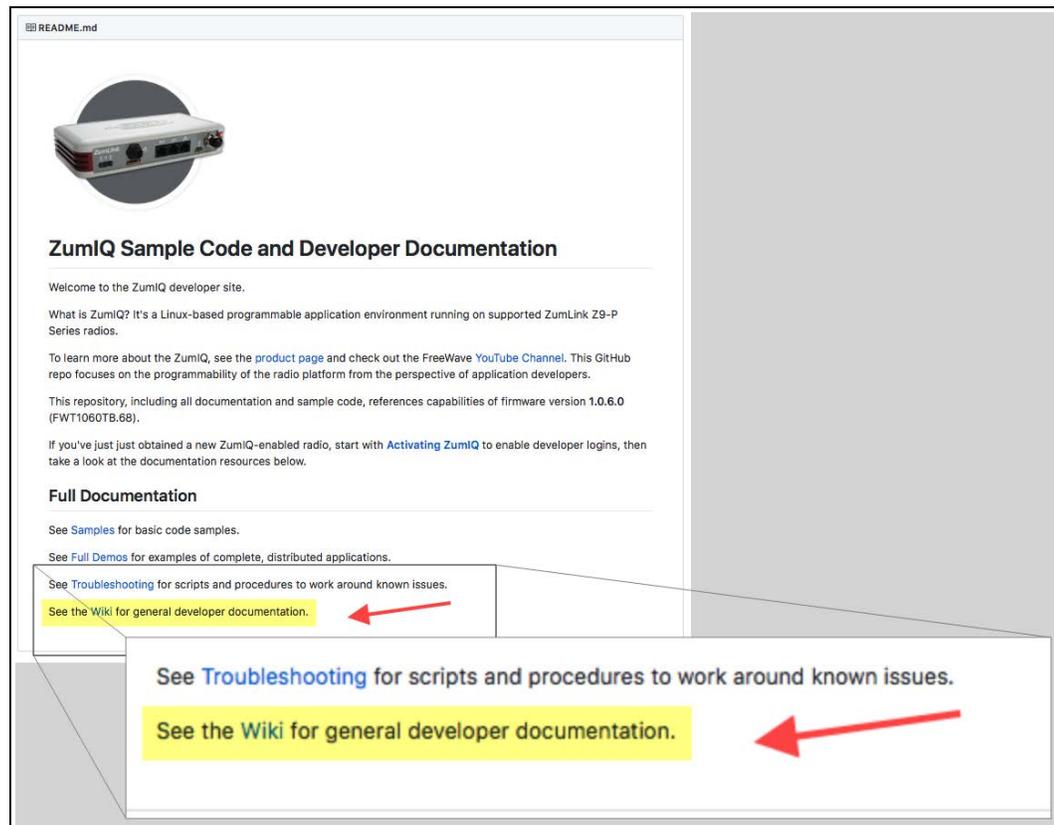


Figure 125: Wiki link on the FreeWave GitHub ZumiQ Main Page

6. In the Wiki, go to **Contents** sidebar > **Reference** to locate the **Installed Packages** for the version on the Z9-P or Z9-PE.

9. Web Interface - Administration

This section provides procedure information about administration of the Z9-P or Z9-PE parameters.

- [Change the COM Parameters \(on page 117\)](#)
- [Change the Data Path Parameters \(on page 120\)](#)
- [Change the Encryption Parameters \(on page 122\)](#)
- [Change the Io Ex Com Parameters \(on page 124\)](#)
- [Change the Local Diagnostics - Monitored Node \(on page 125\)](#)
- [Change the Modbus Parameters \(on page 127\)](#)
- [Change the Network Parameters \(on page 129\)](#)
- [Change the NTP Parameters \(on page 131\)](#)
- [Change the Radio Settings Parameters - Endpoint \(on page 133\)](#)
- [Change the Radio Settings Parameters - Endpoint-Repeater \(on page 135\)](#)
- [Change the Radio Settings Parameters - Gateway \(on page 137\)](#)
- [Change the Radio Settings Parameters - Gateway-Repeater \(on page 140\)](#)
- [Change the Security Parameters \(on page 143\)](#)
- [Change the Services Parameters \(on page 145\)](#)
- [Change the SNMP Parameters \(on page 147\)](#)
- [Change the System Info Parameters \(on page 149\)](#)
- [Change the Terminal Server Relay Parameters \(on page 151\)](#)
- [Web Interface - Network Diagnostics \(on page 153\)](#)

9.1. Setup the Computer IP Address Configuration

Note: This procedure is required to access the Web Interface of the Z9-P or Z9-PE. The images in this procedure are for **Windows® 10** and/or **Firefox®**.

1. Connect the CAT5e / CAT6 Ethernet cable to the Z9-P or Z9-PE Ethernet port and the Ethernet port on the computer.
2. On the computer, open the **Windows® Control Panel**.
3. View the **Control Panel** window by **Category** and click **Network and Sharing Center**.
[Figure 126](#)

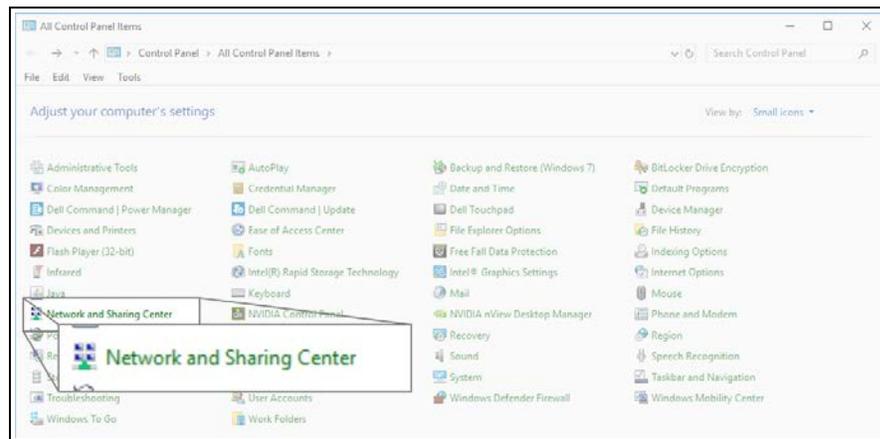


Figure 126: Control Panel > Network and Sharing Center

The **Network and Sharing Center** window opens.

4. Click the **Change Adapter Settings** link. [Figure 127](#)

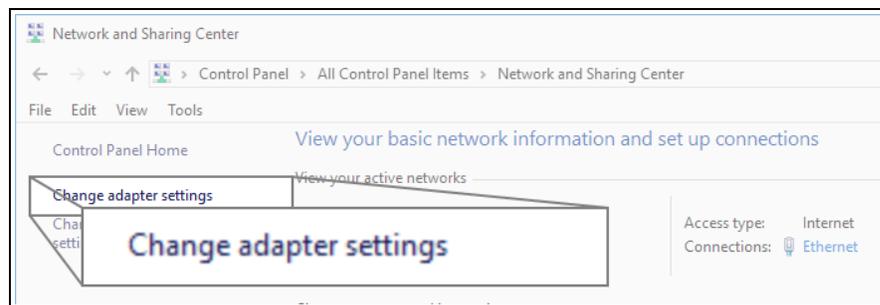


Figure 127: Change Adapter Settings Link

The **Network Connections** window opens. [Figure 128](#)

5. Double-click the **Local Area Connection** link or the connected **Network Connection**.

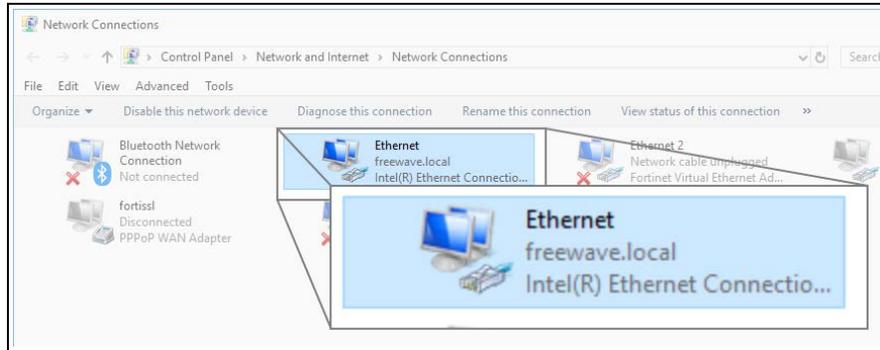


Figure 128: Network Connections window

The **Ethernet Status** dialog box opens. [Figure 129](#)

6. Click the **Properties** button.

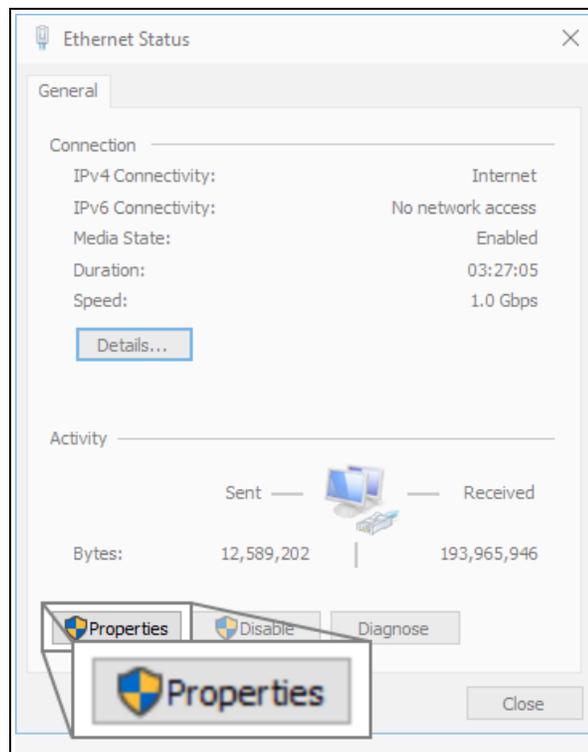


Figure 129: Ethernet Status dialog box

The **Ethernet Properties** dialog box opens.

7. Select the **Internet Protocol Version 4 (TCP/IPv4)** option. [Figure 130](#)
8. Click the **Properties** button.

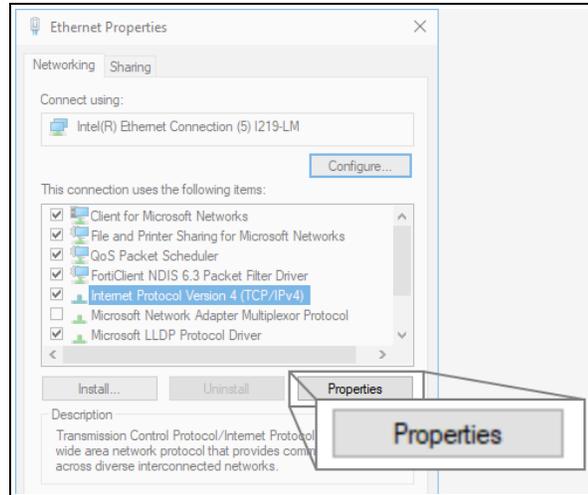


Figure 130: Ethernet Properties dialog box

The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens. [Figure 131](#)

9. **IMPORTANT:** Make a note of the current settings (to reverse this procedure later).

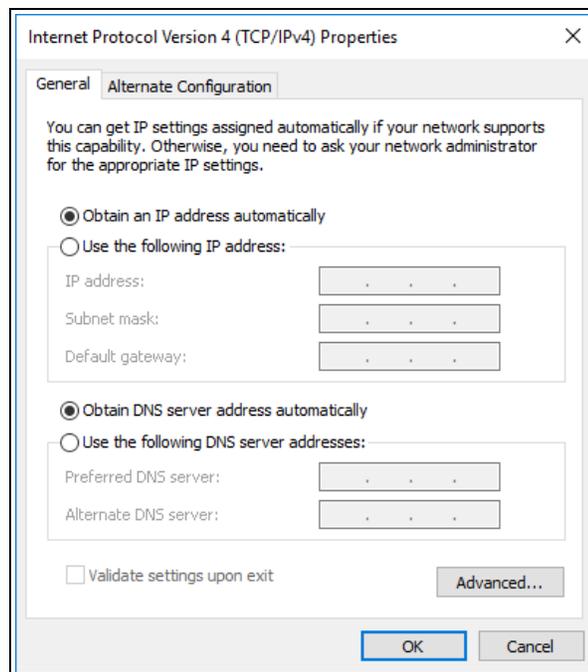


Figure 131: Default Example of Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

10. Select the **Use the following IP address** option button.
11. In the **IP Address** text box, enter an IP Address that is **in the same subnet range but a DIFFERENT IP Address** than the Z9-P or Z9-PE or all other units in the network. [Figure 132](#)

Example: Enter an **IP Address** from **192.168.111.1** to **192.168.111.254** (but NOT **192.168.111.100**) and the **Subnet Mask** to **255.255.255.0**.

Note: The default Z9-P or Z9-PE IP Address is **192.168.111.100**.
The default subnet mask is **255.255.255.0**.

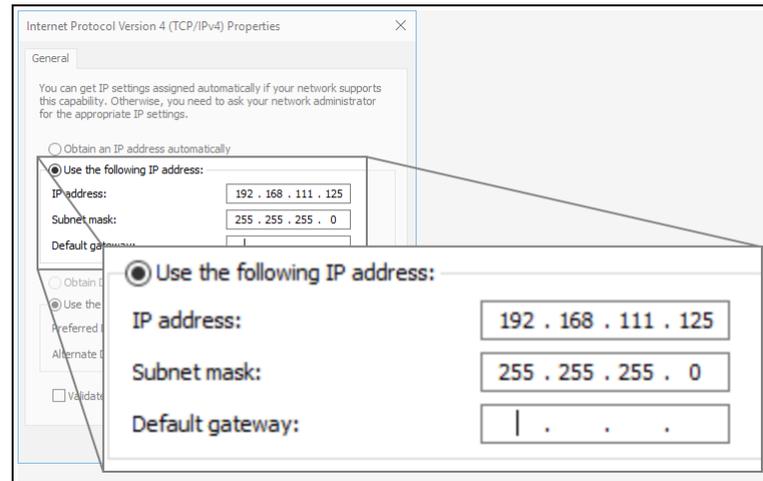


Figure 132: Changed Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

Note: An IP Address is NOT required in the **Default Gateway** text box.

12. Click **OK** to save the changes and close the dialog box.
13. Click **Close** twice to close the **Local Area Connection Properties** and **Local Area Connection Status** dialog boxes.
14. Optional: Continue with these Web Interface administration procedures:
 - [Change the COM Parameters \(on page 117\)](#)
 - [Change the Data Path Parameters \(on page 120\)](#)
 - [Change the Encryption Parameters \(on page 122\)](#)
 - [Change the Io Ex Com Parameters \(on page 124\)](#)
 - [Change the Local Diagnostics - Monitored Node \(on page 125\)](#)
 - [Change the Modbus Parameters \(on page 127\)](#)
 - [Change the Network Parameters \(on page 129\)](#)
 - [Change the NTP Parameters \(on page 131\)](#)
 - [Change the Radio Settings Parameters - Endpoint \(on page 133\)](#)
 - [Change the Radio Settings Parameters - Endpoint-Repeater \(on page 135\)](#)
 - [Change the Radio Settings Parameters - Gateway \(on page 137\)](#)
 - [Change the Radio Settings Parameters - Gateway-Repeater \(on page 140\)](#)

- [Change the Security Parameters \(on page 143\)](#)
 - [Change the Services Parameters \(on page 145\)](#)
 - [Change the SNMP Parameters \(on page 147\)](#)
 - [Change the System Info Parameters \(on page 149\)](#)
 - [Change the Terminal Server Relay Parameters \(on page 151\)](#)
15. Optional: Continue with the [Web Interface - Network Diagnostics \(on page 153\)](#).

9.2. Change the COM Parameters

Note: See the [COM Parameters \(on page 224\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 133](#)

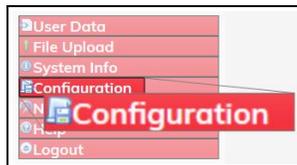


Figure 133: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click either the **COM1** or **COM2** tab to access their respective COM parameters. [Figure 134](#) or [Figure 135](#)

Note: See the [COM Parameters \(on page 224\)](#) for detailed information about the parameters.
The parameters for **COM1** and **COM2** are the same except for the [Terminal Server Port \(on page 235\)](#) parameter setting.



Figure 134: COM1 window



Figure 135: COM2 window

7. As applicable, change these parameters:
 - a. Click the **Mode** list box arrow and select the COM port mode.
 - b. Click the **Handler** list box arrow and select the designated protocol handler.
 - c. Click the **Baudrate** list box arrow and select a COM port baud rate.
 - d. Click the **Databits** list box arrow and select the number of data bits in the frame for COM1 or COM2.
 - e. Click the **Parity** list box arrow and select the COM port parity bits for the system.
 - f. Click the **Stopbits** list box arrow and select the COM port number of stop bits.
 - g. Click the **Duplex** list box arrow and select the duplex designation.
 - h. If applicable for COM2, click the **Flow Control** list box arrow and select **Hardware** to activate **flowControl**.

Important! The RTS and CTS signals are **ONLY** available for COM2.
The RTS and CTS signals are **NOT supported** for COM1.

- i. In the **Delay Before Send MS** text box, enter the milliseconds of time delay.

- j. In the **Break Before Send Us** text box, enter the number of milliseconds the COM port will send a break signal.
- k. In the **Terminal Server Port** text box, enter the designated TCP port number.

FREEWAVE Recommends: If using the [Terminal Server Port](#) parameter, keep the TCP port numbers as their defaults.

- l. In the **Terminal Server Time Out** text box, enter the number of seconds the Terminal Server remains open without transmitting or receiving data from the network.

Important! [TX Bytes \(on page 237\)](#), [RX Bytes \(on page 234\)](#), and [Connection Drops \(on page 226\)](#) are Read-only parameters.

8. Click the **Update** button to save the changed information.

9.3. Change the Data Path Parameters

Note: See the [Data Path Parameters \(on page 242\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 136](#)

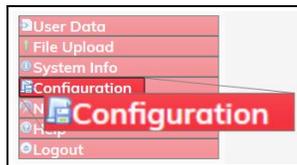


Figure 136: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Data Path** tab to access the **Data Path** parameters. [Figure 137](#)

Note: See the [Data Path Parameters \(on page 242\)](#) for detailed information about the parameters.

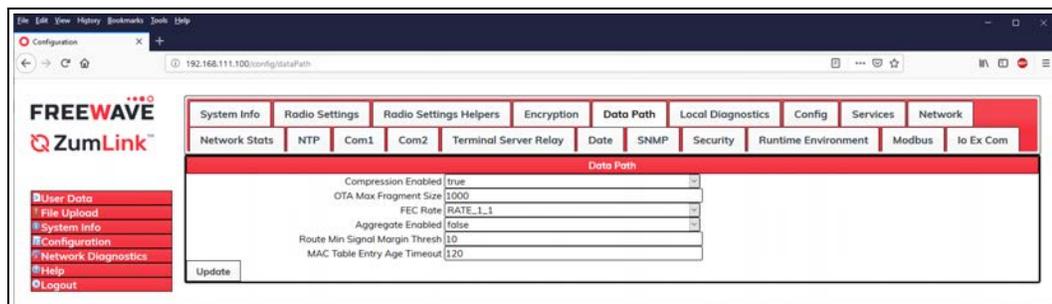


Figure 137: Data Path window

7. As applicable, change these parameters:
 - a. Click the **Compression Enabled** list box arrow and select **False** to disable compression of outgoing packets.

Note: By default, the **Compression Enabled** is enabled (set to True).

- b. In the **OTA Max Fragment Size** text box, enter the maximum fragment size, in bytes, sent over the air.
 - c. Click the **FEC Rate** list box arrow and select the Forward Error Correction (FEC) rate.
 - d. Click the **Aggregate Enabled** list box arrow and select **True** to enable this parameter and increase throughput of small packets.

Note: By default, the **Aggregate Enabled** is NOT enabled (set to False).

- e. In the **Route Min Signal Margin Thresh** text box, enter the minimum threshold signal margin in dB.
 - f. In the **MAC Table Entry Age Timeout** text box, enter the number of seconds before an inactive entry in the MAC Table ages out and expires.
8. Click the **Update** button to save the changed information.

FREEWAVE Recommends: When viewing local diagnostics, if the [Radio Bad CRC \(on page 267\)](#) count is more than 15-20% of the total transmitted packets (the [Radio LL Tx \(on page 270\)](#) count), enabling the [FEC Rate \(on page 246\)](#) setting is beneficial.

9.4. Change the Encryption Parameters

Note: See the [Encryption Parameters \(on page 256\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 138](#)

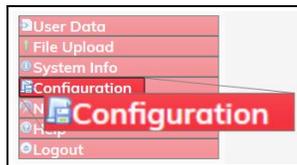


Figure 138: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Encryption** tab to access the **Encryption** parameters. [Figure 139](#)

Note: See the [Encryption Parameters \(on page 256\)](#) for detailed information about the parameters.

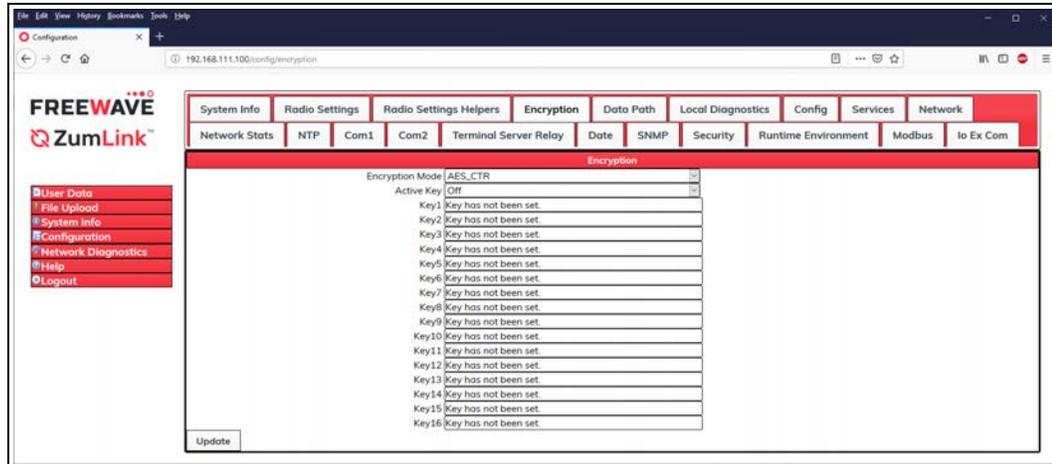


Figure 139: Encryption window

7. Click the **Encryption Mode** list box arrow and select the designated encryption mode.
8. In the **KeyX** text box, enter either the 128- or 256-bit key in 16 or 32 hexadecimal format respectively.

Note: Enter **Clear** to erase a previously enter key.
See the [Key1 to Key 16 \(on page 259\)](#) parameter for additional information.

9. Click the **Active Key** list box arrow and select the designated active key.

Note: See the [Active Key \(on page 257\)](#) parameter for additional information.

10. Click the **Update** button to save the changed information.
The encryption changes take effect immediately.

9.5. Change the Io Ex Com Parameters

Note: This parameter is read-only in the Web Interface.

9.6. Change the Local Diagnostics - Monitored Node

Note: See the [Local Diagnostics Parameters \(on page 261\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 140](#)

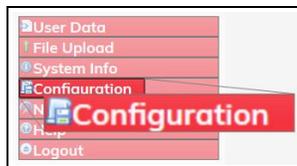


Figure 140: Configuration link

The **Authentication Required** (Login) dialog box opens.

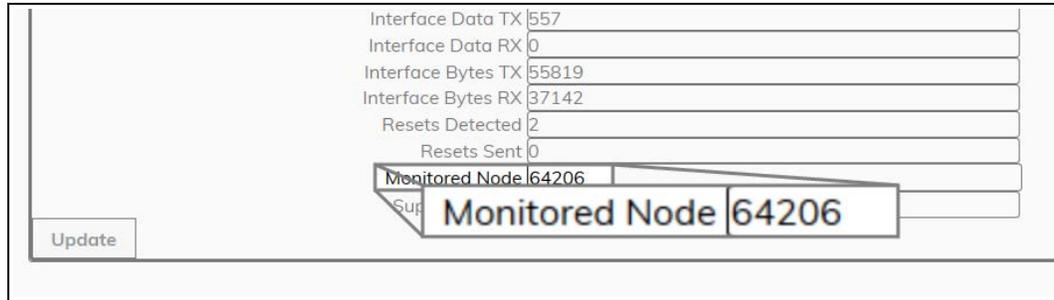
5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Local Diagnostics** tab to access the **Local Diagnostics** parameters.

Note: See the [Local Diagnostics Parameters \(on page 261\)](#) for detailed information about the parameters.

7. Scroll to the **Monitored Node** text box. [Figure 141](#)



The screenshot shows a web interface for local diagnostics. It features a table of statistics and an input field for a monitored node ID. The statistics are as follows:

Interface Data TX	557
Interface Data RX	0
Interface Bytes TX	55819
Interface Bytes RX	37142
Resets Detected	2
Resets Sent	0

Below the table is a text input field labeled "Monitored Node" containing the value "64206". A tooltip is visible over this field, displaying "Monitored Node 64206" and a "Sup" button. An "Update" button is located at the bottom left of the window.

Figure 141: Local Diagnostics window

8. In the **Monitored Node** text box, enter the [Node ID \(on page 322\)](#) to monitor.
9. Click the **Update** button to save the changed information.

FREEWAVE Recommends: When viewing local diagnostics, if the [Radio Bad CRC \(on page 267\)](#) count is more than 15-20% of the total transmitted packets (the [Radio LL Tx \(on page 270\)](#) count), enabling the [FEC Rate \(on page 246\)](#) setting is beneficial.

9.7. Change the Modbus Parameters

Note: See the [Modbus Parameters \(on page 278\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 142](#)

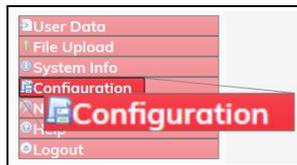


Figure 142: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Modbus** tab to access the **Modbus** parameters. [Figure 143](#)

Note: See the [Modbus Parameters \(on page 278\)](#) for detailed information about the parameters.

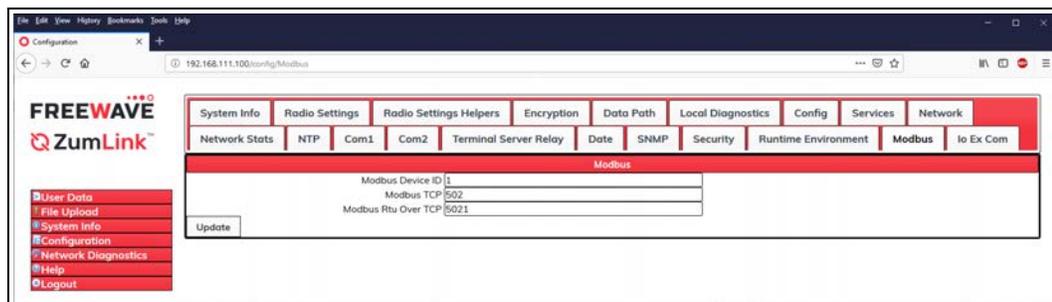


Figure 143: Modbus window

7. As applicable, change these parameters:
 - a. In the **Modbus Device ID** text box, enter a user-defined Modbus device ID.
 - b. In the **Modbus TCP** text box, enter the TCP port used for the Modbus TCP requests.
 - c. In the **Modbus Rtu Over TCP** text box, enter the TCP port used for the Modbus RTU over TCP requests.
8. Click the **Update** button to save the changed information.

9.8. Change the Network Parameters

Note: See the [Network Parameters \(on page 288\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 144](#)

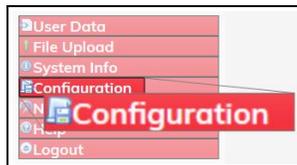


Figure 144: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Network** tab to access the **Network** parameters. [Figure 145](#)

Note: See the [Network Parameters \(on page 288\)](#) for detailed information about the parameters.

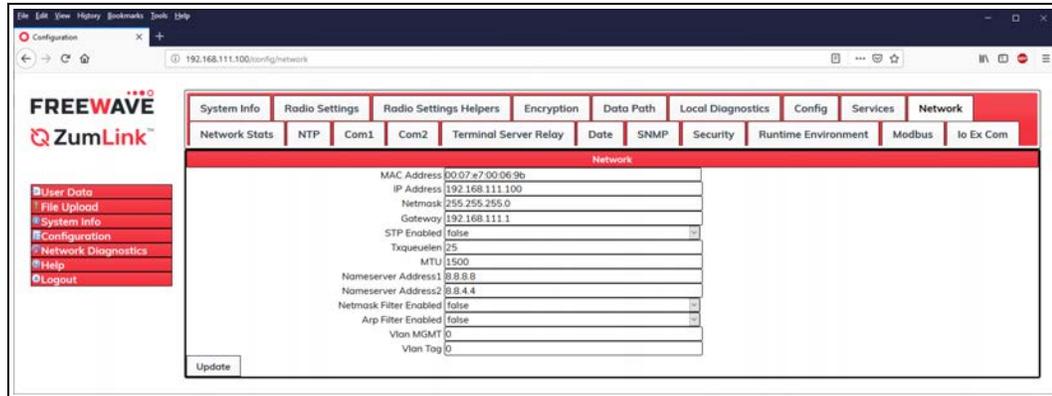


Figure 145: Network window

Note: The [MAC Address \(on page 290\)](#) parameter is Read-only.

7. As applicable, change these parameters:
 - a. In the **IP Address** text box, enter the IP address of the Z9-P or Z9-PE assigned by the IT department for the network.
 - b. In the **Netmask** text box, enter the Netmask of the Z9-P or Z9-PE.
 - c. In the **Gateway** text box, enter the Gateway IP address for the network.
 - d. Click the **STP Enabled** list box arrow and select **True** to enable the Spanning Tree Protocol.

Note: By default, the **STP Enabled** is NOT enabled (set to False).

- e. In the **TxqueueLen** text box, enter the maximum number of packets to hold in the transmit queue.
- f. In the **MTU** text box, enter the maximum transmission unit.
- g. Click the **Netmask Filter Enabled** list box arrow and select **True** to enable the bridge firewall and restrict network communication to current IPv4 subnet.

Note: By default, the **Netmask Filter Enabled** is enabled (set to False).

- h. In the **Nameserver Address 1** text box, enter a user-defined DNS IP address.
 - i. In the **Nameserver Address 2** text box, enter a user-defined DNS IP address..
 - j. Click the **Arp Filter Enabled** list box arrow and select **True** to enable the parameter.
 - k. In the **Vlan MGMT** text box, enter the Management VLAN ID.
 - l. In the **Vlan Tag** text box, enter the VLAN ID.
8. Click the **Update** button to save the changed information.

9.9. Change the NTP Parameters

Note: See the [NTP Parameters \(on page 305\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 146](#)

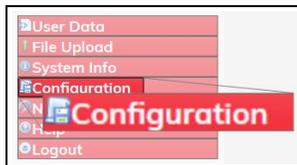


Figure 146: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **NTP** tab to access the **NTP** parameters. [Figure 147](#)

Note: See the [NTP Parameters \(on page 305\)](#) for detailed information about the parameters.

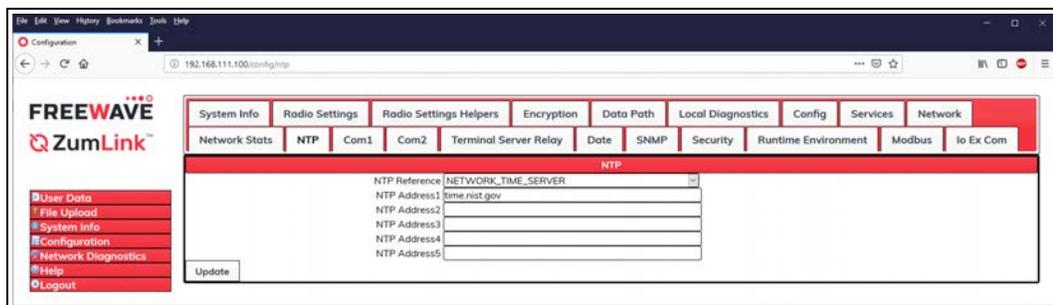


Figure 147: NTP window

7. As applicable, change these parameters:
 - a. Click the **NTP Reference** list box arrow and select either **NETWORK_TIME_SERVER** or **REFCLK_LOCALCLOCK**.
 - b. In the **NTP Restart** text box, enter **Now** to restart the the NTP system.
 - c. In the **NTP Date** text box, enter **Now** to synchronize the local clock with the time from the NTP servers specified in the **NTP Address (1 to 5) (on page 306)** settings.
 - d. In the **NTP Address 2 to 5** text boxes, enter the IP address of the servers used for synchronizing time.

Note: By default, the **NTP Address 1** is time.nist.gov.

8. Click the **Update** button to save the changed information.

9.10. Change the Radio Settings Parameters - Endpoint

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 148](#)

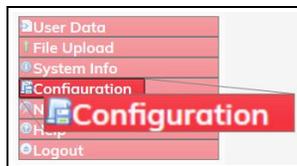


Figure 148: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.
7. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P or Z9-PE as an **Endpoint**. [Figure 149](#)

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

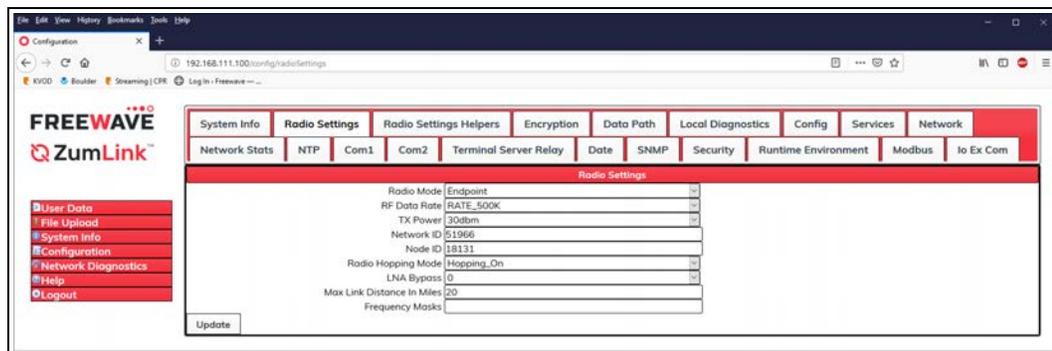


Figure 149: Radio Settings window - Endpoint

8. As applicable, change these parameters:
 - a. Click the **RF Data Rate** list box arrow and select the RF link data rate in bits per second.
 - b. Click the **Tx Power** list box arrow and select the dB RF output transmit power level for the Z9-P or Z9-PE.
 - c. In the **Network ID** text box, enter the network identifier that subdivides traffic on radio units.
 - d. In the **Node ID** text box, enter a user-designated **nodeld** instead of the auto-generated **nodeld**.
 - e. Optional: Click the **Radio Hopping Mode** list box arrow and select **Off** to disable frequency hopping.

Note: By default, the **Radio Hopping Mode** is enabled (set to Hopping_On).

- f. Optional: In the **LNA Bypass** text box, enter **1** to bypass the Low Noise Amplifier (LNA) and reduce the radio module receive signal by 10dB.

Note: By default, the **LNA Bypass** is enabled (set to 0 (zero)).

- g. In the **Max Link Distance in Miles** text box, enter the maximum one-way distance (in miles) used to set the maximum expected propagation delay between any Endpoints in the network.
 - h. In the **Frequency Masks** text box, enter the exact specified format of the frequency range to mask.



Caution: The exact syntax is required in the **Frequency Masks** text box. See [Frequency Masks \(on page 315\)](#) for detailed information.

9. Click the **Update** button to save the changed information.

9.11. Change the Radio Settings Parameters - Endpoint-Repeater

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 150](#)

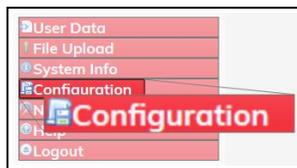


Figure 150: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.
7. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P or Z9-PE as an **Endpoint_Repeater**. [Figure 151](#)

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.



Figure 151: Radio Settings window - Endpoint_Repeater

8. As applicable, change these parameters:
 - a. Click the **RF Data Rate** list box arrow and select the RF link data rate in bits per second.
 - b. In the **Radio Repeater Slot** text box, enter which repeater slot the Endpoint-Repeater uses.
 - c. Click the **Tx Power** list box arrow and select the dB RF output transmit power level for the Z9-P or Z9-PE.
 - d. In the **Network ID** text box, enter the network identifier that subdivides traffic on radio units.
 - e. In the **Node ID** text box, enter a user-designated **nodeld** instead of the auto-generated **nodeld**.
 - f. Optional: Click the **Radio Hopping Mode** list box arrow and select **Off** to disable frequency hopping.

Note: By default, the **Radio Hopping Mode** is enabled (set to Hopping_On).

- g. Optional: In the **LNA Bypass** text box, enter **1** to bypass the Low Noise Amplifier (LNA) and reduce the radio module receive signal by 10dB.

Note: By default, the **LNA Bypass** is enabled (set to 0 (zero)).

- h. In the **Max Link Distance in Miles** text box, enter the maximum one-way distance (in miles) used to set the maximum expected propagation delay between any Endpoints in the network.
- i. In the **Frequency Masks** text box, enter the exact specified format of the frequency range to mask.



Caution: The exact syntax is required in the **Frequency Masks** text box. See [Frequency Masks \(on page 315\)](#) for detailed information.

9. Click the **Update** button to save the changed information.

9.12. Change the Radio Settings Parameters - Gateway

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 152](#)

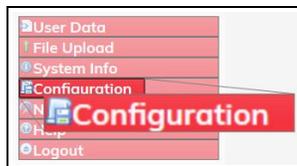


Figure 152: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.
7. Accept the **Radio Mode** default of **Gateway**. [Figure 153](#)

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

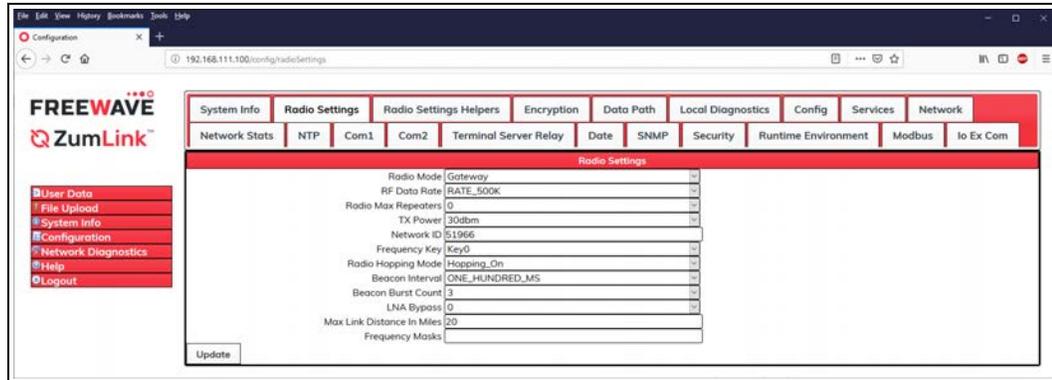


Figure 153: Radio Settings window - Gateway

8. As applicable, change these parameters:
 - a. Click the **RF Data Rate** list box arrow and select the RF link data rate in bits per second.
 - b. In the **Radio Max Repeaters** text box, enter the number of Repeater slots in the network.
 - c. Click the **Tx Power** list box arrow and select the dB RF output transmit power level for the Z9-P or Z9-PE.
 - d. In the **Network ID** text box, enter the network identifier that subdivides traffic on radio units.
 - e. Click the **Frequency Key** list box arrow and select the Key number used as an index to select a hopping table.
 - f. Optional: Click the **Radio Hopping Mode** list box arrow and select **Off** to disable frequency hopping.

Note: By default, the **Radio Hopping Mode** is enabled (set to Hopping_On).

- g. Click the **Beacon Interval** list box arrow and select how often a Gateway radio sends out a beacon packet and changes to the next radio frequency in the hopping pattern.
- h. In the **Beacon Burst Count** text box, enter the number of consecutive beacons to send per **Beacon Interval** time.
- i. Optional: In the **LNA Bypass** text box, enter **1** to bypass the Low Noise Amplifier (LNA) and reduce the radio module receive signal by 10dB.

Note: By default, the **LNA Bypass** is enabled (set to 0 (zero)).

- j. In the **Max Link Distance in Miles** text box, enter the maximum one-way distance (in miles) used to set the maximum expected propagation delay between any Endpoints in the network.
- k. In the **Frequency Masks** text box, enter the exact specified format of the frequency range to mask.



Caution: The exact syntax is required in the **Frequency Masks** text box.
See [Frequency Masks \(on page 315\)](#) for detailed information.

9. Click the **Update** button to save the changed information.

9.13. Change the Radio Settings Parameters - Gateway-Repeater

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 154](#)

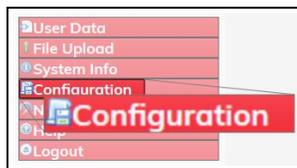


Figure 154: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.
7. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P or Z9-PE as a **Gateway_Repeater**. [Figure 155](#)

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

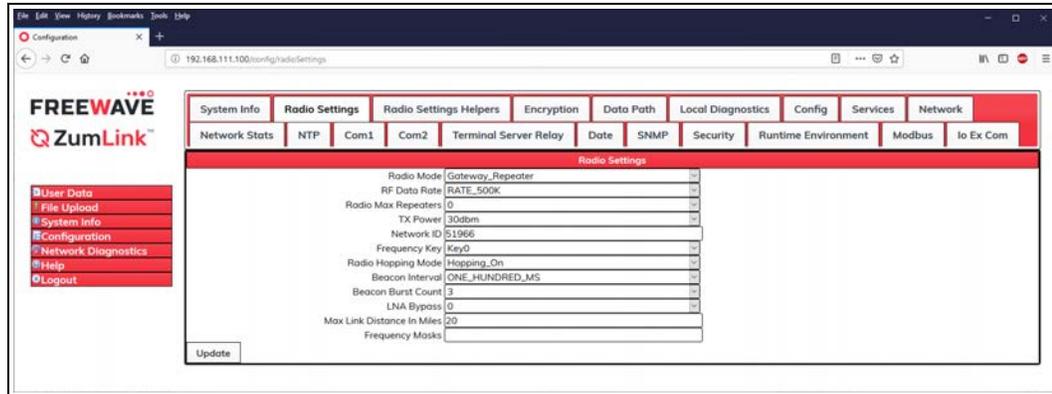


Figure 155: Radio Settings window - Gateway_Repeater

8. As applicable, change these parameters:
 - a. Click the **RF Data Rate** list box arrow and select the RF link data rate in bits per second.
 - b. In the **Radio Max Repeaters** text box, enter the number of Repeater slots in the network.
 - c. Click the **Tx Power** list box arrow and select the dB RF output transmit power level for the Z9-P or Z9-PE.
 - d. In the **Network ID** text box, enter the network identifier that subdivides traffic on radio units.
 - e. Click the **Frequency Key** list box arrow and select the Key number used as an index to select a hopping table.
 - f. Optional: Click the **Radio Hopping Mode** list box arrow and select **Off** to disable frequency hopping.

Note: By default, the **Radio Hopping Mode** is enabled (set to Hopping_On).

- g. Click the **Beacon Interval** list box arrow and select how often a Gateway radio sends out a beacon packet and changes to the next radio frequency in the hopping pattern.
- h. In the **Beacon Burst Count** text box, enter the number of consecutive beacons to send per **Beacon Interval** time.
- i. Optional: In the **LNA Bypass** text box, enter **1** to bypass the Low Noise Amplifier (LNA) and reduce the radio module receive signal by 10dB.

Note: By default, the **LNA Bypass** is enabled (set to 0 (zero)).

- j. In the **Max Link Distance in Miles** text box, enter the maximum one-way distance (in miles) used to set the maximum expected propagation delay between any Endpoints in the network.
- k. In the **Frequency Masks** text box, enter the exact specified format of the frequency range to mask.



Caution: The exact syntax is required in the **Frequency Masks** text box.
See [Frequency Masks \(on page 315\)](#) for detailed information.

9. Click the **Update** button to save the changed information.

9.14. Change the Security Parameters

Note: See the [Security Parameters \(on page 342\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 156](#)

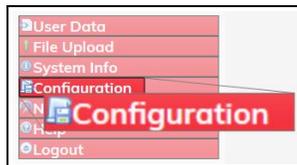


Figure 156: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Security** tab to access the **Security** parameters. [Figure 157](#)

Note: See the [Security Parameters \(on page 342\)](#) for detailed information about the parameters.

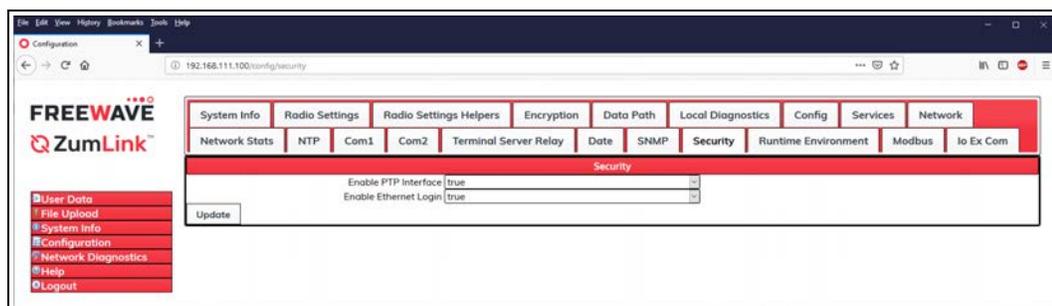


Figure 157: Security window

7. As applicable, change these parameters:
 - a. Optional: Click the **Ethernet PTP Interface** list box arrow and select **False** to disable the PTP (drag-and-drop) interface.

Note: By default, the **Enable Ethernet Login** is enabled (set to True).
See the [Enable Ethernet Login \(on page 343\)](#) parameter for additional information.

- b. Optional: Click the **Enable Ethernet Login** list box arrow and select **False** to disable SSH logins.

Note: By default, the **Ethernet PTP Interface** is enabled (set to True).
See the [Ethernet PTP Interface \(on page 343\)](#) parameter for additional information.

8. Click the **Update** button to save the changed information.

9.15. Change the Services Parameters

Note: See the [Services Parameters \(on page 345\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 158](#)

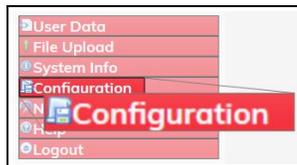


Figure 158: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Services** tab to access the **Services** parameters. [Figure 159](#)

Note: See the [Services Parameters \(on page 345\)](#) for detailed information about the parameters.

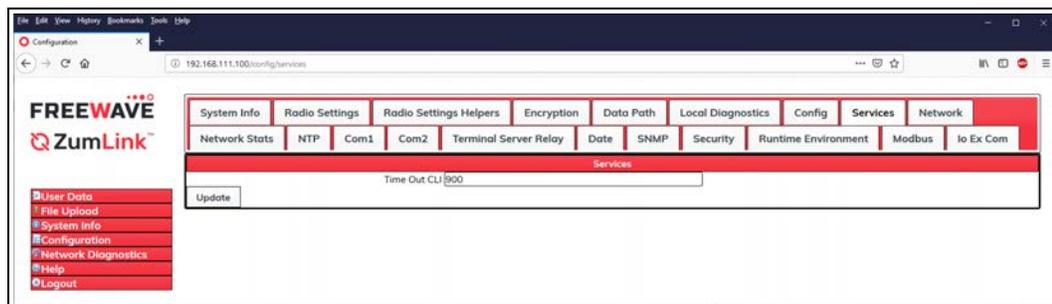


Figure 159: Services window

7. In the **Time Out CLI** text box, enter the number of seconds of idle time before the CLI connection is closed.
8. Click the **Update** button to save the changed information.

9.16. Change the SNMP Parameters

Note: See the [SNMP Parameters \(on page 347\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of

192.168.111.100.

If the IP address was changed, enter that IP Address.

See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 160](#)

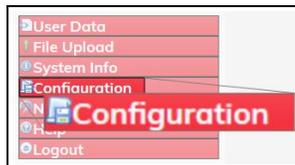


Figure 160: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **SNMP** tab to access the **SNMP** parameters.

Note: See the [SNMP Parameters \(on page 347\)](#) for detailed information about the parameters.

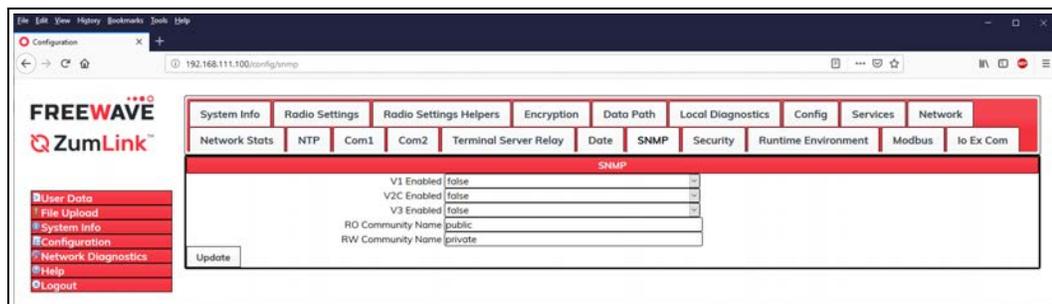


Figure 161: SNMP window

7. As applicable, change these parameters:

- a. Click the **V1 Enabled** list box arrow and select **True** to enable SNMP V1.

Note: For security, the protocol **SNMP v1** is read-only.
See the [V1 Enabled \(on page 350\)](#) parameter for additional information.

- b. Click the **V2C Enabled** list box arrow and select **True** to enable SNMP V2C.

Note: By default, the **v2c Enabled** is NOT enabled (set to False).
See the [V2C Enabled \(on page 351\)](#) parameter for additional information.

- c. Click the **V3 Enabled** list box arrow and select **True** to enable SNMP V3.

Note: By default, the **v3 Enabled** is NOT enabled (set to False).
See the [V3 Enabled \(on page 352\)](#) parameter for additional information.

- d. In the **RO Community Name** text box, enter the user-designated name for SNMP V1/V2C Read-only access.
- e. In the **RW Community Name** text box, enter the user-designated name for SNMP V1/V2C Read-Write access.

Note: The **SNMP User** text box is Read-only in the Web Interface.
Use the CLI to change this parameter.

8. Click the **Update** button to save the changed information.

9.17. Change the System Info Parameters

Note: See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 162](#)

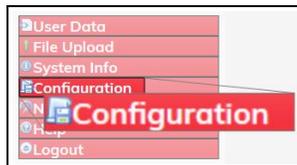


Figure 162: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **System Info** tab to access the **System Info** parameters. [Figure 163](#)

Note: See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

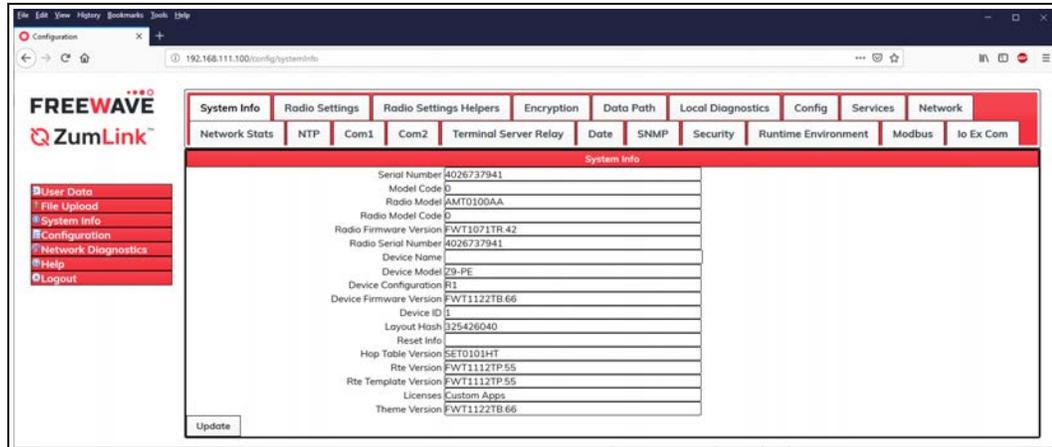


Figure 163: System Info window

7. As applicable, change these parameters:
 - a. In the **Device Name** text box, enter the user-defined name for the Z9-P or Z9-PE.
 - b. In the **Device ID** text box, enter the user-defined Device ID identifier for the Z9-P or Z9-PE.

Note: All other parameters in the **System Info** window are Read-only.

8. Click the **Update** button to save the changed information.

9.18. Change the Terminal Server Relay Parameters

Note: See the [Terminal Server Relay Parameters \(on page 372\)](#) for detailed information about the parameters.

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 164](#)

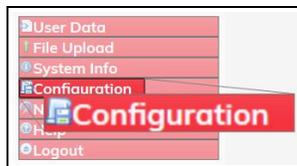


Figure 164: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Terminal Server Relay** tab to access the **Terminal Server Relay** parameters. [Figure 165](#)

Note: See the [Terminal Server Relay Parameters \(on page 372\)](#) for detailed information about the parameters.

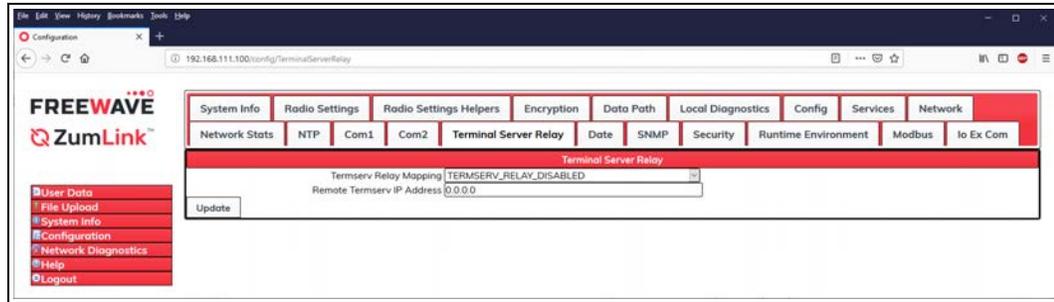


Figure 165: Terminal Server Relay window

7. As applicable, change these parameters:
 - a. Click the **Termserv Relay Mapping** list box arrow and select a setting used for the transfer of a bi-directional byte stream between two serial device servers.
 - b. In the **Remote Termserv IP Address** text box, enter the IP address for the remote terminal server.
8. Click the **Update** button to save the changed information.
9. Restart the Z9-P or Z9-PE for the changes to be implemented.

10. Web Interface - Network Diagnostics

This section provides procedure information about adding, saving, and viewing the Z9-P or Z9-PE **Network Diagnostic** diagrams.

- [Add a Gateway Device IP Address \(on page 154\)](#)
- [Download a Support Bundle \(on page 157\)](#)
- [Save Network Diagnostics \(on page 160\)](#)
- [Save a Network Diagram Image \(on page 163\)](#)
- [Show Table in the Network Diagnostics Window \(on page 167\)](#)
- [View the Network Diagnostics - Breadthfirst \(on page 169\)](#)
- [View the Network Diagnostics - Cose-bilkent \(on page 171\)](#)
- [View the Network Diagnostics - Grid \(on page 173\)](#)
- [View the Network Diagnostics - Margin \(on page 175\)](#)
- [View the Network Diagnostics - Margin with Neighbors \(on page 177\)](#)
- [View the Network Diagnostics - RSSI \(on page 180\)](#)
- [View the Network Diagnostics - RSSI with Neighbors \(on page 182\)](#)
- [View the Network Diagnostics - Rx Rate \(on page 185\)](#)
- [View the Network Diagnostics - Tx Rate \(on page 187\)](#)

10.1. Add a Gateway Device IP Address

Usually the Gateway is auto-detected but sometimes this might not happen. This procedure allows the user to designate a specific Gateway IP address.

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

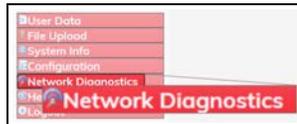


Figure 166: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 167](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

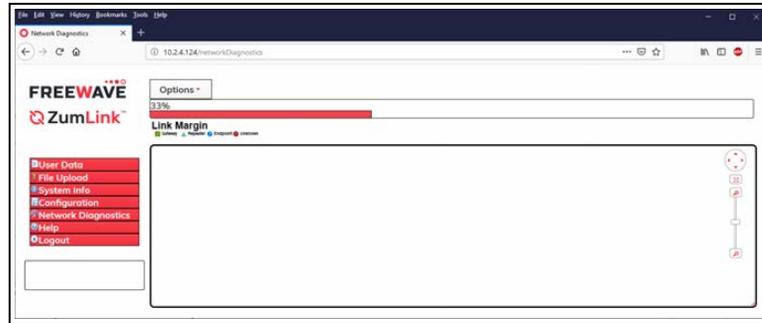


Figure 167: Network Diagnostics window - Scanning Network



To update the [Network Diagnostics window \(on page 412\)](#), refresh the browser to clear the browser cache.

6. Click the **Options** list box arrow and select the **Gateway IP** option. [Figure 168](#)

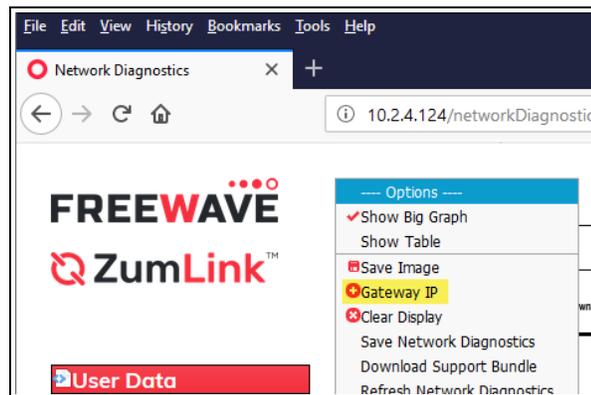


Figure 168: Options list box - Gateway IP option Selected

The **Add Device IP** dialog box opens showing the currently designated Gateway IP address. [Figure 169](#)

Note: The image shows the IP address blocked out.

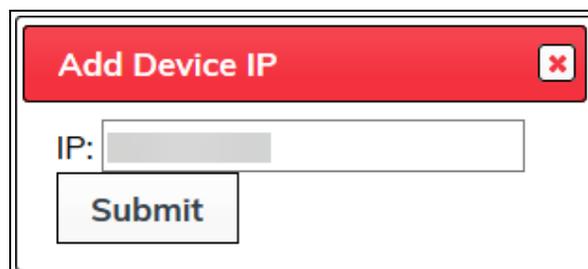


Figure 169: Add Device IP dialog box

7. In the **IP** text box, enter the IP address of the designated a Gateway device and click **Submit**.

Important! Network settings are NOT changed when the Gateway IP address is specified.

10.2. Download a Support Bundle

Save the current network performance reading to send to FreeWave Technical Support for faster issue resolution.

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

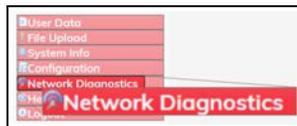


Figure 170: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 171](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

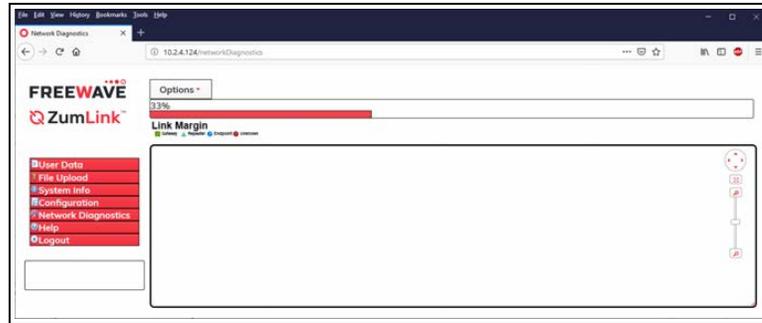


Figure 171: Network Diagnostics window - Scanning Network



To update the [Network Diagnostics window \(on page 412\)](#), refresh the browser to clear the browser cache.

6. Click the **Options** list box arrow and select the **Download Support Bundle** option. [Figure 172](#)

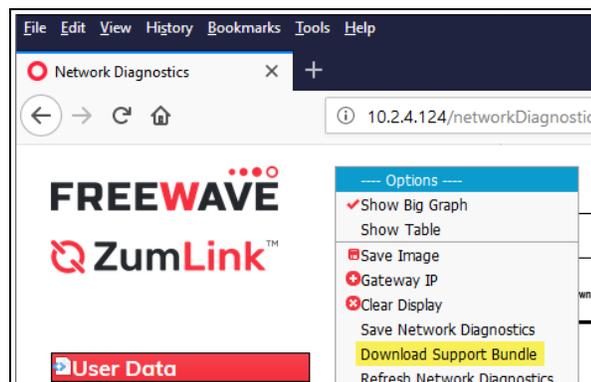


Figure 172: Options list box - Download Support Bundle option Selected

The **Opening support_bundle_nnn.zip** dialog box opens. [Figure 173](#)

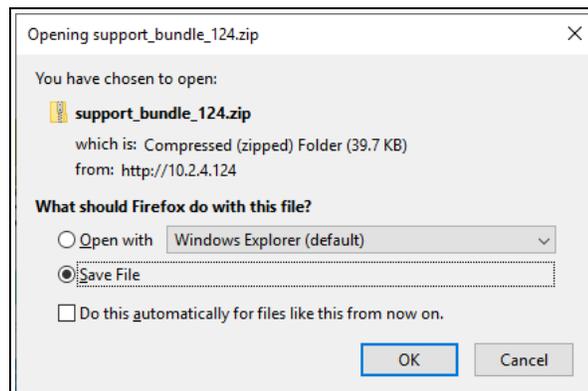


Figure 173: Opening support_bundle_nnn.zip dialog box

Note: Where nnn is the selected device in the **Network Diagram**.

7. Click **OK**.
The **Enter name of file to save to** dialog box opens.
8. Search for and select a location to save the **.zip** file to and click **Save**.
The **Enter name of file to save to** dialog box closes.
9. [Contact FreeWave Technical Support \(on page 14\)](#) for information on where to send the saved **.zip** file.

10.3. Save Network Diagnostics

Use this procedure to save the current network performance reading for later review and to monitor network performance over time.

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

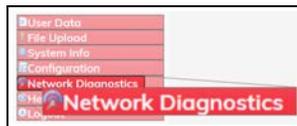


Figure 174: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 175](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

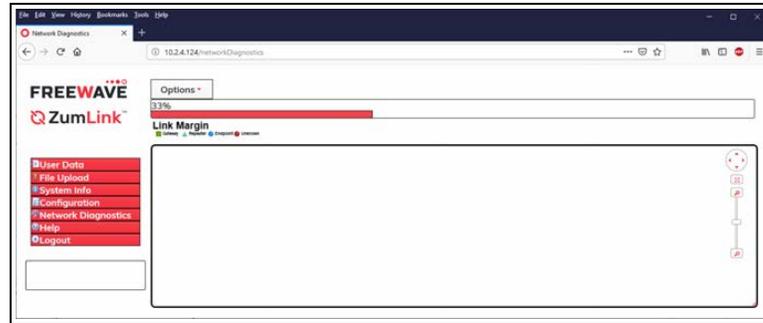


Figure 175: Network Diagnostics window - Scanning Network



To update the [Network Diagnostics window \(on page 412\)](#), refresh the browser to clear the browser cache.

- Click the **Options** list box arrow and select the **Save Network Diagnostics** option. [Figure 176](#)

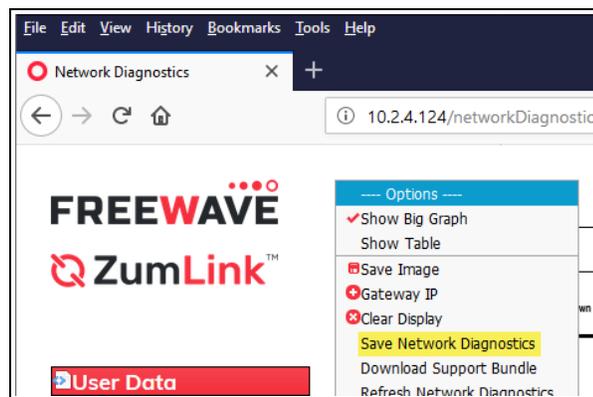


Figure 176: Options list box - Save Network Diagnostics option Selected

The **Opening network_diag.json** dialog box opens. [Figure 177](#)

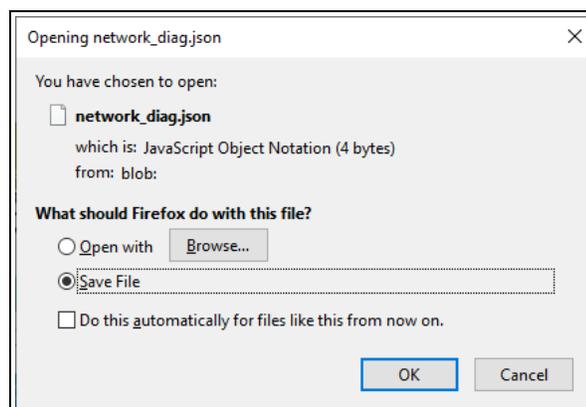


Figure 177: Opening network_diag.json dialog box

7. Click **OK**.

The **Enter name of file to save to** dialog box opens.

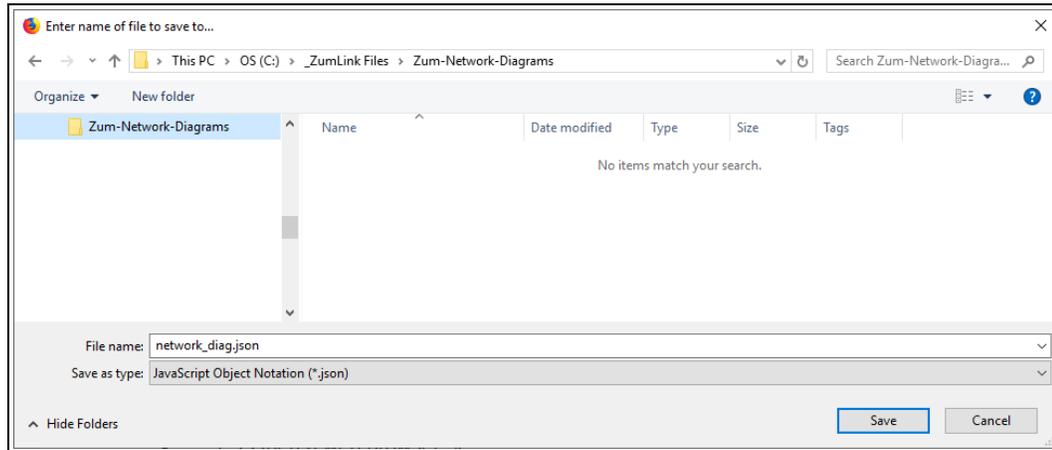


Figure 178: Opening network_diag.json dialog box

8. Search for and select a location to save the **.json** file to and click **Save**.
The **Enter name of file to save to** dialog box closes.
9. Open a **Windows® File Explorer** window and find the location where the **.json** file was saved.
10. Open the **.json** file to review the current network performance reading and monitor network performance over time.

10.4. Save a Network Diagram Image

This procedure is used to track changes in the network using images of the **Network Diagram**.

Note: The diagram is saved as a **.PNG** file.
The images in this procedure are for **Windows® 10** and/or **Firefox®**.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

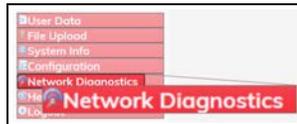


Figure 179: Network Diagnostics link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 180](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

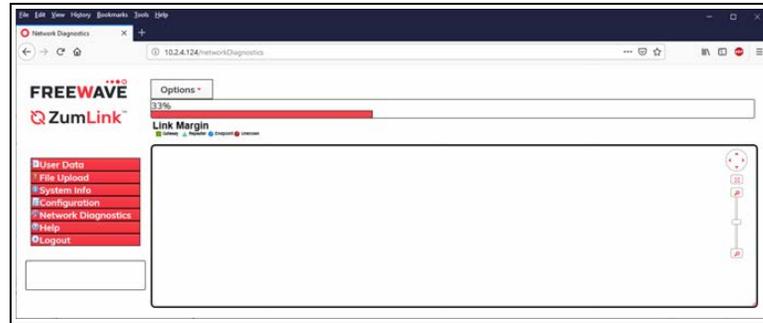


Figure 180: Network Diagnostics window - Scanning Network



To update the [Network Diagnostics window \(on page 412\)](#), refresh the browser to clear the browser cache.

6. Click the **Options** list box arrow and select the **Save Image** option. [Figure 181](#)

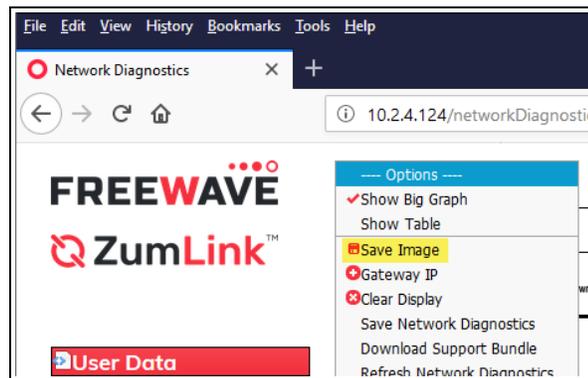


Figure 181: Options list box - Save Image option Selected

The **Save Image** dialog box opens.

7. In the **Save Image** text box, enter a descriptive name for the network image and click **Submit**. [Figure 182](#)

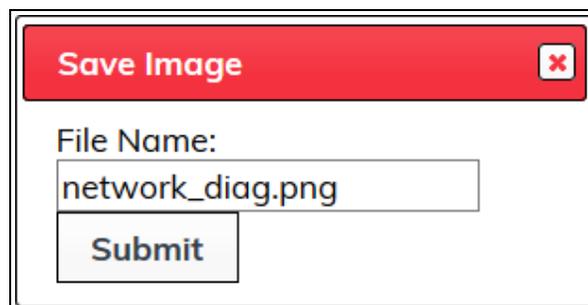


Figure 182: Save Image dialog box

The **Opening _____ .png** dialog box opens. [Figure 183](#)

Note: Where _____ is the entered name of the image file.

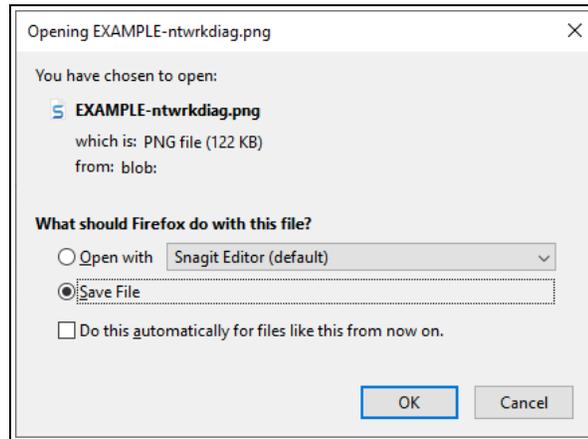


Figure 183: Opening _____ .png dialog box

8. Click **OK**.
The **Enter name of file to save to** dialog box opens. [Figure 184](#)

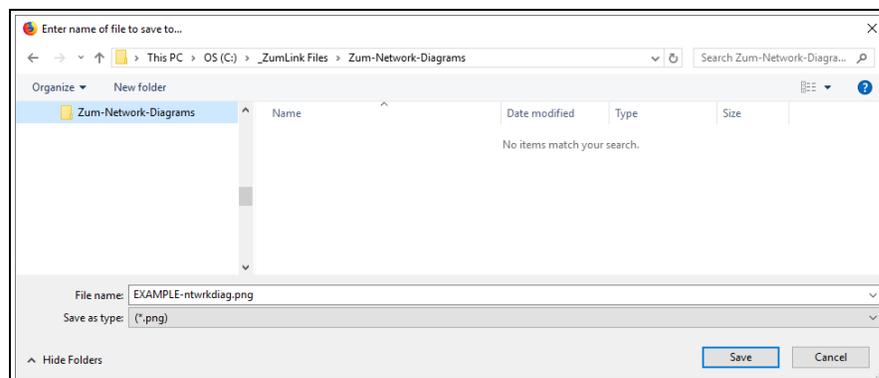


Figure 184: Enter name of file to save to dialog box

9. Search for and select a location to save the **.PNG** file to and click **Save**.
10. Open a Windows® Explorer window and find the location where the **.PNG** file was saved.
11. Open the **.PNG** file to review the changes in the network using the **Network Diagram**.
[Figure 185](#)

10.5. Show Table in the Network Diagnostics Window

Use this procedure to view the connection table of the device selected in the **Network Diagram**.

Note: The images in this procedure are for **Windows® 10** and/or **Firefox®**.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

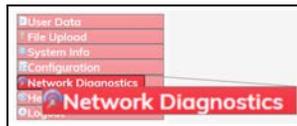


Figure 186: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 187](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

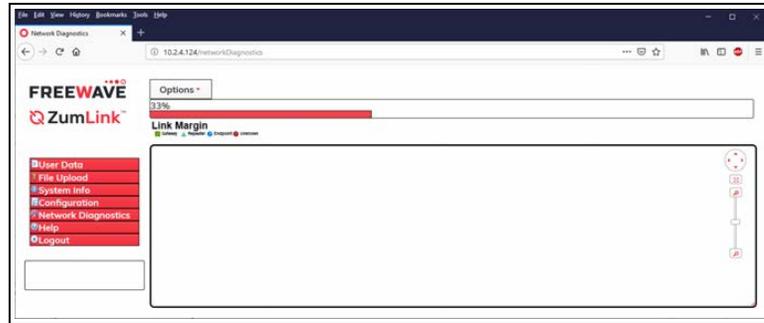


Figure 187: Network Diagnostics window - Scanning Network

The **Link Margin** connections appear in the **Network Diagram**.

6. In the **Options** list box, select the **Show Table** option to view the radio connection table of the selected device below the **Network Diagram**. [Figure 188](#)

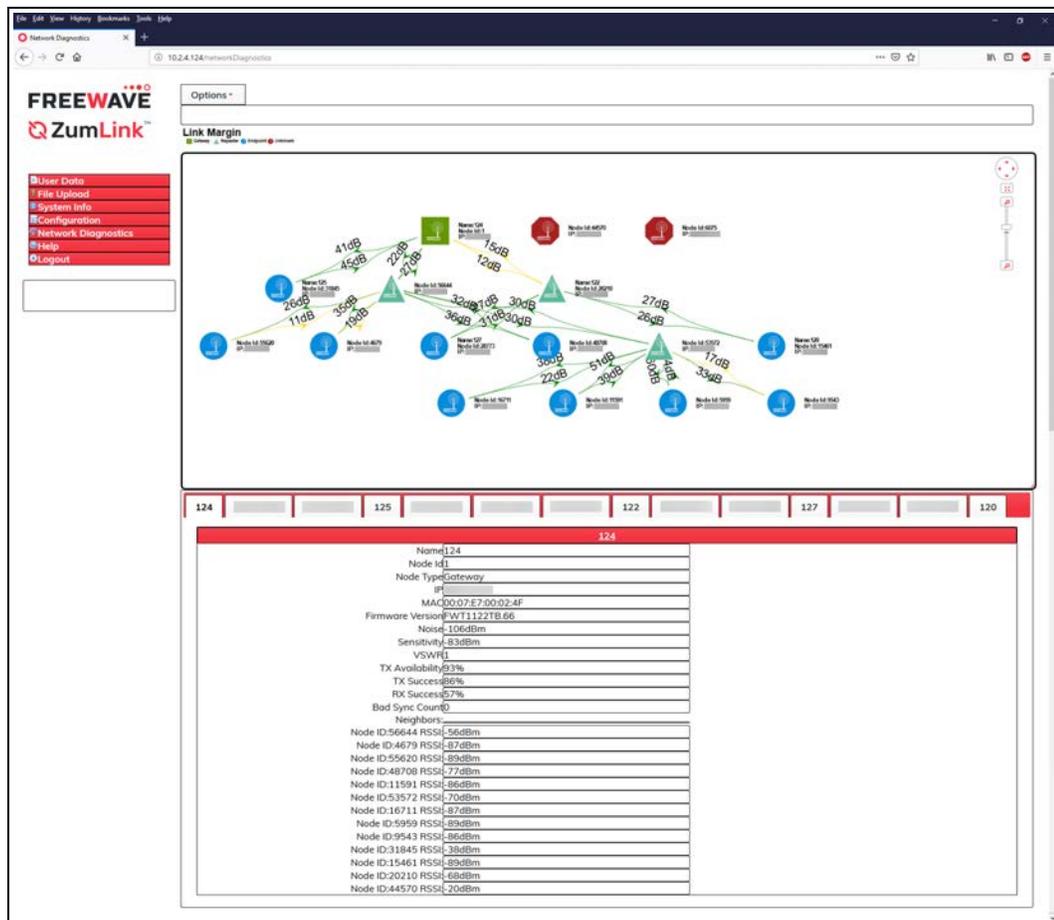


Figure 188: Network Diagnostics window with Show Tables Selected

10.6. View the Network Diagnostics - Breadthfirst

Use the **Breadthfirst Network Diagram** to view the network in a top-down, organization chart-like view.

- The Gateway is always on top of the network diagram.
- The next layers in the network diagram show Repeaters and Endpoints.

Important!: A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

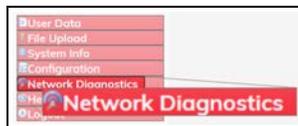


Figure 189: Network Diagnostics link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 190](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

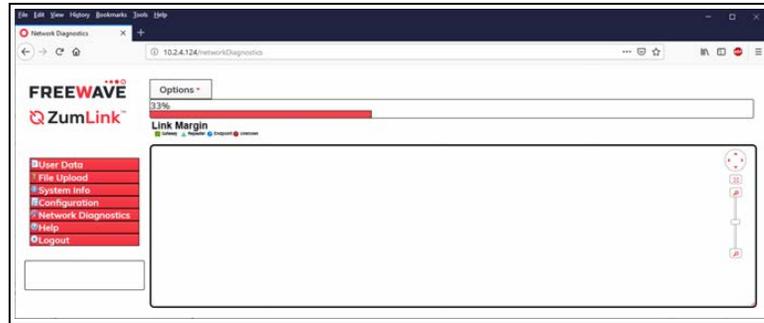


Figure 190: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **Breadthfirst** option to show the Breadthfirst connections in the **Network Diagram**. [Figure 191](#)

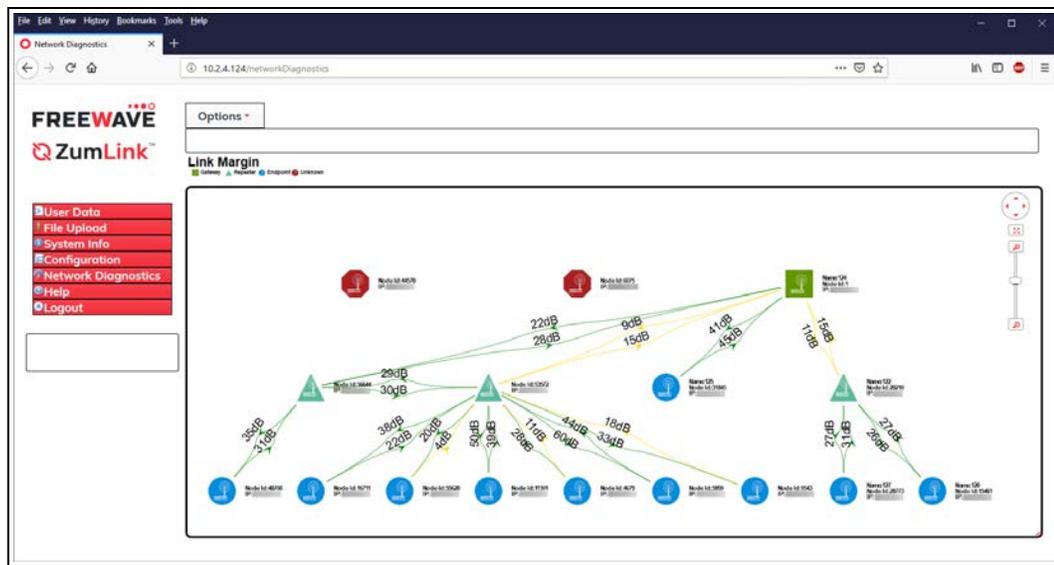


Figure 191: Network Diagnostics window - Breadthfirst



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

10.7. View the Network Diagnostics - Cose-bilkent

Use the **Cose-bilkent Network Diagram** to view the Gateway surrounded by the Repeaters and Endpoints.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

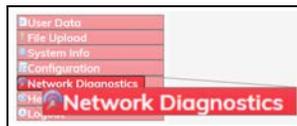


Figure 192: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 193](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

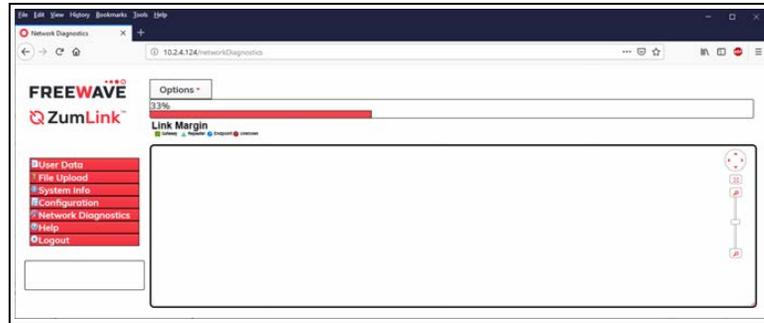


Figure 193: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **Cose-bilkent** option to show the **Cose-bilkent** connections in the **Network Diagram**. [Figure 194](#)

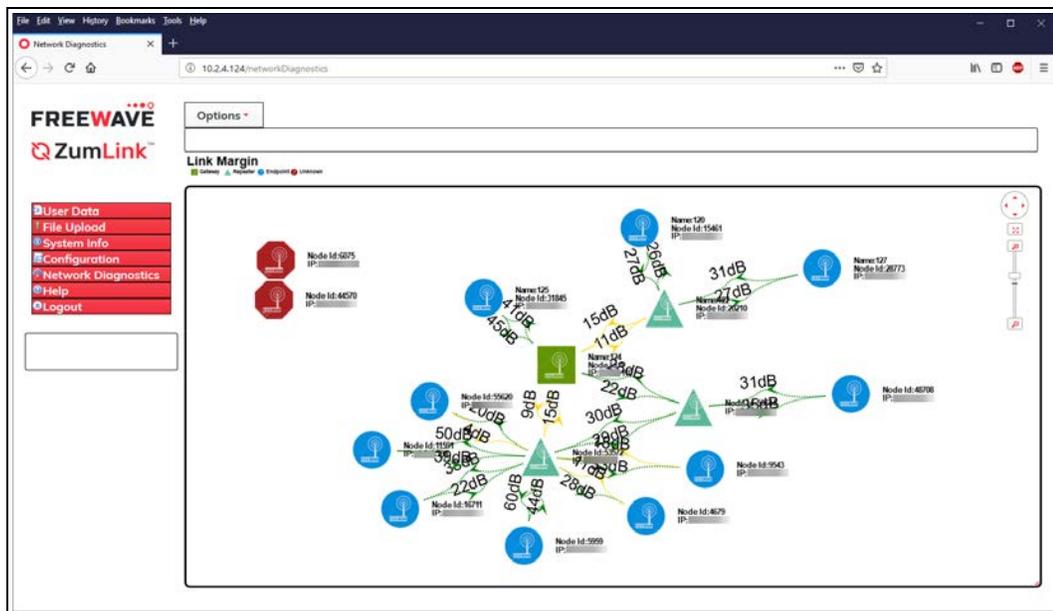


Figure 194: Network Diagnostics window - Cose-bilkent



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

10.8. View the Network Diagnostics - Grid

View a **Grid Network Diagram** to show the network in a column - row layout.

Important!: A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

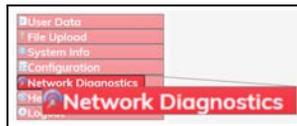


Figure 195: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 196](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

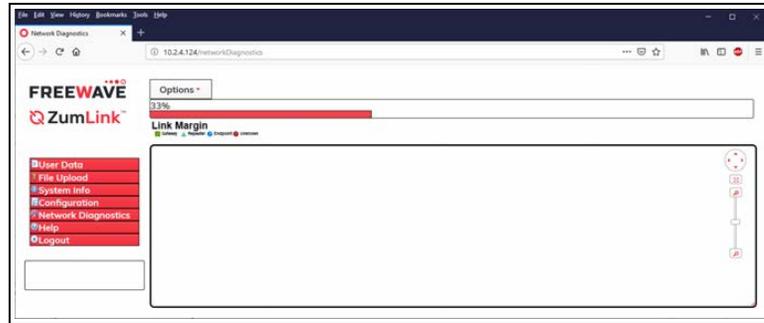


Figure 196: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **Grid** option to show the **Grid** connections in the **Network Diagram**. [Figure 197](#)

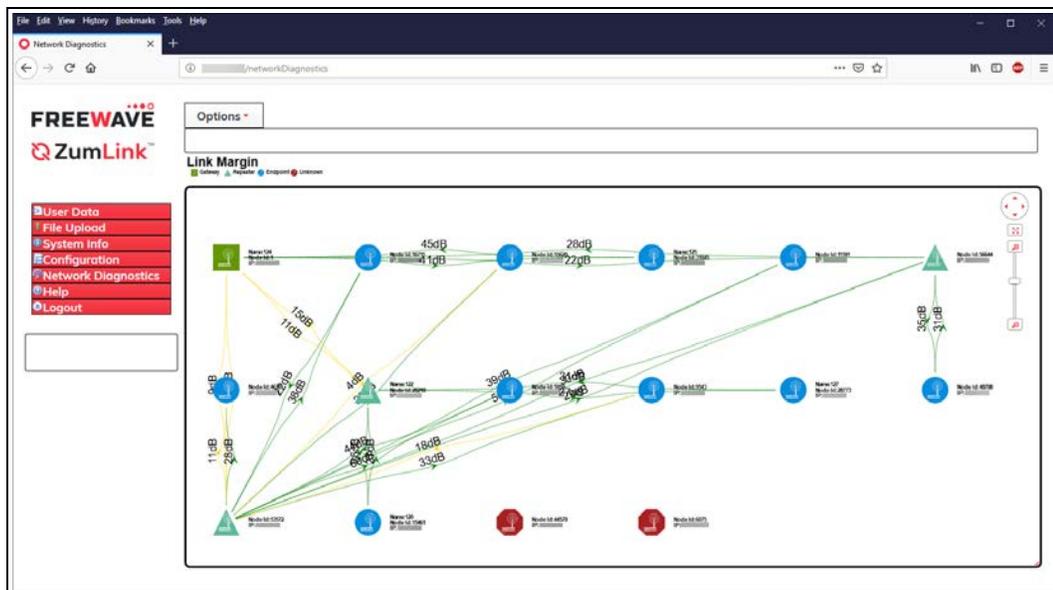


Figure 197: Network Diagnostics window - Grid



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

10.9. View the Network Diagnostics - Margin

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

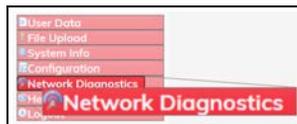


Figure 198: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 199](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

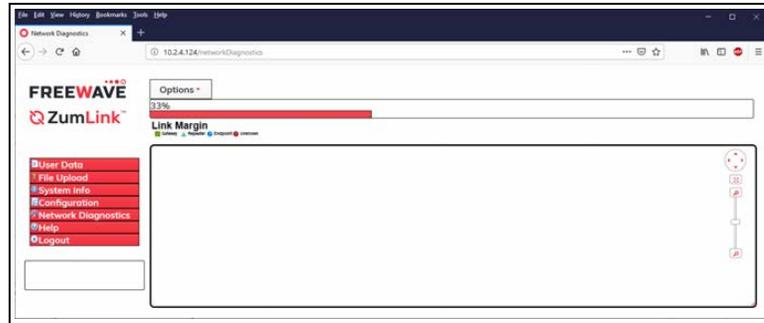


Figure 199: Network Diagnostics window - Scanning Network

The **Link Margin** connections appear in the **Network Diagram** [Figure 200](#)

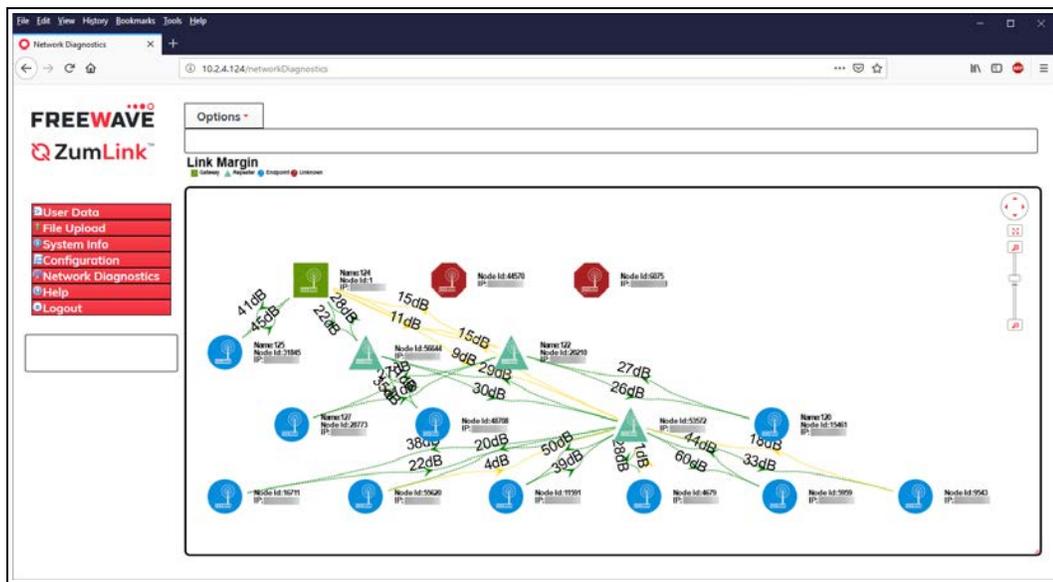


Figure 200: Network Diagnostics window - Link Margin



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

10.10. View the Network Diagnostics - Margin with Neighbors

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

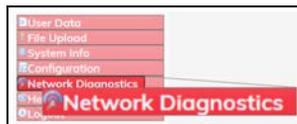


Figure 201: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 202](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

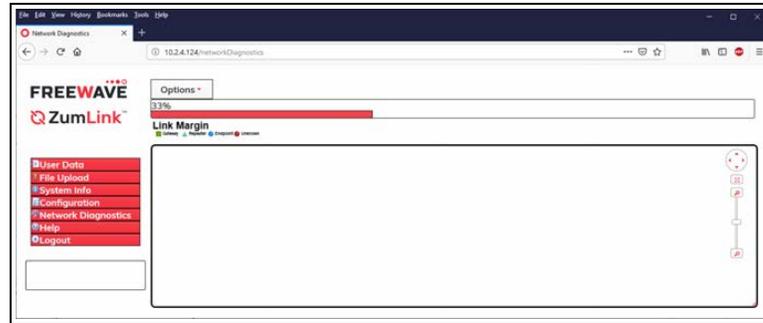


Figure 202: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **Margin with Neighbors** option to show the **Margin with Neighbors** connections in the **Network Diagram**. [Figure 203](#)

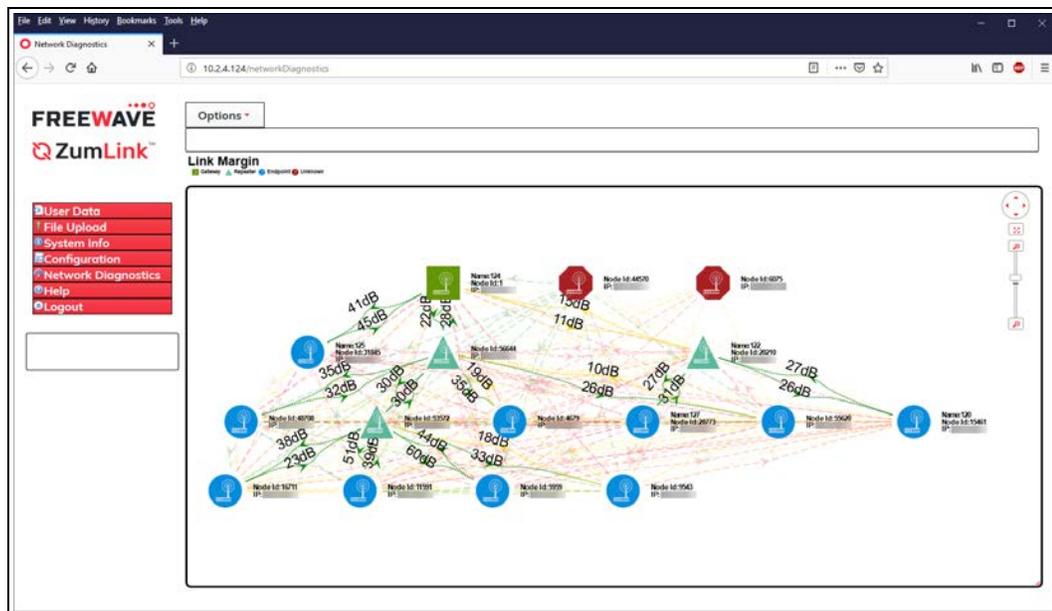


Figure 203: Network Diagnostics window - Margin with Neighbors



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

- Optional: Use the cursor to hover over the Gateway-Endpoint link to view the dBm rate. [Figure 204](#)

Note: The image provides example information only.
Each Z9-P or Z9-PE provides its own unique information.

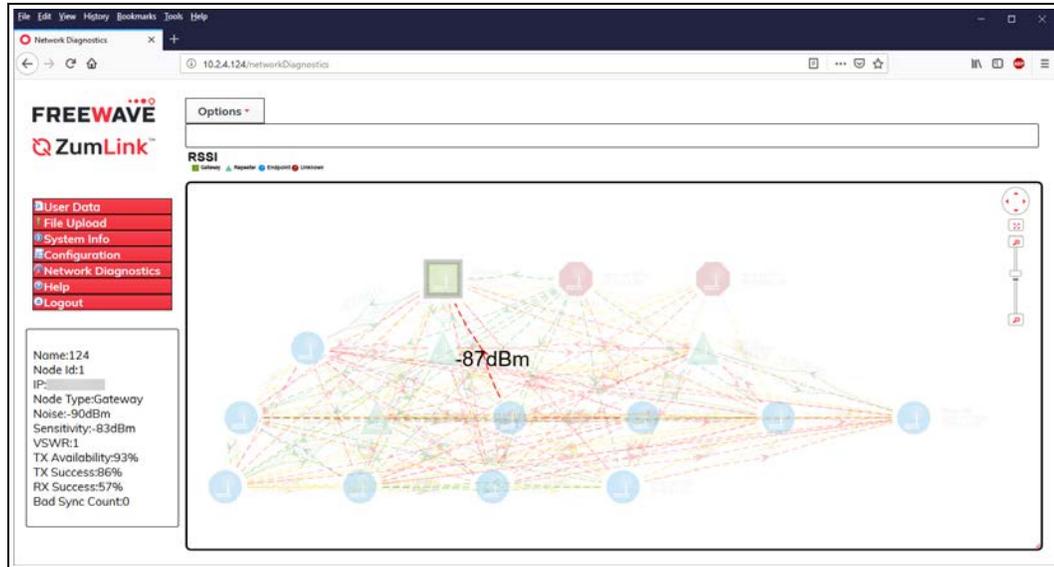


Figure 204: Network Diagnostics window - Margin with Neighbors - Gateway-Endpoint Link

10.11. View the Network Diagnostics - RSSI

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

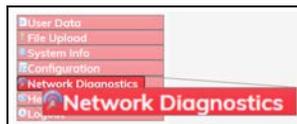


Figure 205: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 206](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

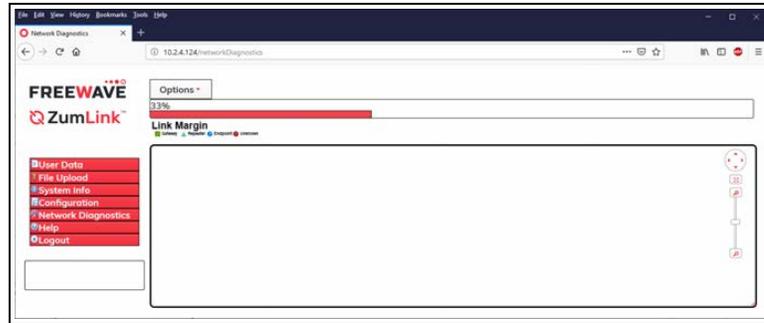


Figure 206: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **RSSI** option to show the **RSSI** connections in the **Network Diagram**. [Figure 207](#)

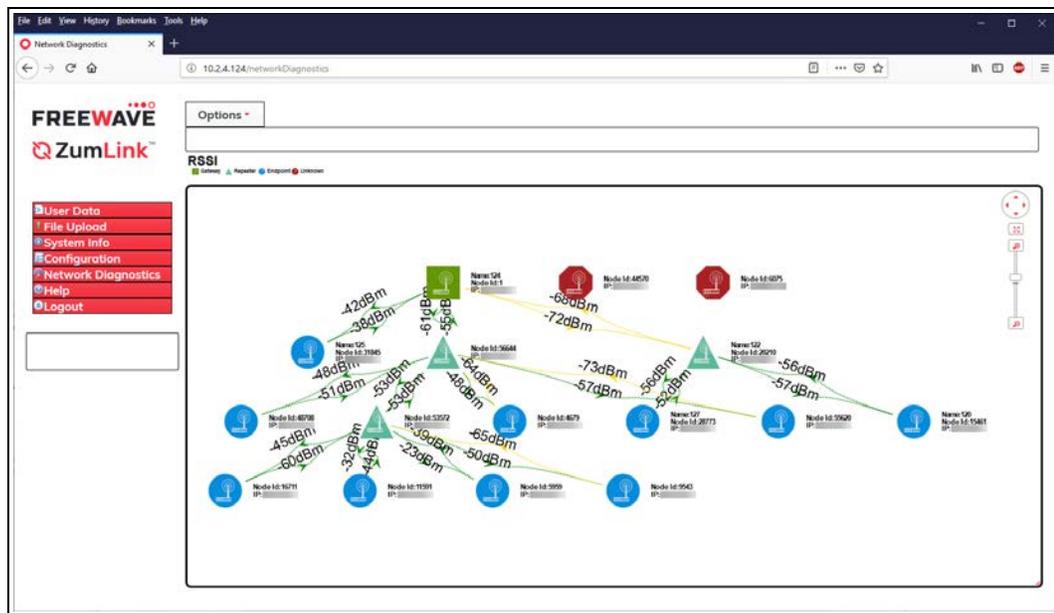


Figure 207: Network Diagnostics window - RSSI



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

10.12. View the Network Diagnostics - RSSI with Neighbors

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

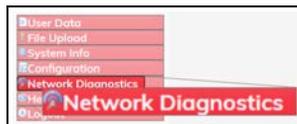


Figure 208: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 209](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

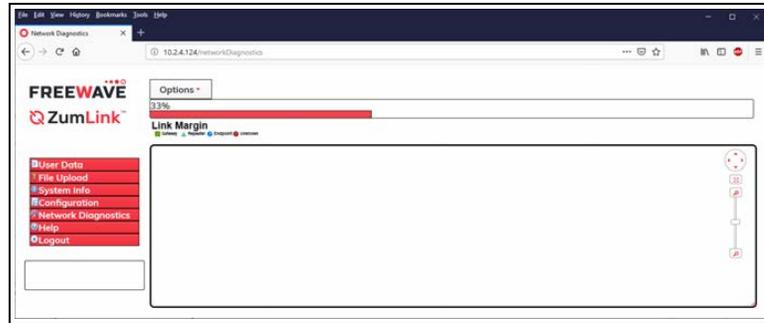


Figure 209: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **RSSI with Neighbors** option to show the **RSSI with Neighbors** connections in the **Network Diagram**. [Figure 210](#)

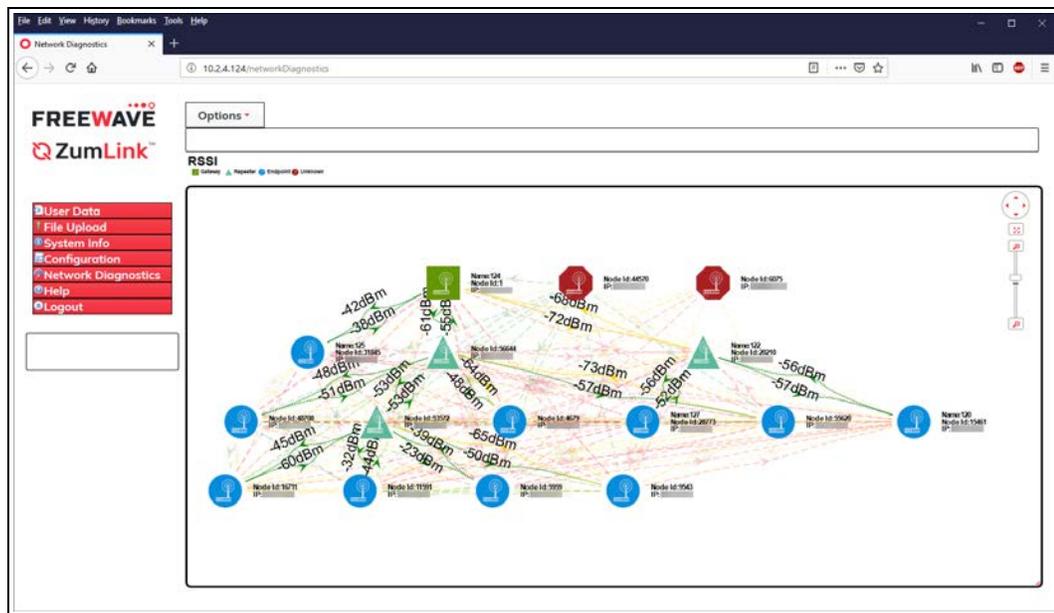


Figure 210: Network Diagnostics window - RSSI with Neighbors



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

- Optional: Use the cursor to hover over the Gateway-Endpoint link to view the dBm rate. [Figure 211](#)

Note: The image provides example information only. Each Z9-P or Z9-PE provides its own unique information.

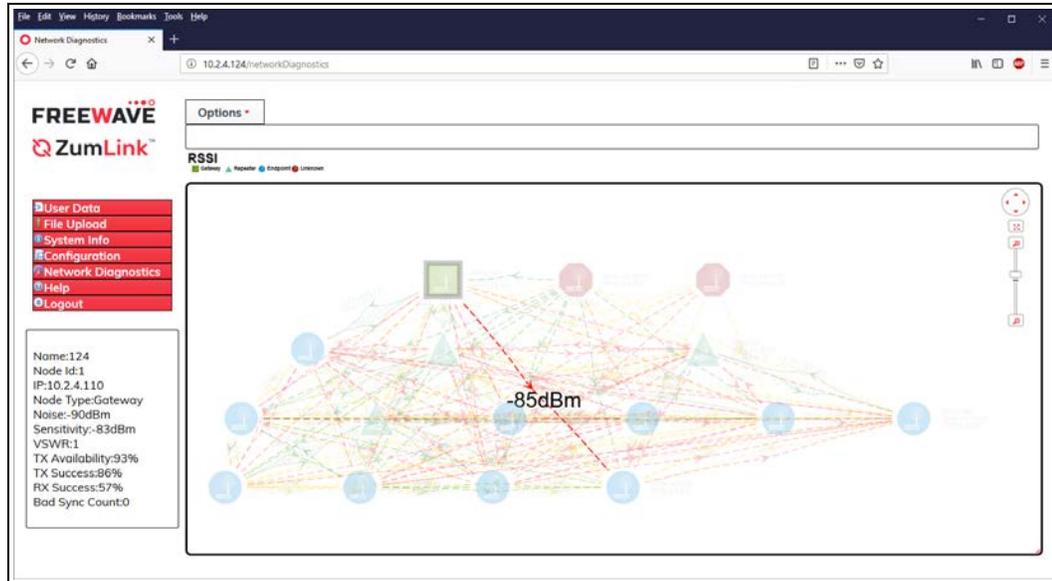


Figure 211: Network Diagnostics window - RSSI with Neighbors - Gateway-Endpoint Link

10.13. View the Network Diagnostics - Rx Rate

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

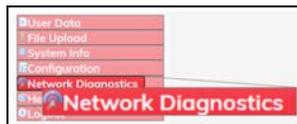


Figure 212: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 213](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

10.14. View the Network Diagnostics - Tx Rate

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Procedure

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

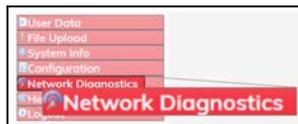


Figure 215: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 216](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

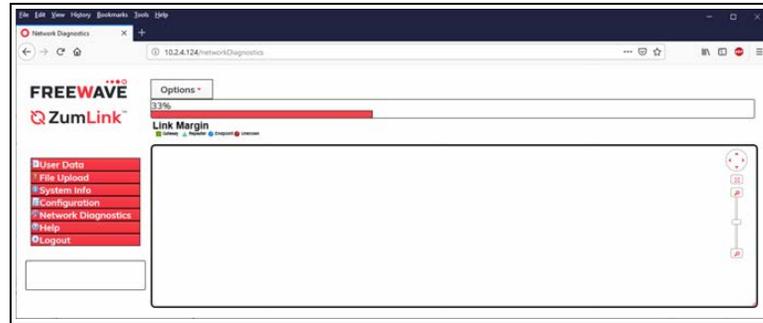


Figure 216: Network Diagnostics window - Scanning Network

- Click the **Options** list box arrow and select the **Tx Rate** option to show the **Tx Rate** connections in the **Network Diagram**. Figure 217

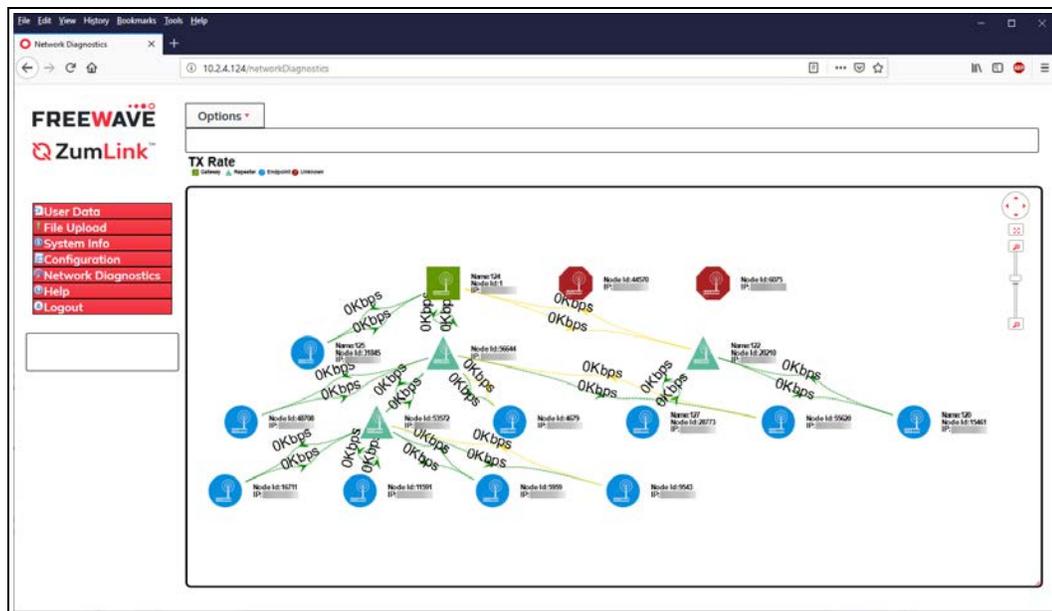


Figure 217: Network Diagnostics window - TX Rate



To update the [Network Diagnostics window](#) (on page 412), refresh the browser to clear the browser cache.

11. Change the Passwords

Important! The Z9-P or Z9-PE password is ONLY changed through the CLI.
See [CLI Configuration \(on page 60\)](#) to connect via CLI.

FREEWAVE Recommends: From a security standpoint, it is best practice to change **both** the **admin** password and the **devuser** passwords.

- [Change the ADMIN Password \(on page 190\)](#)
- [Change the DEVUSER Password \(on page 190\)](#)

11.1. Change the ADMIN Password

1. Login to the FreeWave CLI using `admin` and the current `password`.
2. Use this command format to change the password:
`system.password=[oldpassword] , [newpassword] , [newpassword]` and press <Enter>.

Example: `system.password=admin,12345,12345.`

Note: An error message appears when there is an error in typing the new password command.

11.2. Change the DEVUSER Password



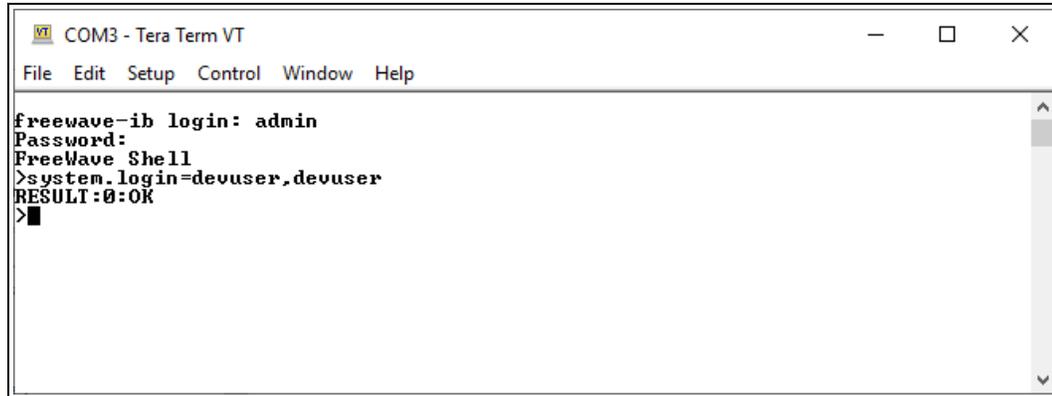
Warning! Do NOT use the Linux command `passwd` to change passwords. Passwords **must be changed** using the FreeWave CLI to keep them synchronized between the FreeWave CLI and the Linux Bash shell.

1. Login to the FreeWave CLI using `admin` and the current `password`. The **FreeWave Shell** returns. [Figure 218](#)

```
COM6 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login: admin
Password:
FreeWave Shell
>
```

Figure 218: FreeWave Shell

2. At the > prompt, type `system.login=devuser , devuser` and press <Enter>. The **devuser** is now logged in. [Figure 219](#)



```
COM3 - Tera Term VT
File Edit Setup Control Window Help

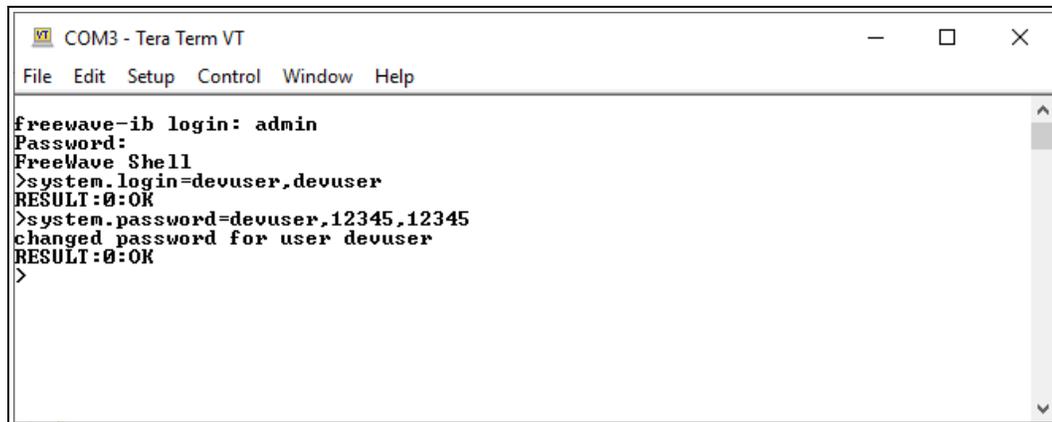
freewave-ib login: admin
Password:
FreeWave Shell
>system.login=devuser,devuser
RESULT:0:OK
>
```

Figure 219: devuser Logged In

3. At the > prompt, type `system.password=devuser,nnnnn,nnnnn` and press <Enter>.

Note: Where `devuser` is the current password and `nnnnn` is the new devuser password.

The CLI shows the new password was accepted. [Figure 220](#)



```
COM3 - Tera Term VT
File Edit Setup Control Window Help

freewave-ib login: admin
Password:
FreeWave Shell
>system.login=devuser,devuser
RESULT:0:OK
>system.password=devuser,12345,12345
changed password for user devuser
RESULT:0:OK
>
```

Figure 220: Accepted devuser New Password

12. IP Filtering

IP Filtering is used to allow only traffic in a designated IP subnet to traverse the radio network.

- Within the radio subnet, the IPv4, TCP, ICMP (ping), ARP, and UDP traffic is permitted to traverse the radio network, while all other Ethernet traffic is blocked.
- The IP Filtering setting does NOT need to match on all the radios in the network. Only enable IP Filtering on individual radios with incoming LAN Ethernet traffic to filter from the network.



IP Filtering can prevent non-radio Ethernet traffic from adversely affecting the performance and capacity of the radio network.

Procedure

Note: This procedure provides a **Tera Term** terminal connection to the FreeWave CLI. Other terminal emulators (e.g., **HyperTerminal**, **PuTTY**) may be used. The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

1. On the computer connected to the Z9-P or Z9-PE, open a terminal program (e.g., **Tera Term** <http://ttssh2.osdn.jp/>).
2. In **Tera Term**, click the **File** menu and select **New Connection**. [Figure 221](#)

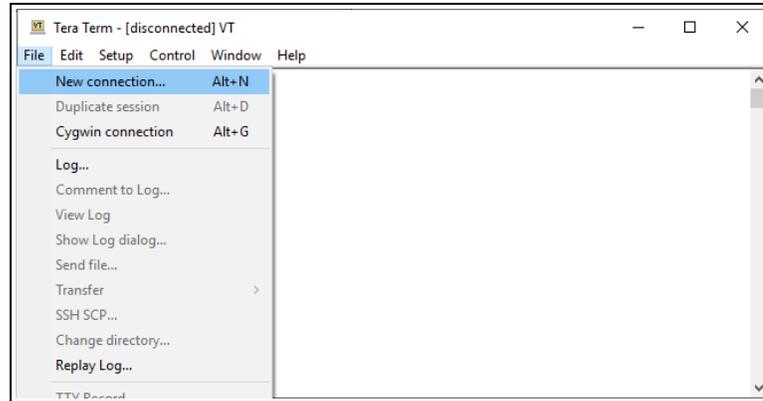


Figure 221: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P or Z9-PE is connected to. [Figure 222](#)

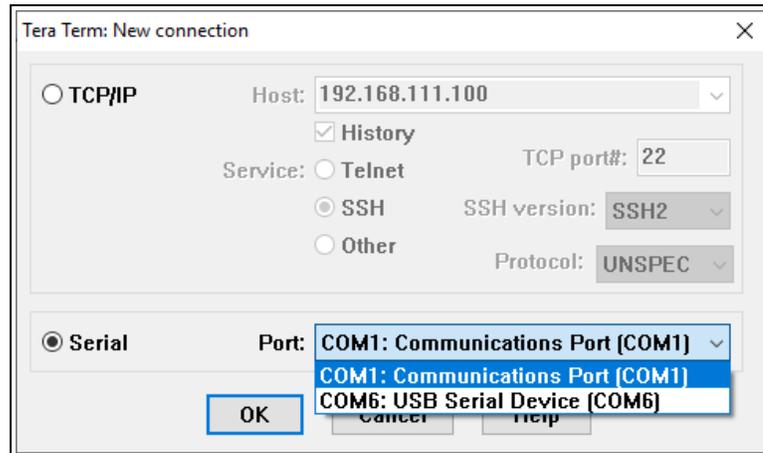


Figure 222: Select the Z9-P or Z9-PE COM Port

Important! The **Port** assignment varies from computer to computer.

4. 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.
5. In the **Tera Term** window, click the **Setup** menu and select **Serial Port**. [Figure 223](#)

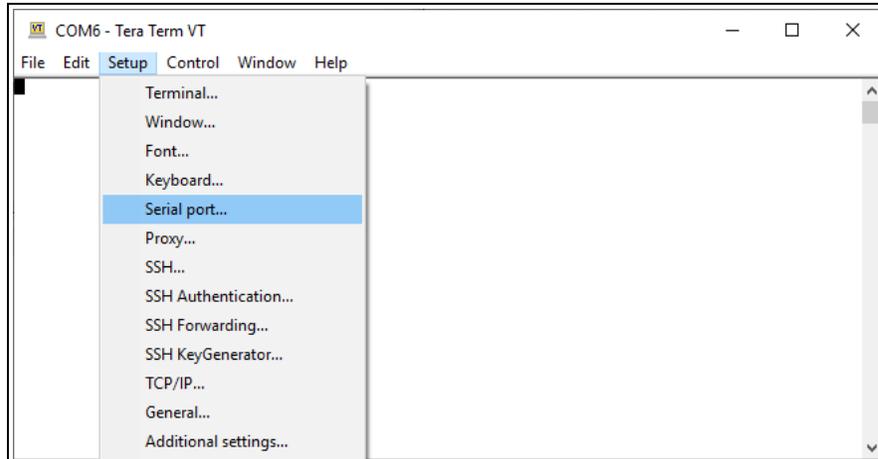


Figure 223: Setup menu > Serial Port

The **Tera Term: Serial Port Setup** dialog box opens. [Figure 224](#)

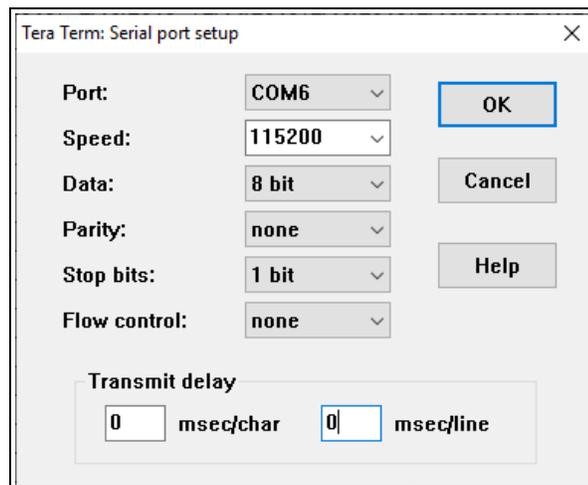
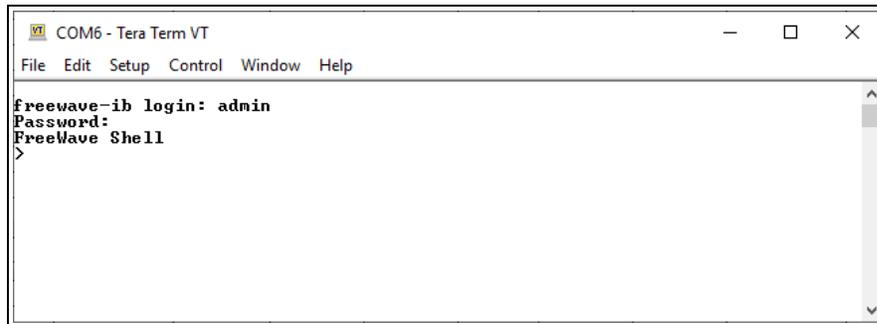


Figure 224: Tera Term: Serial Port Setup dialog box with Default Settings

6. Using [Figure 224](#) as the example, verify the COM port settings are:
 - Speed** (Baud Rate): 115200
 - Data** (Databits): 8 bit
 - Parity**: none
 - Stop bits**: 1 bit
7. Click **OK** to save the changes and close the dialog box.
8. In the **Tera Term** window, press <Enter>.
 - The FreeWave CLI Login returns.
9. Enter **admin** for the **Username** and press <Enter>.
10. Enter **admin** for the **Password** and press <Enter>.

Note: The default username and password is **admin**.
If the **User Name** or **Password** were changed, enter the applicable information.
The password does not appear when typing - it looks blank.

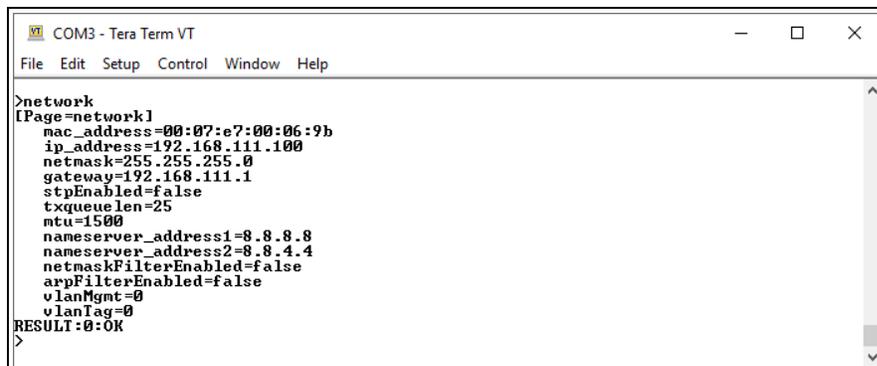
The **FreeWave Shell** opens. [Figure 225](#)



```
COM6 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login: admin
Password:
FreeWave Shell
>
```

Figure 225: FreeWave Shell

- At the > prompt, type **network** and press <Enter>. The Z9-P or Z9-PE **network** settings appear.



```
COM3 - Tera Term VT
File Edit Setup Control Window Help
>network
[Page=network]
mac_address=00:07:e7:00:06:9b
ip_address=192.168.111.100
netmask=255.255.255.0
gateway=192.168.111.1
stpEnabled=false
txqueue len=25
mtu=1500
nameserver_address1=8.8.8.8
nameserver_address2=8.8.4.4
netmaskFilterEnabled=false
arpFilterEnabled=false
vlanMgmt=0
vlanTag=0
RESULT:0:OK
>
```

Figure 226: network Settings Page

- At the > prompt, type **network.netmaskFilterEnabled=true** and press <Enter>. The IP Filtering is now active on the **ZumLink** device.



The IP Filtering setting does NOT need to match on all the radios in the network. Only enable IP Filtering on individual radios with incoming LAN Ethernet traffic to filter from the network.

- At the > prompt, type **save** and press <Enter>.

Note: See [Example: Network Topology with Traffic at the Gateway \(on page 196\)](#)

12.1. Example: Network Topology with Traffic at the Gateway

In [Figure 227](#):

- The yellow communication link arrows are used to denote which of the radio units can directly communicate.
- Devices in green can communicate with IPv4.
- Devices in red and other traffic is excluded from **ZumLink** network.

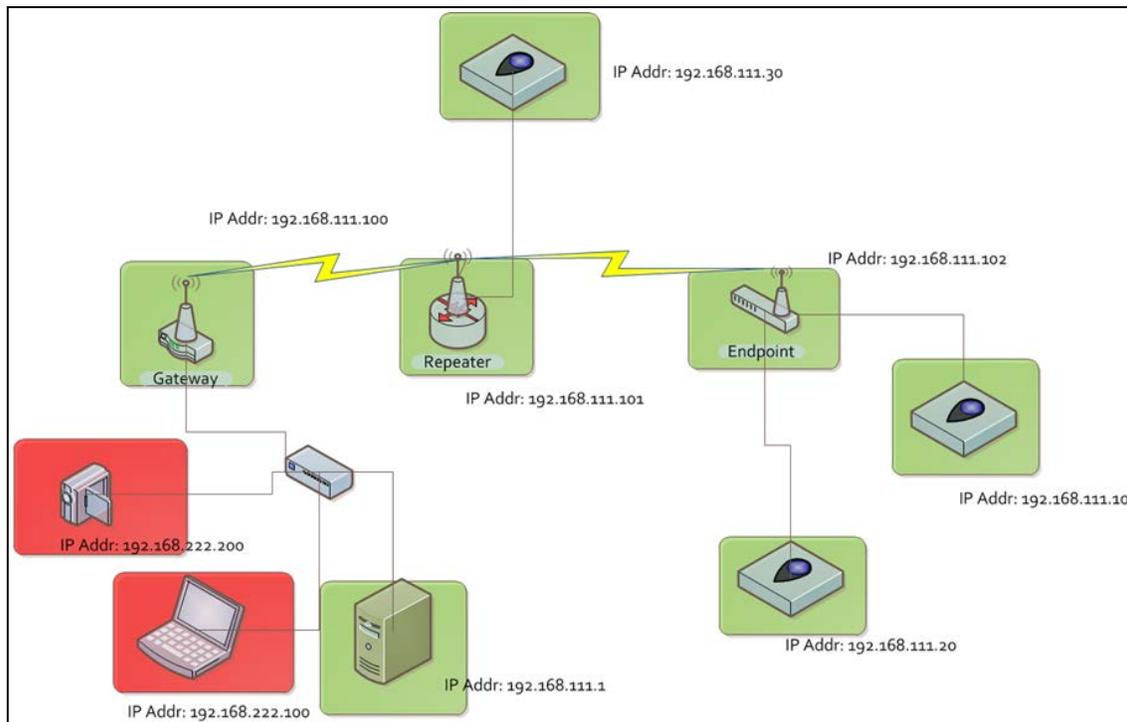


Figure 227: Network Topology with Traffic at the Gateway but not Desired on the Rest of the Network

[Figure 227](#) is a common network topology where IP filtering on the Gateway radio reduces unwanted traffic on the radio network.

In this example:

- Only traffic on the 192.168.111.255 netmask passes over the radio network.
- The red laptop and the camera traffic are on the 222.nnn subnet; their traffic is blocked at the Gateway radio.
- Only IPv4. TCP, UDP, ICMP (ping), and ARP traffic destined to and from the desired subnet is transmitted over the radio network.
- VLAN tagged packets are filtered out because the radio is not considered on the VLAN and therefore VLAN packets cannot be on the same subnet.

13. Repeaters

ZumLink Repeater allows the extension of the **ZumLink** network, forwarding packets between **ZumLink** devices that could otherwise not communicate directly with each other. The advantage of using Repeaters is to reach very long distances and "hop" over or around obstacles like buildings or hills.

The **ZumLink** Repeater can be configured as either a Gateway-Repeater or Endpoint-Repeater.

- The Gateway-Repeater is a Gateway that also repeats packets.
- The Endpoint-Repeater is an Endpoint able to repeat packets and master beacons.

Note: An Endpoint-Repeater strongly favors its wired device over Endpoints it's repeating for.

This section has this information:

- [Repeater - Setup Table \(on page 199\)](#)
 - [Hopping OFF Repeater Setup \(on page 199\)](#)
 - [Hopping ON Repeater Setup \(on page 200\)](#)
- [Basic Gateway and Endpoint-Repeater Setup \(on page 202\)](#)
 - [Open a Terminal Emulator Application \(on page 203\)](#)
 - [Hopping On: Gateway and Endpoint-Repeater Setup \(on page 206\)](#)
 - [Hopping Off: Gateway and Endpoint-Repeater Setup \(on page 208\)](#)
- [Repeater - Examples \(on page 210\)](#)
 - [Gateway-Repeater \(on page 211\)](#)
 - [Endpoint-Repeater \(on page 212\)](#)
 - [Multiple Repeaters: Gateway-Repeater and Endpoint-Repeater \(on page 213\)](#)
 - [Multiple Repeaters: Four Endpoint-Repeaters \(on page 214\)](#)
 - [Back-to-Back Repeaters \(on page 216\)](#)

ZumLink Repeaters support all 5 data rates; 115.2kbps, 250kbps, 500kbps, 1Mbps, and 4Mbps.

- At 115.2kbps and 250kbps data rates, hopping capability must be enabled for the ZumLink Repeaters.
- At 500kbps, 1Mbps, and 4Mbps data rates, hopping capability is optional.

When hopping capability is employed, one radio must be configured as the Gateway (or Gateway-Repeater).

- The beacon from the Gateway radio must be heard by the Repeater.
- The Repeater must also re-send the beacon so that the Endpoints, and downstream Repeaters, it communicates with can stay synchronized with the frequency hopping pattern.
- To keep the Gateway and Endpoint-Repeater beacons from colliding, the Endpoint-Repeater must have their own time slot (radio Repeater slot).
- The Endpoint-Repeater has a radio Repeater slot range from 1-3.
 - A maximum number of 3 Endpoint-Repeaters are supported in an overlapping communication space or RF coverage area.
 - The radio Repeater slot numbers can be reused where there is no RF connectivity or overlap between the reused radio Repeater slots.

Where multiple communication paths are available, the **ZumLink** Repeater can be influenced to a preferred communication path by optimizing the minimum signal level margin. The minimum signal level margin establishes a minimum signal threshold required for a Repeater hop to be considered.

FREEWAVE Recommends: Set the [Beacon Burst Count \(on page 311\)](#) to **2** or more for optimal throughput when Repeaters are used and the RF environment is noisy. This increases the number of beacons sent in a beacon interval.

Caution: The repeating operation occurs on the same frequencies normally used for transmit and receive.



This causes the throughput of the communication path utilizing the Repeater to be reduced by approximately 50 percent with each Repeater hop.

Only communication paths via Repeaters are impacted, communication paths that do not utilize the Repeater remain at full throughput.

13.1. Repeater - Setup Table

These tables show the basic setting configurations in a Repeater network with either:

- [Hopping OFF Repeater Setup \(on page 199\)](#)
- [Hopping ON Repeater Setup \(on page 200\)](#)

Note: For detailed procedures, see [Basic Gateway and Endpoint-Repeater Setup \(on page 202\)](#).

13.1.1. Hopping OFF Repeater Setup

The settings in this table assumes that `radioSettings.radioHoppingMode=Hopping_Off`.

- Hopping is required at data rates below 500kbps.
- Hopping is optional at data rate 500kbps or above.
- With hopping disabled, a Gateway or Gateway-Repeater is optional.

Repeater Network Configuration			
radioSettings Setting*	Gateway Setup	Endpoint-Repeater Setup	Endpoint Setup
radioMode=	Gateway	Endpoint_Repeater	Endpoint
nodeId=	N/A	= unique Node ID for each device	= unique Node ID for each device
networkId=	= same Network ID for all devices	= same Network ID for all devices	= same Network ID for all devices
rfDataRate=	= same Data Rate for all devices	= same Data Rate for all devices	= same Data Rate for all devices
dataPath Setting*	Gateway Setup	Endpoint-Repeater Setup	Endpoint Setup
routeMinSignalMarginThresh=	= desired Link Signal Margin minus 4dB	= desired Link Signal Margin minus 4dB	= desired Link Signal Margin minus 4dB
network Setting*	Gateway Setup	Endpoint-Repeater Setup	Endpoint Setup
ip_address=	= unique IP address for each device.	= unique IP address for each device.	= unique IP address for each device.

Note: *See the [Data Path Parameters \(on page 242\)](#), [Network Parameters \(on page 288\)](#), or [Radio Settings Parameters \(on page 310\)](#) for additional information.

13.1.2. Hopping ON Repeater Setup

The settings in this table assumes that `radioSettings.radioHoppingMode=Hopping_On`.

- Hopping is required at data rates below 500kbps.
- Hopping is optional at data rate 500kbps or above.
- With hopping enabled, a Gateway or Gateway-Repeater must be configured.

Repeater Network Configuration			
radioSettings Setting****	Gateway Setup	Endpoint-Repeater Setup	Endpoint Setup
radioMode=	Gateway	Endpoint_Repeater	Endpoint
nodeId=	N/A	= unique Node ID for each device	= unique Node ID for each device
networkId=	= same Network ID for all devices	= same Network ID for all devices	= same Network ID for all devices
rfDataRate=	= same Data Rate for all devices	= same Data Rate for all devices	= same Data Rate for all devices
radioMaxRepeaters=	0-3 ¹	NA	NA
radioRepeaterSlot=	NA	1-3 ²	NA
beaconBurstCount=	1-7 ³	NA	NA
dataPath Setting****	Gateway Setup	Endpoint-Repeater Setup	Endpoint Setup
routeMinSignalMarginThresh=	= desired Link Signal Margin minus 4dB	= desired Link Signal Margin minus 4dB	= desired Link Signal Margin minus 4dB
network Setting****	Gateway Setup	Endpoint-Repeater Setup	Endpoint Setup
ip_address=	= unique IP address for each device.	= unique IP address for each device.	= unique IP address for each device.

1. Set the **radioMaxRepeaters** to match the number of overlapping Repeaters with a maximum of 3.
 - Setting this value too high adds unnecessary latency to the network.
 - In this example, set this to 1.
2. Set the **radioRepeaterSlot** to designate which Repeater slot to use, up to the **radioMaxRepeaters** setting.
 - In this example, set this to 1.

3. Set the [Beacon Burst Count \(on page 311\)](#) to **2** or more for optimal throughput when Repeaters are used and the RF environment is noisy.
This increases the number of beacons sent in a beacon interval.

Note: ****See the [Data Path Parameters \(on page 242\)](#), [Network Parameters \(on page 288\)](#), or [Radio Settings Parameters \(on page 310\)](#) for additional information.

13.2. Basic Gateway and Endpoint-Repeater Setup

Important! This procedure assumes the user has 3 new **ZumLink** devices.
The number of Endpoint-Repeaters in the network **must be known before** starting this procedure.

The basic setup procedures are:

- A. [Open a Terminal Emulator Application \(on page 203\)](#)
- B. Configure using either:
 - [Hopping On: Gateway and Endpoint-Repeater Setup \(on page 206\)](#)
 - or
 - [Hopping Off: Gateway and Endpoint-Repeater Setup \(on page 208\)](#)

13.2.1. Open a Terminal Emulator Application

Note: This procedure provides a **Tera Term** terminal connection to the FreeWave CLI. Other terminal emulators (e.g., **HyperTerminal**, **PuTTY**) may be used. The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

1. On the computer connected to the Z9-P or Z9-PE, open a terminal program (e.g., **Tera Term** <http://ttssh2.osdn.jp/>).
2. In **Tera Term**, click the **File** menu and select **New Connection**. [Figure 228](#)

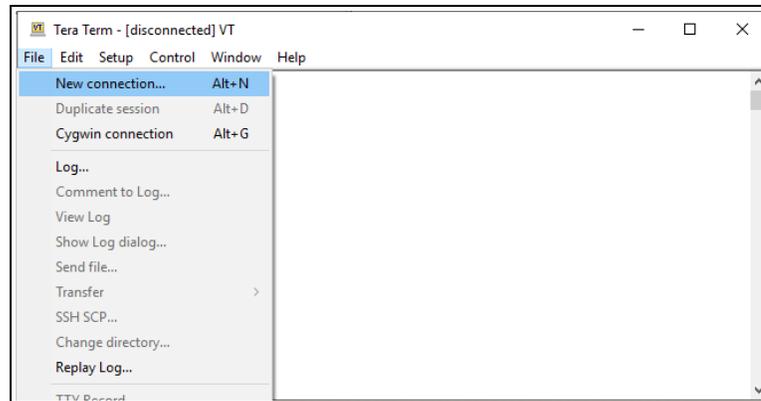


Figure 228: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P or Z9-PE is connected to. [Figure 229](#)

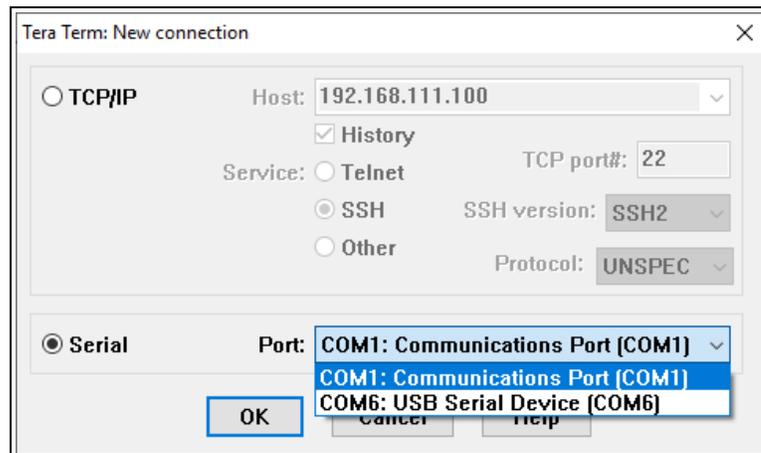


Figure 229: Select the Z9-P or Z9-PE COM Port

Important! The **Port** assignment varies from computer to computer.

4. 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.
5. In the **Tera Term** window, click the **Setup** menu and select **Serial Port**. [Figure 230](#)

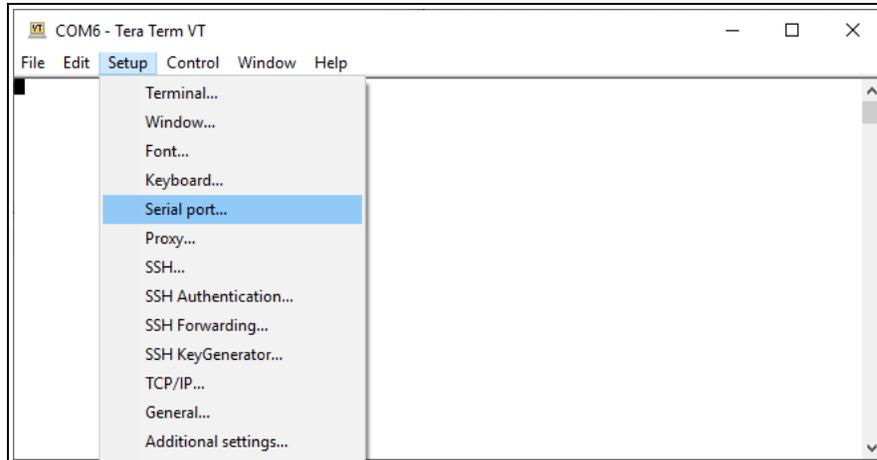


Figure 230: Setup menu > Serial Port

The **Tera Term: Serial Port Setup** dialog box opens. [Figure 231](#)

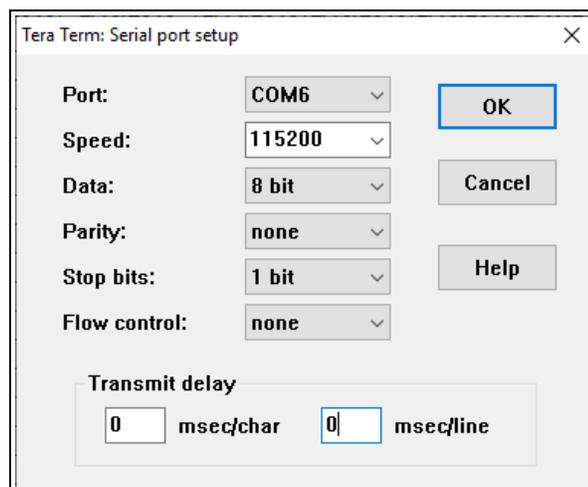


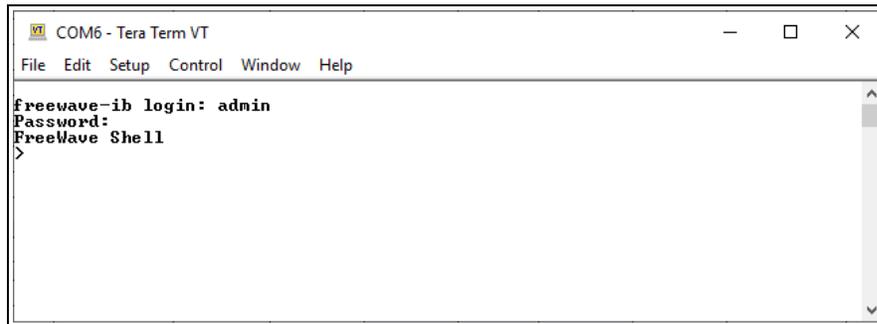
Figure 231: Tera Term: Serial Port Setup dialog box with Default Settings

6. Using [Figure 231](#) as the example, verify the COM port settings are:
 - Speed** (Baud Rate): 115200
 - Data** (Databits): 8 bit
 - Parity**: none
 - Stop bits**: 1 bit
7. Click **OK** to save the changes and close the dialog box.
8. In the **Tera Term** window, press <Enter>.
The FreeWave CLI Login returns.
9. Enter **admin** for the **Username** and press <Enter>.

10. Enter **admin** for the **Password** and press <Enter>.

Note: The default username and password is **admin**.
If the **User Name** or **Password** were changed, enter the applicable information.
The password does not appear when typing - it looks blank.

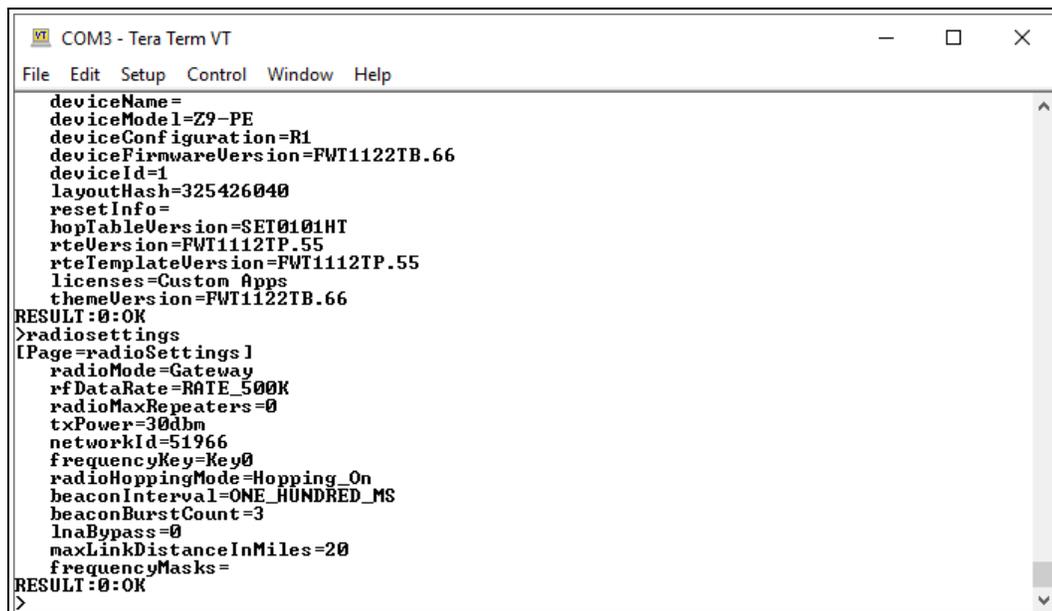
The **FreeWave Shell** opens. [Figure 232](#)



```
COM6 - Tera Term VT
File Edit Setup Control Window Help
freewave-ib login: admin
Password:
FreeWave Shell
>
```

Figure 232: FreeWave Shell

11. At the > prompt, type **radioSettings** and press <Enter>.
The current [Page=radioSettings] appears. ([Figure 233](#))



```
COM3 - Tera Term VT
File Edit Setup Control Window Help
deviceName=
deviceModel=Z9-PE
deviceConfiguration=R1
deviceFirmwareVersion=FWT1122TB.66
deviceId=1
layoutHash=325426040
resetInfo=
hopTableVersion=SET0101HT
rteVersion=FWT112TP.55
rteTemplateVersion=FWT112TP.55
licenses=Custom Apps
themeVersion=FWT1122TB.66
RESULT:0:OK
>radioSettings
[Page=radioSettings]
radioMode=Gateway
rfDataRate=RATE_500K
radioMaxRepeaters=0
txPower=30dbm
networkId=51966
frequencyKey=Key0
radioHoppingMode=Hopping_On
beaconInterval=ONE_HUNDRED_MS
beaconBurstCount=3
lnaBypass=0
maxLinkDistanceInMiles=20
frequencyMasks=
RESULT:0:OK
>
```

Figure 233: radioSettings Page

12. Continue with either:
- [Hopping On: Gateway and Endpoint-Repeater Setup \(on page 206\)](#)
 - [Hopping Off: Gateway and Endpoint-Repeater Setup \(on page 208\)](#)

13.2.2. Hopping On: Gateway and Endpoint-Repeater Setup

Important!: This procedure has **HOPPING ON**
(`radiosettings.radioHoppingMode=Hopping_On`).

If Hopping is OFF (`radiosettings.radioHoppingMode=Hopping_Off`) go to
Hopping Off: Gateway and Endpoint-Repeater Setup (on page 208).

1. On the **Gateway ZumLink** device:
 - a. Complete the [Open a Terminal Emulator Application \(on page 203\)](#) procedure.
 - b. At the > prompt, type:
 - i. `radioSettings.radioMode=Gateway` and press <Enter>.
 - ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network ID and press <Enter>.
 - iii. `network.ip_address=nnn.nnn.nnn.nnn` where nnn.nnn.nnn.nnn is the **unique** IP address for each device and press <Enter>.
 - iv. `radioSettings.rfDataRate=Rate_nnnn.nn` where nnnn.nn is the RF data rate in Kilobytes or Megabytes and press <Enter>.

Note: See [RF Data Rate \(on page 332\)](#) for the correct command format of the RF Data Rate.

- v. `radiosettings.radioHoppingMode=Hopping_On` and press <Enter>.
 - vi. `radioSettings.maxRepeater=1` and press <Enter>.
 - vii. `radioSettings.beaconBurstCount=2` and press <Enter>.
 - c. At the > prompt, type `save` and press <Enter>.
2. Disconnect the computer from the **Gateway ZumLink** device.
3. On the **Endpoint-Repeater ZumLink** device:
 - a. Complete the [Open a Terminal Emulator Application \(on page 203\)](#) procedure.
 - b. At the > prompt, type:

- i. `radioSettings.radioMode=Endpoint_Repeater` and press <Enter>.
 - ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network ID used when configuring the Gateway **ZumLink** device and press <Enter>.
 - iii. `network.ip_address=nnn.nnn.nnn.nnn` where nnn.nnn.nnn.nnn is the **unique** IP address for each device and press <Enter>.
 - iv. `radioSettings.rfDataRate=Rate_nnnn.nn` where nnnn.nn is the same data rate in Kilobytes or Megabytes used when configuring the Gateway **ZumLink** device and press <Enter>.

Note: See [RF Data Rate \(on page 332\)](#) for the correct command format of the RF Data Rate.

- v. `radioSettings.nodeId=nnnnn` where nnnnn is the unique ID of the device and press <Enter>.
 - vi. Verify the `radioSettings.radioRepeaterSlot=1` and press <Enter>.
 - c. At the > prompt, type `save` and press <Enter>.
4. Disconnect the computer from the **Endpoint-Repeater ZumLink** device.
 5. On the **Endpoint ZumLink** device:
 - a. Complete the [Open a Terminal Emulator Application \(on page 203\)](#) procedure.
 - b. At the > prompt, type:
 - i. `radioSettings.radioMode=Endpoint` and press <Enter>.
 - ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network ID used when configuring the Gateway **ZumLink** device and press <Enter>.
 - iii. `network.ip_address=nnn.nnn.nnn.nnn` where nnn.nnn.nnn.nnn is the **unique** IP address for each device and press <Enter>.
 - iv. `radioSettings.rfDataRate=Rate_nnnn.nn` where nnnn.nn is the same data rate in Kilobytes or Megabytes used when configuring the Gateway **ZumLink** device and press <Enter>.

Note: See [RF Data Rate \(on page 332\)](#) for the correct command format of the RF Data Rate.

- v. `radioSettings.nodeId=nnnnn` where nnnnn is the unique ID of the device and press <Enter>
- c. At the > prompt, type `save` and press <Enter>.

Note: The LEDs indicate a successful setup.
See [LEDs \(on page 502\)](#) for additional information.



See the [Gateway-Repeater \(on page 211\)](#) example.

13.2.3. Hopping Off: Gateway and Endpoint-Repeater Setup

Important! This procedure has **HOPPING OFF**
(`radiosettings.radioHoppingMode=Hopping_Off`).

If Hopping is ON (`radiosettings.radioHoppingMode=Hopping_On`) go to
Hopping On: Gateway and Endpoint-Repeater Setup (on page 206).

1. On the **Gateway ZumLink** device:
 - a. Complete the [Open a Terminal Emulator Application \(on page 203\)](#) procedure.
 - b. At the > prompt, type:
 - i. `radioSettings.radioMode=Gateway` and press <Enter>.
 - ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network ID and press <Enter>.
 - iii. `network.ip_address=nnn.nnn.nnn.nnn` where nnn.nnn.nnn.nnn is the **unique** IP address for each device and press <Enter>.
 - iv. `radioSettings.rfDataRate=Rate_nnnn.nn` where nnnn.nn is the RF data rate in Kilobytes or Megabytes and press <Enter>.

Note: See [RF Data Rate \(on page 332\)](#) for the correct command format of the RF Data Rate.

- v. Verify `radiosettings.radioHoppingMode=Hopping_Off` and press <Enter>.
 - c. At the > prompt, type `save` and press <Enter>.
2. Disconnect the computer from the **Gateway ZumLink** device.
3. On the **Endpoint-Repeater ZumLink** device:
 - a. Repeat Steps 1 to 12.
 - b. At the > prompt, type:
 - i. `radioSettings.radioMode=Endpoint_Repeater` and press <Enter>.
 - ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network ID used when configuring the Gateway **ZumLink** device and press <Enter>.
 - iii. `network.ip_address=nnn.nnn.nnn.nnn` where nnn.nnn.nnn.nnn is the **unique** IP address for each device and press <Enter>.
 - iv. `radioSettings.rfDataRate=Rate_nnnn.nn` where nnnn.nn is the same data rate in Kilobytes or Megabytes used when configuring the Gateway **ZumLink** device and press <Enter>.

Note: See [RF Data Rate \(on page 332\)](#) for the correct command format of the RF Data Rate.

- v. `radioSettings.nodeId=nnnnn` where nnnnn is the unique ID of the device and press <Enter>.
 - vi. Verify `radioSettings.radioHoppingMode=Hopping_Off` and press <Enter>.
 - c. At the > prompt, type `save` and press <Enter>.
4. Disconnect the computer from the **Endpoint-Repeater ZumLink** device.
 5. On the **Endpoint ZumLink** device:
 - a. Complete the [Open a Terminal Emulator Application \(on page 203\)](#) procedure.
 - b. At the > prompt, type:
 - i. `radioSettings.radioMode=Endpoint` and press <Enter>.
 - ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network ID used when configuring the Gateway **ZumLink** device and press <Enter>.
 - iii. `network.ip_address=nnn.nnn.nnn.nnn` where nnn.nnn.nnn.nnn is the **unique** IP address for each device and press <Enter>.
 - iv. `radioSettings.rfDataRate=Rate_nnnn.nn` where nnnn.nn is the same data rate in Kilobytes or Megabytes used when configuring the Gateway **ZumLink** device and press <Enter>.
- Note:** See [RF Data Rate \(on page 332\)](#) for the correct command format of the RF Data Rate.
- v. `radioSettings.nodeId=nnnnn` where nnnnn is the unique ID of the device and press <Enter>.
 - c. At the > prompt, type `save` and press <Enter>.

Note: The LEDs indicate a successful setup.
See [LEDs \(on page 502\)](#) for additional information.



See the [Gateway-Repeater \(on page 211\)](#) example.

13.3. Repeater - Examples

Note: The yellow communication link arrows are used to denote which of the radio units can directly communicate.

Radio units that DO NOT have yellow communication links between them are considered to be in different communication spaces.

- [Gateway-Repeater \(on page 211\)](#)
- [Endpoint-Repeater \(on page 212\)](#)
- [Multiple Repeaters: Gateway-Repeater and Endpoint-Repeater \(on page 213\)](#)
- [Multiple Repeaters: Four Endpoint-Repeaters \(on page 214\)](#)
- [Back-to-Back Repeaters \(on page 216\)](#)

13.3.1. Gateway-Repeater

Note: The yellow communication link arrows are used to denote which of the radio units can directly communicate. Radio units that DO NOT have yellow communication links between them are considered to be in different communication spaces.

Figure 234 shows:

- Endpoints that cannot peer directly can communicate through a Gateway-Repeater, extending the length of a point-to-multipoint network.
- Repeater is operating in Gateway-Repeater mode.
- No performance loss for Gateway-Repeater to Endpoint 1-Endpoint 2-Endpoint 3 communication.
- The throughput for Endpoint 2 to Endpoint 3 communication via Gateway-Repeater is reduced by approximately 50 percent.

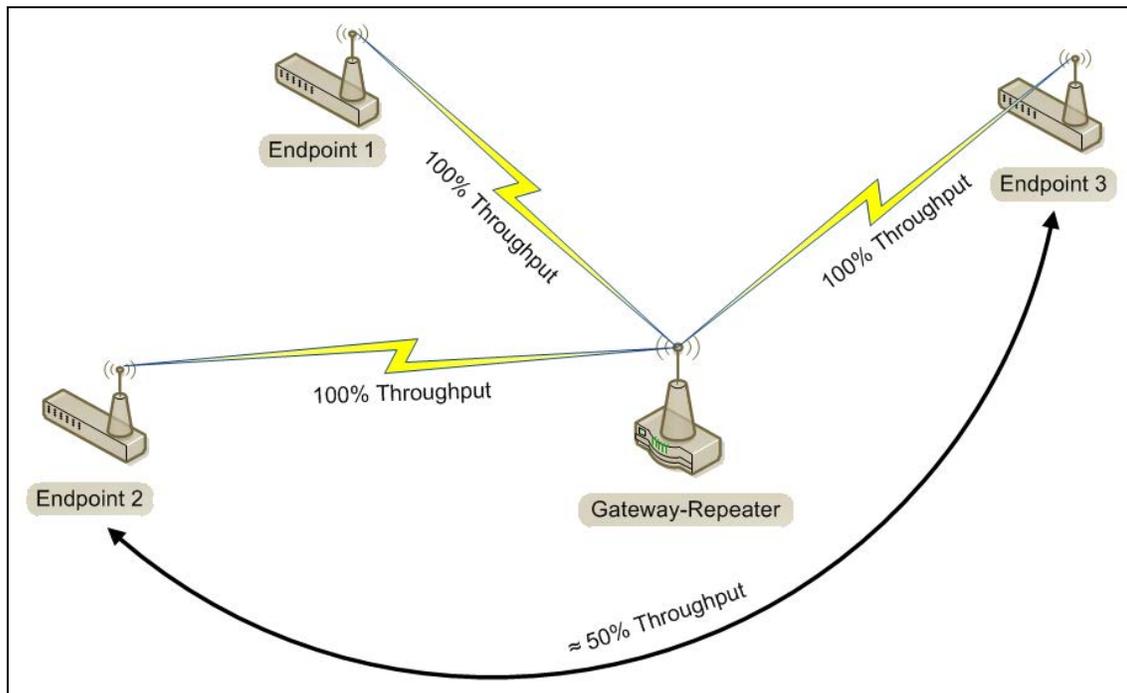


Figure 234: Gateway-Repeater

13.3.2. Endpoint-Repeater

Note: The yellow communication link arrows are used to denote which of the radio units can directly communicate. Radio units that DO NOT have yellow communication links between them are considered to be in different communication spaces.

Figure 235 shows:

- Endpoints that cannot peer directly can communicate through an Endpoint-Repeater, extending the length of a point-to-point network.
- Repeater is operating in Endpoint-Repeater mode.
- No performance loss for Gateway to Endpoint 3, Gateway to Endpoint-Repeater, or Endpoint-Repeater to Endpoint 1-Endpoint 2 communication.
- The throughput for Endpoint 1-Endpoint 2 to Gateway communication via Endpoint-Repeater is reduced by approximately 50 percent.

Note: An Endpoint-Repeater strongly favors its wired device over Endpoints it's repeating for.



User devices can be physically attached to the Endpoint-Repeater.

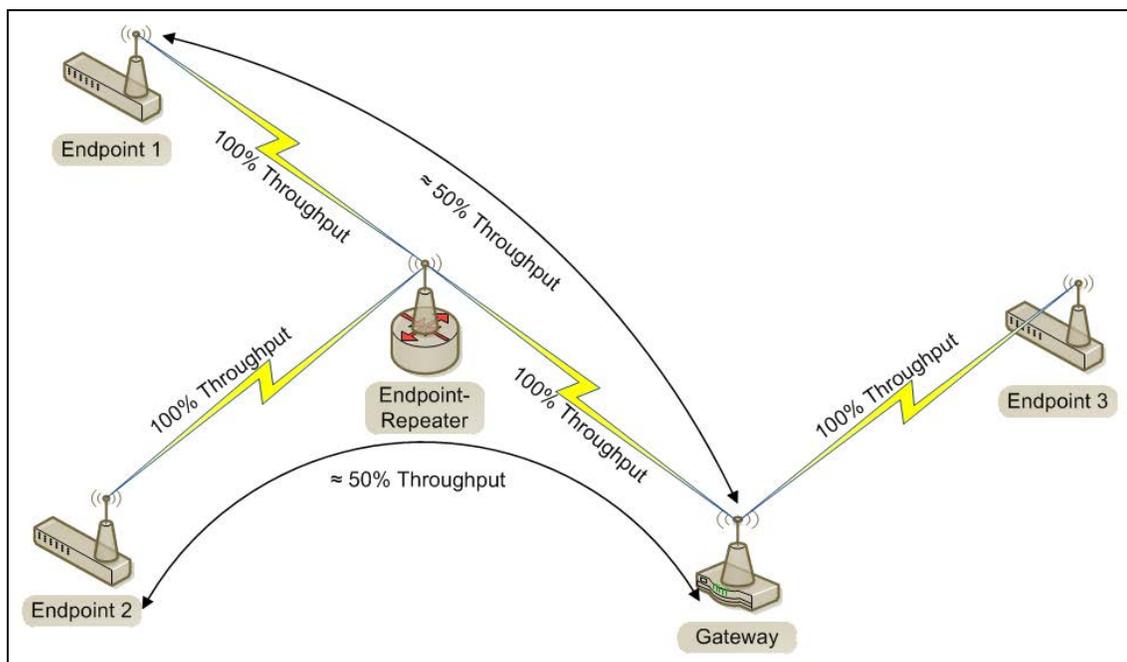


Figure 235: Endpoint-Repeater

13.3.3. Multiple Repeaters: Gateway-Repeater and Endpoint-Repeater

Note: The yellow communication link arrows are used to denote which of the radio units can directly communicate.

Radio units that DO NOT have yellow communication links between them are considered to be in different communication spaces.

Figure 236 shows:

- Repeaters are operating in Gateway-Repeater and Endpoint-Repeater mode.
- No performance loss for Endpoint-Repeater to Gateway-Repeater, Endpoint 1 to Endpoint-Repeater, Endpoint 2 to Gateway-Repeater communication.
- The throughput for Endpoint 1 to Gateway communication via Endpoint-Repeater is reduced by approximately 50 percent.
- The throughput for Endpoint 2 to Endpoint-Repeater via the Gateway-Repeater is reduced by approximately 50 percent.
- Endpoint 1 to Endpoint 2 communicate via the Endpoint-Repeater and Gateway-Repeater, or 2 repeater hops.
- The throughput for Endpoint 1 to Endpoint 2 communication is approximately 25%.
- As Repeaters are chained in the network, round trip delay increases.
 - When issuing pings of large packet sizes at the lower data rates, such as 115.2K, and a **Beacon Interval=TWENTY_FIVE_MS**, the latency can increase causing the pings to fail.
 - **Workaround:** Allow an appropriate delay between pings.

FREEWAVE Recommends: Set the **beaconBurstCount=1** or more and **beaconInterval=ONE_HUNDRED_MS** or more for optimal throughput when extended Repeater networks are used.

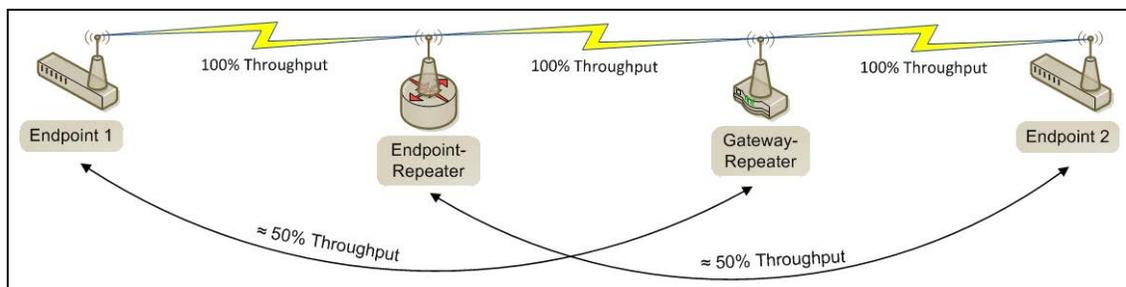


Figure 236: Repeater with Additional Endpoint to Enhance Connectivity

13.3.4. Multiple Repeaters: Four Endpoint-Repeaters

Note: The yellow communication link arrows are used to denote which of the radio units can directly communicate.

Radio units that DO NOT have yellow communication links between them are considered to be in different communication spaces.

Figure 237 shows:

- Gateway has radio maximum of three Repeaters slots.
- Repeaters are operating in Endpoint-Repeater mode.
- Repeaters in the same network that have overlapping RF coverage must have unique radio Repeater slots.
 - Endpoint-Repeater 1 has a Repeater slot of 1.
 - Endpoint-Repeater 2 has a Repeater slot of 2.
 - Endpoint-Repeater 3 has a radio Repeater slot of 3.
 - Endpoint-Repeater 4 has a radio Repeater slot of 1.
- Endpoint-Repeater 1 and Endpoint-Repeater 4 do NOT overlap in RF coverage; therefore they can use the same repeater slot number.
- Endpoint 1 to Gateway communicate via the Endpoint-Repeater 1-2-3-4 or 4 Repeater hops.
- The throughput for Endpoint 1 to Gateway communication will be approximately 6.25%.

Important!: Supporting three Repeaters in the same overlapping RF coverage does NOT limit the total number of Repeaters that can be chained together. However, make careful considerations regarding the throughput impact of chained Repeaters.

Note: An Endpoint-Repeater strongly favors its wired device over Endpoints it's repeating for.

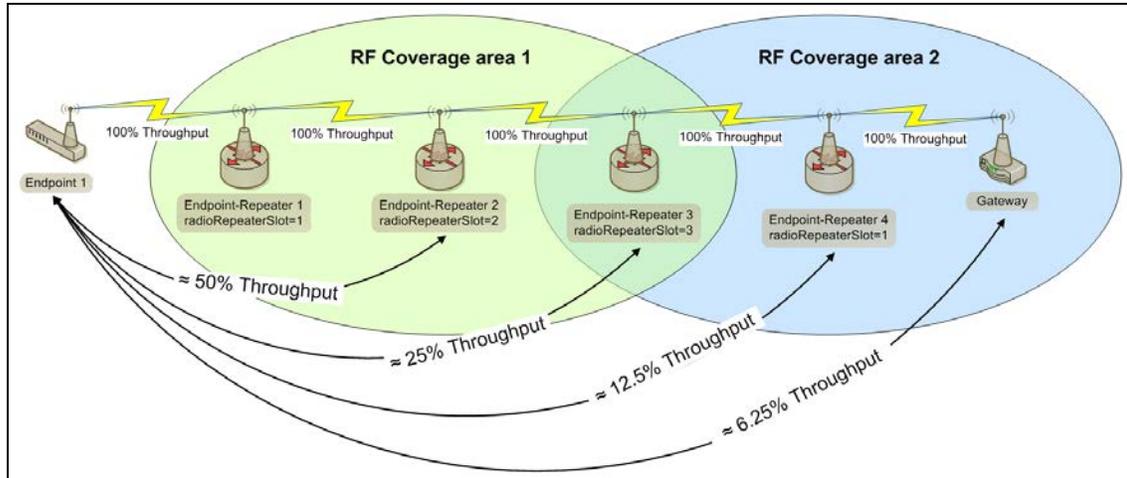


Figure 237: Multiple Repeaters: Four Endpoint-Repeaters

- As Repeaters are chained in the network, round trip delay increases.
- When issuing pings of large packet sizes at the lower data rates, such as 115.2K, and a **Beacon Interval=TWENTY_FIVE_MS**, the latency can increase causing the pings to fail.
- **Workaround:** Allow an appropriate delay between pings.

FREEWAVE Recommends: Set the **beaconBurstCount=1** or more and **beaconInterval=ONE_HUNDRED_MS** or more for optimal throughput when extended Repeater networks are used.

13.3.5. Back-to-Back Repeaters

Note: The yellow communication link arrows are used to denote which of the radio units can directly communicate.

Radio units that DO NOT have yellow communication links between them are considered to be in different communication spaces.

If the network topology requires Repeaters to connect radios over greater distances, use back-to-back Repeaters where data is repeated over a wire instead of over the air. This preserves throughput.

Figure 238 shows:

- Each link in the back to back network should be set to a unique [Network ID \(on page 321\)](#).
- At least one of these parameters should be configured differently between each link in the back-to-back network.
 - [Beacon Interval \(on page 312\)](#)
 - [Frequency Key \(on page 313\)](#)
 - [Radio Frequency \(on page 323\)](#)
 - [Radio Hopping Mode \(on page 324\)](#)
 - [RF Data Rate \(on page 332\)](#)

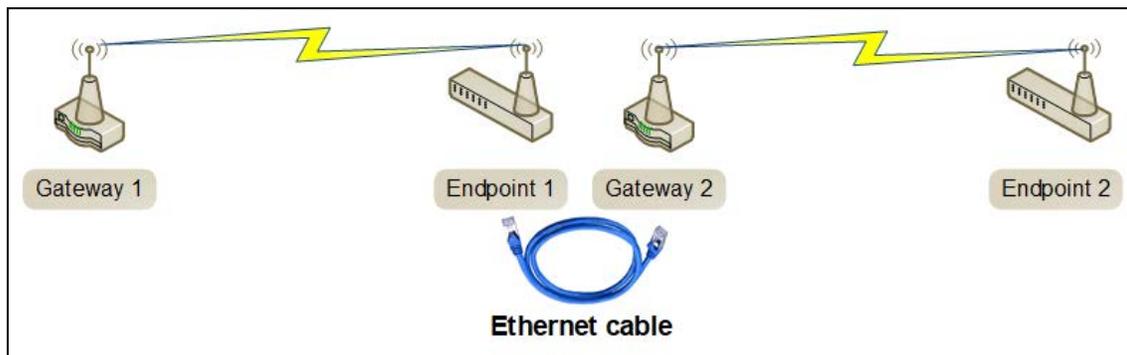


Figure 238: Back-to-Back Repeaters

14. Mounting the Z9-P or Z9-PE

Separate mounting kits are available for purchase from FreeWave.

- **Z9-P**
 - FreeWave Part Number: AOH0001HT
- **Z9-PE or Z9-PE-GREY**
 - FreeWave Part Number: AOH4003SP

Mounting Procedures

- [Z9-P Mounting \(on page 218\)](#)
- [Z9-PE Mounting \(on page 220\)](#)

Note: See [Remove the Z9-P or Z9-PE from the DIN Rail \(on page 221\)](#) for additional information.

14.1. Z9-P Mounting

Mounting Kit - Included Equipment

Z9-P Mounting Kit - Included Equipment	
Qty	Description
1	DIN Rail Spring Clip
3	Flat-head machine screws, Phillips, M4 x 0.7, 12mm Long
1	DIN Rail Bracket
4	Pan-head machine screws, Phillips, 4-40, 1/4" Long, Lock Patch
1	Mounting Instruction Sheet

User-supplied Equipment

- Medium Phillips-head screwdriver
- Medium Flat-head screwdriver

Procedure

1. Use the Pan-head machine screws to attach the DIN Rail Bracket to the **Z9-P**.
2. Orient the DIN Rail Bracket / DIN Rail Spring Clip assembly so:
 - a. The spring-loaded end of the DIN Rail Spring Clip is on the bottom lip of the rail.
 - b. The **fixed (not spring-loaded)** end of the DIN Rail Spring Clip is on the top.



Caution: Per the manufacturer's instructions, the DIN Rail Spring Clip is oriented with the **spring-loaded end on the bottom lip of the rail**.

- a. Use the Flat-head machine screws to attach the DIN Rail Spring Clip to the DIN Rail Bracket.
- b. Mount the **Z9-P** to the 35mm DIN rail using the rail slide on the enclosure as shown in [Figure 239](#).

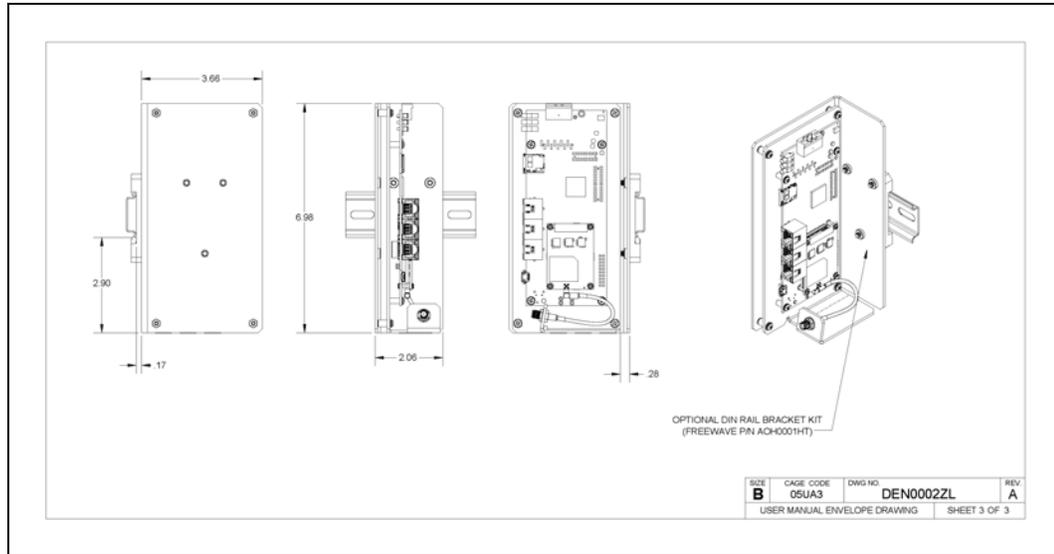


Figure 239: Z9-P Attached to a DIN Rail with the Power Connection on Top

14.2. Z9-PE Mounting

Mounting Kit - Included Equipment

Z9-PE Mounting Kit - Included Equipment	
Qty	Description
1	DIN Rail Spring Clip
3	Flat-head machine screws, Phillips, M4 x 0.7, 12mm Long
1	DIN Rail Bracket
3	Pan-head machine screws, Phillips, 6-32 Unc, 1/4" Long
1	Mounting Instruction Sheet

User-supplied Equipment

- Medium Phillips-head screwdriver
- Medium Flat-head screwdriver

Procedure

Note: This mounting procedure for **Z9-PE** is the same for the **Z9-PE-GREY**

1. Use the Pan-head machine screws to attach the DIN Rail Bracket to the **Z9-PE**.
2. Orient the DIN Rail Bracket / DIN Rail Spring Clip assembly so:
 - a. The spring-loaded end of the DIN Rail Spring Clip is on the bottom lip of the rail.
 - b. The **fixed (not spring-loaded)** end of the DIN Rail Spring Clip is on the top.



Caution: Per the manufacturer's instructions, the DIN Rail Spring Clip is oriented with the **spring-loaded end on the bottom lip of the rail**.

- a. Use the Flat-head machine screws to attach the DIN Rail Spring Clip to the DIN Rail Bracket.
- b. Mount the **Z9-PE** to the 35mm DIN rail using the rail slide on the enclosure as shown in [Figure 240](#).

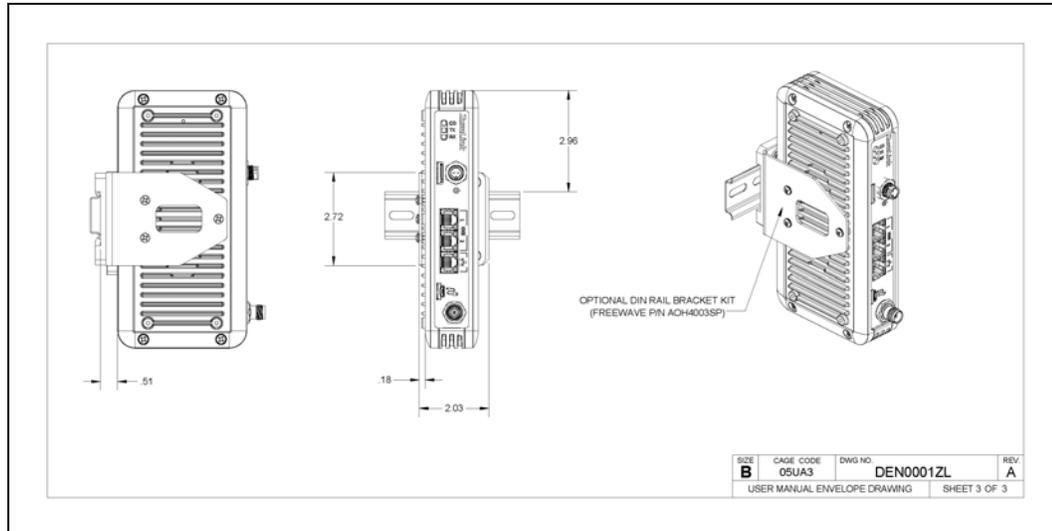


Figure 240: Z9-PE Attached to a DIN Rail with the Power Connection on Top

14.3. Remove the Z9-P or Z9-PE from the DIN Rail

1. Push upwards on the DIN Rail Spring Clip (compressing the springs in the bottom).
2. Pivot the top of the DIN Rail Bracket / DIN Rail Spring Clip assembly off of the rail.
3. Move the whole DIN Rail Spring Clip down to release the bottom of the clip.

15. Approved Antennas

15.0.1. Yagi Directional Antennas

The 900 MHz is approved by the FCC for use with directional antennas with a 16.08.6 dBi gain or less.

900 MHz Yagi Directional Antennas				
Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturer Model Number	FreeWave Part Number
6.45	8.6	WaveLink	PRO890-8-40F02N4	EAN0906YC

15.0.2. Omni-directional Antennas

The 900 MHz is approved by the FCC for use with omni-directional antennas with a 10.5dBi gain or less.

Note: These antennas, including antenna gains, are approved for use with the [ZumLink](#) device.

900 MHz Omni-Directional Antennas				
Gain (dBd)	Gain (dBi)	Manufacturer	Manufacturer Model Number	FreeWave Part Number
3.85	5.0	Antenex	EB8965C	EAN0905WC
3.0	5.15	Maxrad	MAX-9053	EAN0900WC
0.85	3.0	Mobile Mark	PSKN3-925S	EAN0900SR
-2.15	0.0	Mobile Mark	PSTG0-915SE	EAN0900SQ

15.0.3. 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 10.5dBi 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.

16. COM Parameters

Note: See the [COM window \(on page 389\)](#) for parameter location.
The parameters for **COM1** and **COM2** are the same except for the [Terminal Server Port \(on page 235\)](#) parameter setting.

[Baudrate \(on page 225\)](#)

[Break Before Send Us \(on page 225\)](#)

[Connection Drops \(on page 226\)](#)

[Databits \(on page 227\)](#)

[Delay Before Send MS \(on page 228\)](#)

[Duplex \(on page 228\)](#)

[Flow Control \(on page 229\)](#)

[Handler \(on page 230\)](#)

[Mode \(on page 232\)](#)

[Parity \(on page 233\)](#)

[RX Bytes \(on page 234\)](#)

[Stopbits \(on page 235\)](#)

[Terminal Server Port \(on page 235\)](#)

[Terminal Server Time Out \(on page 236\)](#)

[TX Bytes \(on page 237\)](#)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

16.1. Baudrate

Baudrate															
Setting	Description														
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2] 														
CLI Command	<ul style="list-style-type: none"> Com1.baudrate=nnnn Com2.baudrate=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the baud rate value.</p> </div>														
Web Interface window	<p>Baudrate</p> <ol style="list-style-type: none"> Click the Baudrate list box arrow and select a COM port baud rate. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>														
Default Setting	115200														
Options	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Rate Options</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1200</td> <td style="text-align: center;">38400</td> </tr> <tr> <td style="text-align: center;">2400</td> <td style="text-align: center;">57600</td> </tr> <tr> <td style="text-align: center;">4800</td> <td style="text-align: center;">115200</td> </tr> <tr> <td style="text-align: center;">9600</td> <td style="text-align: center;">230400</td> </tr> <tr> <td style="text-align: center;">14400</td> <td style="text-align: center;">250000</td> </tr> <tr> <td style="text-align: center;">19200</td> <td></td> </tr> </tbody> </table>	Rate Options		1200	38400	2400	57600	4800	115200	9600	230400	14400	250000	19200	
Rate Options															
1200	38400														
2400	57600														
4800	115200														
9600	230400														
14400	250000														
19200															
Description	The Com1.baudrate or Com2.baudrate parameter designates the COM port baud rate for COM1 or COM2.														

16.2. Break Before Send Us

Break Before Send Us	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.breakBeforeSendUs=nnnn Com2.breakBeforeSendUs=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the break signal value.</p> </div>

Break Before Send Us	
Setting	Description
Web Interface window	<p>Break Before Send Us</p> <ol style="list-style-type: none"> 1. In the Break Before Send Us text box, enter the number of milliseconds the COM port will send a break signal. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	<ul style="list-style-type: none"> • The maximum value is 0 (zero). • The minimum value is 1000.
Description	<p>The Com1.breakBeforeSendUs or Com2.breakBeforeSendUs parameter designates how long the COM port will send a break signal for at least the number of microseconds specified before sending the data.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Example: For COM1, enter Com1.breakBeforeSendUs=500 to have the COM1 port send a break signal for 500 microseconds.</p> </div>

16.3. Connection Drops

Connection Drops	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> • [Page=Com1] • [Page=Com2]
CLI Command	<ul style="list-style-type: none"> • Com1.connectionDrops • Com2.connectionDrops
Web Interface window	<p>Connection Drops</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A

Connection Drops	
Setting	Description
Description	<p>The Com1.connectionDrops or Com2.connectionDrops command reports the number of terminal server connections dropped due to inactivity on the network socket.</p> <ul style="list-style-type: none"> The number of drops only increments if a connection is left open and no data is sent. Connections that are closed by either side before the time out are not considered a dropped connection. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

16.4. Databits

Databits	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.databits=7 Com2.databits=7 Com1.databits=8 Com2.databits=8
Web Interface window	<p>Databits</p> <ol style="list-style-type: none"> Click the Databits list box arrow and select the number of data bits in the frame for COM1 or COM2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	8
Options	<ul style="list-style-type: none"> 7 8
Description	The Com1.databits or Com2.databits parameter designates the number of data bits in the frame for COM1 or COM2.

16.5. Delay Before Send MS

Delay Before Send MS	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.delayBeforeSendMs=nnnn Com2.delayBeforeSendMs=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the amount of time delay in milliseconds.</p> </div>
Web Interface window	<p>Delay Before Send MS</p> <ol style="list-style-type: none"> In the Delay Before Send MS text box, enter the milliseconds of time delay. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	<ul style="list-style-type: none"> The maximum value is 0 (zero). The minimum value is 5000.
Description	<p>The Com1.delayBeforeSendMs or Com2.delayBeforeSendMs parameter designates the amount of time delay in milliseconds the Z9-P or Z9-PE waits to allow the device connected to the COM port to switch from transmit (Tx) to receive (Rx) mode.</p> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p>Example: For COM1, enter <code>Com1.delayBeforeSendMs=100</code> for a 100 millisecond delay.</p> </div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p> Tip Increase this delay if the ZumLink is responding before a polling system is ready for a response.</p> </div>

16.6. Duplex

Duplex	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]

Duplex	
Setting	Description
CLI Command	<ul style="list-style-type: none"> • Com1.duplex=Half • Com2.duplex=Half • Com1.duplex=Full • Com2.duplex=Full
Web Interface window	<p>Duplex</p> <ol style="list-style-type: none"> 1. Click the Duplex list box arrow and select the duplex designation. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	Full
Options	Half or Full
Description	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Important!: This parameter applies ONLY to the RS485 mode.</p> </div> <p>The Com1.duplex or Com2.duplex parameter designates whether the COM port is Full or Half-duplex.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See Ports and Pinouts for input and output information.</p> </div>

16.7. Flow Control

Flow Control	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> • [Page=Com1] • [Page=Com2]
CLI Command	<p>For Com2, the command is:</p> <ul style="list-style-type: none"> • Off: Com2.flowControl=Off • On: Com2.flowControl=Hardware
Web Interface window	<p>Flow Control</p> <ol style="list-style-type: none"> 1. If applicable for COM2, click the Flow Control list box arrow and select Hardware to activate flowControl. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	Off

Flow Control	
Setting	Description
Options	<ul style="list-style-type: none"> • Off • Hardware
Description	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p>Important!: The RTS and CTS signals are ONLY available for COM2. The RTS and CTS signals are NOT supported for COM1.</p> </div> <p>The Com2.flowControl parameter designates the hardware flow control as either On (Hardware) or Off.</p>

16.8. Handler

Handler	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> • [Page=Com1] • [Page=Com2]

Handler	
Setting	Description
CLI Command	<p>CLI</p> <p>When CLI is designated, a configuration CLI is on the COM port.</p> <p>The command is:</p> <ul style="list-style-type: none"> • <code>Com1.handler=cli</code> • <code>Com2.handler=cli</code> <p>ModbusPassthru</p> <p>When ModbusPassthru is designated, modbus requests are sent out to modbus sensors that are received via Modbus TCP or Modbus RTU.</p> <p>The command is:</p> <ul style="list-style-type: none"> • <code>Com1.handler=ModbusPassthru</code> • <code>Com2.handler=ModbusPassthru</code> <p>ModbusRTU</p> <p>When ModbusRTU is designated, receive Modbus RTU requests from a serial modbus RTU device.</p> <p>The command is:</p> <ul style="list-style-type: none"> • <code>Com1.handler=ModbusRTU</code> • <code>Com2.handler=ModbusRTU</code> <p>Off</p> <p>When Off is designated, this allows for application use with no setup. A port is never opened.</p> <p>The command is:</p> <ul style="list-style-type: none"> • <code>Com1.handler=Off</code> • <code>Com2.handler=Off</code> <p>Setup</p> <p>When Setup is designated, the COM port then frees up the port for application use.</p> <p>The command is:</p> <ul style="list-style-type: none"> • <code>Com1.handler=Setup</code> • <code>Com2.handler=Setup</code> <p>Terminal Server</p> <p>When Terminal Server is designated, the COM port acts as a terminal server.</p> <ul style="list-style-type: none"> • The TCP port number is set by the COM1 Terminal Server Port (on page 235). • The default port number for COM1 is 5041. <p>The command is:</p> <ul style="list-style-type: none"> • <code>Com1.handler=TerminalServer</code>

Handler	
Setting	Description
	<ul style="list-style-type: none"> Com2.handler=TerminalServer <p>Trace</p> <p>When Trace is designated, a configuration CLI with trace is on the COM port.</p> <ul style="list-style-type: none"> Com1.handler=trace Com2.handler=trace
Web Interface window	<p>Handler</p> <ol style="list-style-type: none"> Click the Handler list box arrow and select the designated protocol handler. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	TerminalServer
Options	<ul style="list-style-type: none"> CLI (on page 231) ModbusPassthru (on page 231) ModbusRTU (on page 231) Off (on page 231) Setup (on page 231) Terminal Server (on page 231) Trace (on page 232)
Description	<p>The Com1.handler or Com2.handler parameter designates the protocol of the COM port.</p> <p>Notes</p> <ul style="list-style-type: none"> The default port number for COM1 is 5041. The default port number for COM2 is 5042. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: If using the Terminal Server Port parameter, keep the TCP port numbers as their defaults.</p> </div>

16.9. Mode

Mode	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]

Mode	
Setting	Description
CLI Command	<ul style="list-style-type: none"> • Com1.mode=RS232 • Com2.mode=RS232 • Com1.mode=RS485 • Com2.mode=RS485
Web Interface window	<p>Mode</p> <ol style="list-style-type: none"> 1. Click the Mode list box arrow and select the COM port mode. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	RS232
Options	<ul style="list-style-type: none"> • RS232 • RS485
Description	<p>The Com1.mode or Com2.mode parameter designates the COM port mode as either RS232 or RS485.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: When Com1.mode=RS485 or Com2.mode=RS485 AND Com1.duplex=Full or Com2.duplex=Full, the COM supports RS422.</p> </div>

16.10. Parity

Parity	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> • [Page=Com1] • [Page=Com2]
CLI Command	<ul style="list-style-type: none"> • Com1.parity=None • Com2.parity=None • Com1.parity=Even • Com2.parity=Even • Com1.parity=Odd • Com2.parity=Odd

Parity	
Setting	Description
Web Interface window	<p>Parity</p> <ol style="list-style-type: none"> 1. Click the Parity list box arrow and select the COM port parity bits for the system. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	None
Options	<ul style="list-style-type: none"> • None • Even • Odd
Description	The Com1.parity or Com2.parity parameter designates the COM port parity bits for the system.

16.11. RX Bytes

RX Bytes	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> • [Page=Com1] • [Page=Com2]
CLI Command	<ul style="list-style-type: none"> • Com1.RxBytes • Com2.RxBytes
Web Interface window	<p>RX Bytes</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The Com1.RxBytes or Com2.RxBytes command reports the total bytes received from the COM port.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

16.12. Stopbits

Stopbits	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.stopbits=1 <ul style="list-style-type: none"> Com2.stopbits=1 Com1.stopbits=2 <ul style="list-style-type: none"> Com2.stopbits=2
Web Interface window	<p>Stopbits</p> <ol style="list-style-type: none"> Click the Stopbits list box arrow and select the COM port number of stop bits. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	1
Options	<ul style="list-style-type: none"> 1 2
Description	The Com1.stopbits or Com2.stopbits parameter designates the COM port number of stop bits.

16.13. Terminal Server Port

Note: See [Terminal Server Relay Examples \(on page 377\)](#) for additional information.

Terminal Server Port	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.TerminalServerPort=nnnn Com2.TerminalServerPort=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the TCP port number.</p> </div>

Terminal Server Port	
Setting	Description
Web Interface window	Terminal Server Port <ol style="list-style-type: none"> In the Terminal Server Port text box, enter the designated TCP port number. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	<ul style="list-style-type: none"> The default port number for COM1 is 5041. The default port number for COM2 is 5042.
Options	<ul style="list-style-type: none"> The minimum value is 0 (zero). The maximum value is 65535.
Description	The Com1.TerminalServerPort or Com2.TerminalServerPort parameter designates the TCP port number to use when Handler (on page 230) is set to TerminalServer . <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: If using the Terminal Server Port parameter, keep the TCP port numbers as their defaults.</p> </div>

16.14. Terminal Server Time Out

Note: See [Terminal Server Relay Examples \(on page 377\)](#) for additional information.

Terminal Server Time Out	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.TerminalServerTimeOut=nnnn Com2.TerminalServerTimeOut=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the amount of time, in seconds, the Terminal Server remains open.</p> </div>

Terminal Server Time Out	
Setting	Description
Web Interface window	<p>Terminal Server Time Out</p> <ol style="list-style-type: none"> In the Terminal Server Time Out text box, enter the number of seconds the Terminal Server remains open without transmitting or receiving data from the network. Click the Update button to save the change. Reboot the Z9-P or Z9-PE for changes to take effect. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	300
Options	<ul style="list-style-type: none"> The minimum value is 5. The maximum value is 3600.
Description	<p>The Com1.TerminalServerTimeOut or Com2.TerminalServerTimeOut parameter designates the amount of time, in seconds, the Terminal Server remains open without transmitting or receiving data from the network.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This can prevent an idle socket from remaining open indefinitely and preventing new connections.</p> </div>

16.15. TX Bytes

TX Bytes	
Setting	Description
CLI / Web Page	<ul style="list-style-type: none"> [Page=Com1] [Page=Com2]
CLI Command	<ul style="list-style-type: none"> Com1.TxBytes Com2.TxBytes
Web Interface window	<p>TX Bytes</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the COM window (on page 389) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The Com1.TxBytes or Com2.TxBytes command reports the total bytes sent out of the COM port.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

17. Config Parameters

Note: See the [Config window \(on page 391\)](#).

[Factory Defaults \(on page 239\)](#)

[License State \(on page 239\)](#)

[Reset \(on page 240\)](#)

[Restore \(on page 240\)](#)

[Save \(on page 241\)](#)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 **frequencyKey** returns the current value of **frequencyKey**.
Entering **frequencyKey=** is an implied change to **frequencyKey**.
If a value is NOT included, it changes **frequencyKey** to 0 (zero).

17.1. Factory Defaults

Factory Defaults	
Setting	Description
CLI / Web Page	[Page=config]
CLI Command	<ul style="list-style-type: none"> • <code>config.factoryDefaults=set</code> • <code>factoryDefaults=set</code>
Web Interface window	Factory Defaults <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: See the Config window (on page 391) for parameter location.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Important!: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	Idle
Description	The config.factoryDefaults command restores the Z9-P or Z9-PE to its factory default configuration.

17.2. License State

License State	
Setting	Description
CLI / Web Page	[Page=config]
CLI Command	<ul style="list-style-type: none"> • <code>config.licenseState</code> • <code>licenseState</code>
Web Interface window	License State <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: See the Config window (on page 391) for parameter location.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Important!: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A

License State	
Setting	Description
Description	<p>The config.licenseState command reports the extra feature licenses in the Z9-P or Z9-PE.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

17.3. Reset

Reset	
Setting	Description
CLI / Web Page	[Page=config]
CLI Command	<ul style="list-style-type: none"> • Reboot the entire Z9-P or Z9-PE device: <ul style="list-style-type: none"> • <code>config.reset=now</code> • <code>config.reset=reboot</code> • Reset to restart the main application: <ul style="list-style-type: none"> • <code>config.reset=reset</code>
Web Interface window	<p>Reset</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Config window (on page 391) for parameter location.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A
Description	The config.reset command restarts or reboots the Z9-P or Z9-PE.

17.4. Restore

Restore	
Setting	Description
CLI / Web Page	[Page=config]
CLI Command	<ul style="list-style-type: none"> • <code>config.restore=now</code> • <code>config.restore</code> • <code>restore</code>

Restore	
Setting	Description
Web Interface window	Restore <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: See the Config window (on page 391) for parameter location.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Important!: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A
Description	The config.restore command reloads a previously saved setting configuration of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: Restore happens automatically when the Z9-P or Z9-PE starts.</p> </div>

17.5. Save

Save	
Setting	Description
CLI / Web Page	[Page=config]
CLI Command	<ul style="list-style-type: none"> • <code>config.save=now</code> • <code>config.save</code> • <code>save</code>
Web Interface window	Save <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: See the Config window (on page 391) for parameter location.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Important!: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A
Description	The config.save command saves changes made to the Z9-P or Z9-PE configuration.

18. Data Path Parameters

Note: See the [Data Path window](#) (on page 393).

[Aggregate Enabled](#) (on page 243)

[Compression Enabled](#) (on page 244)

[FEC Rate](#) (on page 246)

[MAC Table Entry Age Timeout](#) (on page 247)

[OTA Max Fragment Size](#) (on page 249)

[Route Min Signal Margin Thresh](#) (on page 249)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

18.1. Aggregate Enabled

Aggregate Enabled	
Setting	Description
CLI / Web Page	[Page=dataPath]
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • dataPath.aggregateEnabled=true • aggregateEnabled=true • Disable: <ul style="list-style-type: none"> • dataPath.aggregateEnabled=false • aggregateEnabled=false
Web Interface window	<p>Aggregate Enabled</p> <ol style="list-style-type: none"> 1. Click the Aggregate Enabled list box arrow and select True to enable this parameter and increase throughput of small packets. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the Aggregate Enabled is NOT enabled (set to False). See the Data Path window (on page 393) for parameter location.</p> </div>
Default Setting	False
Options	<ul style="list-style-type: none"> • True • False

Aggregate Enabled	
Setting	Description
Description	<p>The Aggregate Enabled (on page 243) setting increases throughput of small packets by combining multiple packets into a single packet minimizing the number of packets required for transmission.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Important! All radios have the ability to de-aggregate received packets, regardless of the aggregation setting.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>FREEWAVE Recommends: Enable this setting on individual radios that send a high percentage of network data packets that are smaller than 900 bytes.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> • Increases latency by 20msec and reduces poll rates. <ul style="list-style-type: none"> • When enabled, this setting adds 20 msec of latency. • However, net throughput may increase due to sending fewer, larger packets. • If another packet is not received within 20 msec, the aggregated packet is transmitted. • This setting does NOT need to match on all radios. • Does NOT affect medium and large packets. • Packets below 900 bytes are aggregated up to an aggregated packet size of 970 bytes.

18.2. Compression Enabled

Compression Enabled	
Setting	Description
CLI / Web Page	[Page=dataPath]
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • dataPath.compressionEnabled=true • compressionEnabled=true • Disable: <ul style="list-style-type: none"> • dataPath.compressionEnabled=false • compressionEnabled=false

Compression Enabled	
Setting	Description
Web Interface window	<p>Compression Enabled</p> <ol style="list-style-type: none"> 1. Click the Compression Enabled list box arrow and select False to disable compression of outgoing packets. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the Compression Enabled is enabled (set to True). See the Data Path window (on page 393) for parameter location.</p> </div>
Default Setting	True
Options	<ul style="list-style-type: none"> • True • False
Description	<p>When the Compression Enabled (on page 244) setting is enabled, the outgoing packets are analyzed and, if the data packet can be compressed, sent compressed to transmit fewer bits over the air.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! The compression ratio varies depending on the type of data being transmitted.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px; background-color: #e0e0e0;"> <p>Example: Text data is easily compressible, while video data is not.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Enable Packet Compression on all ZumLink networks.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> • When enabled, the Packet Compression setting increases latency by a maximum of 10msec. • When enabled, the Packet Compression setting ensures that the packet transmitted is no larger than the current packet size. • Net throughput may increase due to sending more data in each packet. • All radios have the ability to de-compress received packets regardless of their compression setting. • This setting does NOT need to match on all radios.

18.3. FEC Rate

FEC Rate	
Setting	Description
CLI / Web Page	[Page=dataPath]
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • dataPath.fecRate=RATE_7_8 • fecRate=RATE_7_8 • Disable: <ul style="list-style-type: none"> • dataPath.fecRate=RATE_1_1 • fecRate=RATE_1_1
Web Interface window	<p>FEC Rate</p> <ol style="list-style-type: none"> 1. Click the FEC Rate list box arrow and select the Forward Error Correction (FEC) rate. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Data Path window (on page 393) for parameter location.</p> </div>
Default Setting	RATE_1_1
Options	<ul style="list-style-type: none"> • RATE_1_1 • RATE_7_8

FEC Rate	
Setting	Description
Description	<p>The dataPath.fecRate parameter enables the Forward Error Correction (FEC) rate.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note: The FEC Rate (on page 246) increases the reliability of the data transferred over the air at the cost of some transmission throughput.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> • The FEC setting MUST match on ALL radios in the network, to maintain over-the-air compatibility. • When enabled, this setting indicates that for every 7 bytes in, the radio sends 8 bytes out, with the 8th byte used for parity / error correction. • Reduces throughput by 13%. • Improves sensitivity by 3dB to maximize link range in noisy environments. • Adds redundant information to a data stream to detect packet errors and corrects them to avoid retransmission of the packet. • Adds resilience in noisy environments. • FEC reduces the maximum achievable throughput. <ul style="list-style-type: none"> • However, in noisy environments, net throughput may increase due to reduced errors and retries. <div style="border: 1px solid orange; padding: 5px; margin: 10px 0;"> <p>Caution: When enabling FEC, start with the farthest Endpoints, then any Repeaters, then lastly the Gateway.</p> <p> As FEC is enabled on each radio, that radio is temporarily dropped off the network, until any downstream Repeaters and the Gateway also have FEC enabled, at which time all communication will resume.</p> </div> <div style="border: 1px solid gray; padding: 5px; margin: 10px 0;"> <p>FREEWAVE Recommends: When viewing local diagnostics, if the Radio Bad CRC (on page 267) count is more than 15-20% of the total transmitted packets (the Radio LL Tx (on page 270) count), enabling the FEC Rate (on page 246) setting is beneficial.</p> </div>

18.4. MAC Table Entry Age Timeout

MAC Table Entry Age Timeout	
Setting	Description
CLI / Web Page	[Page=dataPath]

MAC Table Entry Age Timeout	
Setting	Description
CLI Command	<ul style="list-style-type: none"> <code>dataPath.MacTableEntryAgeTimeout=nnnn</code> <code>MacTableEntryAgeTimeout=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is the number of seconds.</p> </div>
Web Interface window	<p>MAC Table Entry Age Timeout</p> <ol style="list-style-type: none"> In the MAC Table Entry Age Timeout text box, enter the number of seconds before an inactive entry in the MAC Table ages out and expires. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Data Path window (on page 393) for parameter location.</p> </div>
Default Setting	120
Options	<ul style="list-style-type: none"> The minimum value is 30. The maximum value is 86400.
Description	<p>The dataPath.MacTableEntryAgeTimeout parameter designates the number of seconds before an inactive entry in the MAC Table ages out and expires.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Set this timeout longer than the polling rate on the network. Entries do not use the new timeout value until they are updated when a packet transfers.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See Mac Table Show (on page 265) to view the MAC to <code>nodeld</code> mapping table.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> The radio network learns the MAC address of devices connected to particular radio Endpoints and stores them in a MAC table. As traffic passes between the Endpoints, the entries in the MAC table are updated. If packets have NOT been sent or received to a MAC address within the designated dataPath.MacTableEntryAgeTimeout period, the entry in the table is marked as expired. Expired entries must be re-learned and generate some extra traffic on the network until the radio Endpoint associated with the MAC address is learned. The timeout does impact the time it takes to learn the new path. This value can be optimized with parallel Repeaters to allow for fail over. Setting this value too small so normal traffic does not keep the MAC table entry from expiring may generate excess network traffic.

18.5. OTA Max Fragment Size

OTA Max Fragment Size	
Setting	Description
CLI / Web Page	[Page=dataPath]
CLI Command	<ul style="list-style-type: none"> <code>dataPath.otaMaxFragmentSize=nnnn</code> <code>otaMaxFragmentSize=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is the maximum fragment size.</p> </div>
Web Interface window	<p>OTA Max Fragment Size</p> <ol style="list-style-type: none"> In the OTA Max Fragment Size text box, enter the maximum fragment size, in bytes, sent over the air. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Data Path window (on page 393) for parameter location.</p> </div>
Default Setting	1000
Options	<ul style="list-style-type: none"> The minimum value is 64. The maximum value is 1000.
Description	<p>The dataPath.otaMaxFragmentSize setting designates the maximum fragment size, in bytes, sent over the air.</p> <p>Notes</p> <ul style="list-style-type: none"> This setting does NOT need to match on all radios. A smaller Max Fragment Size may increase RF link reliability in highly noisy environments. <ul style="list-style-type: none"> A smaller Max Fragment Size may reduce data throughput. A larger Max Fragment Size may increase data throughput. <ul style="list-style-type: none"> A larger Max Fragment Size may reduce RF link reliability in noisy environments.

18.6. Route Min Signal Margin Thresh

Route Min Signal Margin Thresh	
Setting	Description
CLI / Web Page	[Page=dataPath]
CLI Command	<ul style="list-style-type: none"> <code>dataPath.routeMinSignalMarginThresh=nnnn</code> <code>routeMinSignalMarginThresh=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is the minimum signal margin in dB.</p> </div>

Route Min Signal Margin Thresh	
Setting	Description
Web Interface window	<p>Route Min Signal Margin Thresh</p> <ol style="list-style-type: none"> 1. In the Route Min Signal Margin Thresh text box, enter the minimum threshold signal margin in dB. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Data Path window (on page 393) for parameter location.</p> </div>
Default Setting	<ul style="list-style-type: none"> • 10
Options	<ul style="list-style-type: none"> • The minimum value is -5. • The maximum value is 60.
Description	<p>The dataPath.routeMinSignalMarginThresh parameter designates the minimum (threshold) signal margin, in dB, the next hop must be considered part of the packet route.</p> <div style="border: 1px solid gray; padding: 10px; margin-top: 10px;"> <p>FREEWAVE Recommends: This value should be at least 4 dB lower than the reported link margin to the next hop.</p> </div> <div style="border: 1px solid gray; padding: 10px; margin-top: 10px; background-color: #e6f2ff;"> <p>Example: If the best-reported link margin for the next hop is 20 dB, this number should be set to 16 or less. This prevents the traffic from choosing an alternative route with lower margin.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> • When Repeaters are enabled, the packets take the path through the radio network with the minimum number of hops. • By increasing the threshold value, the possible routes can be reduced to allow a particular routing path to be preferred.

19. Date Parameters

Note: See the [Date window](#) (on page 395).

[DC App StartTime](#) (on page 252)

[DC App Uptime](#) (on page 252)

[Time](#) (on page 253)

[Time String](#) (on page 253)

[Up Time](#) (on page 254)

[Up Time String](#) (on page 255)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

19.1. DC App StartTime

Important! Time zones **do not** apply to the Z9-P or Z9-PE.

DC App StartTime	
Setting	Description
CLI / Web Page	[Page=date]
CLI Command	<ul style="list-style-type: none"> date.dcAppStartTime dcAppStartTime
Web Interface window	DC App Start Time <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Date window (on page 395) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The date.dcAppStartTime parameter reports the time stamp of when the main app started. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

19.2. DC App Uptime

Important! Time zones **do not** apply to the Z9-P or Z9-PE.

DC App Uptime	
Setting	Description
CLI / Web Page	[Page=date]
CLI Command	<ul style="list-style-type: none"> date.dcAppUptime dcAppUptime
Web Interface window	DC App Uptime <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Date window (on page 395) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A

DC App Uptime	
Setting	Description
Description	The date.dcAppUptime parameter reports the number of Days, Hours, Minutes, and Seconds since the main app started. Note: This is a Read-only parameter.

19.3. Time

Important!: Time zones **do not** apply to the Z9-P or Z9-PE.

Time	
Setting	Description
CLI / Web Page	[Page=date]
CLI Command	<ul style="list-style-type: none"> date.time time
Web Interface window	Time Note: This parameter is read-only in the Web Interface. See the Date window (on page 395) for parameter location.
Default Setting	N/A
Options	N/A
Description	The date.time parameter reports the current time in Unix time stamp format. Note: This is a Read-only parameter.

19.4. Time String

Important!: Time zones **do not** apply to the Z9-P or Z9-PE.

Time String	
Setting	Description
CLI / Web Page	[Page=date]
CLI Command	date.timeString=MM/DD/YYYY HH.MM.SS

Time String	
Setting	Description
Web Interface window	Time String Note: This parameter is read-only in the Web Interface. See the Date window (on page 395) for parameter location.
Default Setting	N/A
Options	N/A
Description	The date.timeString parameter designates the time ONLY if the NTP Reference (on page 308) is set to REFCLK_LOCALCLOCK . Important! If the Z9-P or Z9-PE loses power, the time must be manually reset.

19.5. Up Time

Important! Time zones **do not** apply to the Z9-P or Z9-PE.

Up Time	
Setting	Description
CLI / Web Page	[Page=date]
CLI Command	<ul style="list-style-type: none"> date.upTime upTime
Web Interface window	Up Time Note: This parameter is read-only in the Web Interface. See the Date window (on page 395) for parameter location.
Default Setting	N/A
Options	N/A
Description	The date.upTime parameter reports the number of seconds since the Z9-P or Z9-PE restarted. Note: This is a Read-only parameter.

19.6. Up Time String

Important! Time zones **do not** apply to the Z9-P or Z9-PE.

Up Time String	
Setting	Description
CLI / Web Page	[Page=date]
CLI Command	<ul style="list-style-type: none"> date.upTimeString upTimeString <p>Example: A return of Uptime 5 Days 01:36:41 means the unit has been up for 5 days, 1 hour, 36 minutes, and 41 seconds.</p>
Web Interface window	Up Time String <p>Note: This parameter is read-only in the Web Interface. See the Date window (on page 395) for parameter location.</p>
Default Setting	N/A
Options	N/A
Description	The date.upTimeString parameter reports the amount of time in Days, Hours, Minutes, and Seconds the Z9-P or Z9-PE has been powered on without a reboot. <p>Note: This is a Read-only parameter.</p>

20. Encryption Parameters

Note: See the [Encryption window \(on page 397\)](#).

[Active Key \(on page 257\)](#)

[Encryption Mode \(on page 258\)](#)

[Key1 to Key 16 \(on page 259\)](#)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 **frequencyKey** returns the current value of **frequencyKey**.
Entering **frequencyKey=** is an implied change to **frequencyKey**.
If a value is NOT included, it changes **frequencyKey** to 0 (zero).

20.1. Active Key



Caution: Encryption settings **MUST match** on ALL radios in the network to maintain over-the-air compatibility.

When enabling Encryption, start with the farthest Endpoints, then any Repeaters, then lastly the Gateway.

As Encryption is enabled on each radio, that radio temporarily drops off the network, until any downstream Repeaters and the Gateway also have Encryption enabled, at which time all communication will resume.

Active Key	
Setting	Description
CLI / Web Page	[Page=encryption]
CLI Command	<ul style="list-style-type: none"> • <code>encryption.activeKey=Off</code> • <code>activeKey=Off</code> • <code>encryption.activeKey=Key1</code> to <code>Key16</code> • <code>activeKey=Key1</code> to <code>Key16</code> <p>Example: <code>encryption.activeKey=Key10</code>.</p>
Web Interface window	<p>Active Key</p> <ol style="list-style-type: none"> 1. Verify the designated Key1 to Key 16 (on page 259) is set at either a 128- or 256-bit hexadecimal. 2. Click the Active Key list box arrow and select the designated active key. 3. Click the Update button to save the change. <p>Note: See the Encryption window (on page 397) for parameter location.</p>
Default Setting	Off
Options	<ul style="list-style-type: none"> • Off • Key1 to Key16
Description	<p>The <code>encryption.activeKey</code> parameter designates the key used for encryption and decryption.</p> <p>Important!: Assigning the <code>activeKey</code> to a key that is NOT set will NOT allow communication across the link. Keys MUST BE set before they can become active keys.</p>

20.2. Encryption Mode



Caution: Encryption settings **MUST match** on ALL radios in the network to maintain over-the-air compatibility.

When enabling Encryption, start with the farthest Endpoints, then any Repeaters, then lastly the Gateway.

As Encryption is enabled on each radio, that radio temporarily drops off the network, until any downstream Repeaters and the Gateway also have Encryption enabled, at which time all communication will resume.

Encryption Mode	
Setting	Description
CLI / Web Page	[Page=encryption]
CLI Command	<ul style="list-style-type: none"> • AES Counter Mode: <ul style="list-style-type: none"> • <code>encryption.encryptionMode=AES_CTR</code> • <code>encryptionMode=AES_CTR</code> • AES Counter Mode with MIC (Message Integrity Check): <ul style="list-style-type: none"> • <code>encryption.encryptionMode=AES_CCM</code> • <code>encryptionMode=AES_CCM</code>
Web Interface window	<p>Encryption Mode</p> <ol style="list-style-type: none"> 1. Click the Encryption Mode list box arrow and select the designated encryption mode. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Encryption window (on page 397) for parameter location.</p> </div>
Default Setting	AES_CTR
Options	<ul style="list-style-type: none"> • AES_CCM • AES_CTR
Description	<p>The <code>encryption.encryptionMode</code> parameter designates the encryption mode.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! Use of encryption may affect latency and user throughput.</p> </div>

20.3. Key1 to Key 16



Caution: Encryption settings **MUST match** on ALL radios in the network to maintain over-the-air compatibility.

When enabling Encryption, start with the farthest Endpoints, then any Repeaters, then lastly the Gateway.

As Encryption is enabled on each radio, that radio temporarily drops off the network, until any downstream Repeaters and the Gateway also have Encryption enabled, at which time all communication will resume.

Key1 to Key16 (Get Key)

Setting	Description
CLI / Web Page	[Page=encryption]
CLI Command	<ul style="list-style-type: none"> • <code>encryption.Key1=Key1 to Key16</code> • <code>Key1=Key1 to Key16</code> <p>Example: <code>encryption.getKey=key8.</code></p>
Web Interface window	<p>Get Key</p> <ol style="list-style-type: none"> 1. In the KeyX text box, enter either the 128- or 256-bit key in 16 or 32 hexadecimal format respectively. Enter Clear to erase a previously enter key. 2. Click the Update button to save the change. <p>Note: Where X is the designated key number. See the Encryption window (on page 397) for parameter location.</p>
Default Setting	Key has not been set.
Options	Key1 to Key16
Description	<p>The encryption.Key1 parameter designates whether the specified key is a 128- or 256-bit key.</p> <p>Example: 128 bit key: <code>Key1=1234567890abcdef1234567890abcdef</code></p> <p>Example: 256 bit key: <code>Key2=1234567890abcdef1234567890abcdef1234567890abcdef1234567890ab</code> <code>cdef</code></p>

21. IO Ex Com Parameters

Note: This parameter is read-only.

22. Local Diagnostics Parameters

Note: See the [Local Diagnostics window](#) (on page 406).

Signal Level (on page 262)	Radio LL Tx (on page 270)
Signal Margin (on page 262)	Radio No Ack Tx (on page 270)
CNT Bad BCC (on page 263)	Radio Reliable Rx (on page 270)
CNT Bad Sync (on page 263)	Radio Reliable Tx (on page 270)
CNT ETX (on page 263)	Radio Reremit (on page 271)
CNT STX (on page 263)	Radio Rx (on page 271)
Get Stats (on page 263)	Radio Sending Drop (on page 271)
Interface Bytes Rx (on page 264)	Radio Timed Out (on page 271)
Interface Bytes Tx (on page 264)	Radio Too Long (on page 271)
Interface Data Rx (on page 264)	Radio Too Short (on page 272)
Interface Data Tx (on page 264)	Radio Tx (on page 272)
Mac Table Clear (on page 264)	Resets Detected (on page 272)
Mac Table Show (on page 265)	Resets Sent (on page 272)
Monitored Node (on page 265)	Reset Stats (on page 272)
Noise Level (on page 266)	Rx Success (on page 273)
Radio Ack Tx (on page 267)	Show Channel Diags (on page 273)
Radio Bad Ack Rx (on page 267)	Show Node Diags (on page 274)
Radio Bad CRC (on page 267)	Supply Voltage (on page 274)
Radio Bad Sync (on page 268)	Timestamp (on page 275)
Radio Contention Drop (on page 269)	Tx Availability (on page 276)
Radio LL Rx (on page 269)	Tx Success (on page 276)
	VSWR (Signal Level) (on page 277)

22.1. Signal Level

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

signalLevel	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.signalLevel signalLevel
Web Interface window	Signal Level <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	N/A
Description	The localDiagnostics.signalLevel command reports the signal level of the Z9-P or Z9-PE, in dBm, of the last received packet. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This setting shows -128.00 if no packet has been received since the stats were cleared.</p> </div>

22.2. Signal Margin

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

signalMargin	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.signalMargin signalMargin
Web Interface window	Signal Margin <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>

signalMargin	
Setting	Description
Default Setting	N/A
Options	N/A
Description	<p>The localDiagnostics.signalMargin command reports the amount of signal margin, in dB, the last received packet experienced.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: The signal margin is the difference between the signal level and either the receive sensitivity or the noise level, whichever is higher, for the configured RF data rate.</p> </div>

22.3. CNT Bad BCC

Important!: FreeWave internal use only.

22.4. CNT Bad Sync

Important!: FreeWave internal use only.

22.5. CNT ETX

Important!: FreeWave internal use only.

22.6. CNT STX

Important!: FreeWave internal use only.

22.7. Get Stats

Get Stats	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> • localDiagnostics.getStats • getStats
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Note: This parameter is only available in the CLI window.</p> </div>

Get Stats	
Setting	Description
Default Setting	N/A
Options	N/A
Description	<p>The localDiagnostics.getStats command reports the local diagnostics from the connected Z9-P or Z9-PE immediately.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! A refresh of the localDiagnostics page is required to see the updates.</p> </div>

22.8. Interface Bytes Rx

Important! FreeWave internal use only.

22.9. Interface Bytes Tx

Important! FreeWave internal use only.

22.10. Interface Data Rx

Important! FreeWave internal use only.

22.11. Interface Data Tx

Important! FreeWave internal use only.

22.12. Mac Table Clear

Mac Table Clear	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> • <code>localDiagnostics.MacTableClear=Now</code> • <code>localDiagnostics.MacTableClear=</code> • <code>MacTableClear=Now</code> • <code>MacTableClear=</code>

Mac Table Clear	
Setting	Description
Web Interface window	Note: This parameter is only available in the CLI window.
Default Setting	N/A
Options	Now
Description	The localDiagnostics.MacTableClear command clears the MAC to the Node ID (on page 322) mapping table and forces routes to be relearned.

22.13. Mac Table Show

MacTableShow	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.MacTableShow MacTableShow
Web Interface window	Note: This parameter is only available in the CLI window.
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.MacTableShow command reports the MAC addresses of the devices connected to the Z9-P or Z9-PE in a Node ID (on page 322) table format.

22.14. Monitored Node

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Monitored Node	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.monitoredNode=<Node ID here> monitoredNode=<Node ID here>

Monitored Node	
Setting	Description
Web Interface window	<p>Monitored Node</p> <ol style="list-style-type: none"> In the Monitored Node text box, enter the Node ID (on page 322) to monitor. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The localDiagnostics.monitoredNode parameter designates the Node ID (on page 322) to monitor the signal level.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  <p>Use the Show Node Diags (on page 274) to view the received signal level (RSSI) of this node.</p> </div>

22.15. Noise Level

Important! Most of the [localDiagnostics](#) parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Noise Level	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.noiseLevel</code> <code>noiseLevel</code>
Web Interface window	<p>Noise Level</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	0.000000
Options	N/A
Description	<p>The localDiagnostics.noiseLevel command reports the amount of link noise measured in dB before the last packet was transmitted.</p>

22.16. Radio Ack Tx

Important! FreeWave internal use only.

22.17. Radio Bad Ack Rx

Important! Most of the [localDiagnostics](#) parameters are read-only.
The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio Bad Ack Rx	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.RadioBadAckRx</code> <code>RadioBadAckRx</code>
Web Interface window	Radio Bad Ack RX <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioBadAckRx command reports the number of received ACKs missed in unicast transmissions.

22.18. Radio Bad CRC

Important! Most of the [localDiagnostics](#) parameters are read-only.
The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio Bad CRC	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.RadioBadCRC</code> <code>RadioBadCRC</code>

Radio Bad CRC	
Setting	Description
Web Interface window	Radio Bad CRC Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioBadCRC command reports the number of radio packets received with data corruption. FREEWAVE Recommends: When viewing local diagnostics, if the Radio Bad CRC (on page 267) count is more than 15-20% of the total transmitted packets (the Radio LL Tx (on page 270) count), enabling the FEC Rate (on page 246) setting is beneficial.

22.19. Radio Bad Sync

Important! Most of the [localDiagnostics](#) parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio Bad Sync	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.RadioBadSync</code> <code>RadioBadSync</code>
Web Interface window	Radio Bad Sync Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioBadSync command reports the number of times beacons were lost and the Endpoint needed to re-synchronize with the Gateway when radiosettings.radioHoppingMode=Hopping_On .

22.20. Radio Contention Drop

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio Contention Drop	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.RadioContentionDrop RadioContentionDrop
Web Interface window	Radio Contention Drop <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioContentionDrop command reports the number of times a transmission was backed-off due to contention on the RF channel.

22.21. Radio LL Rx

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio LL Rx	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.RadioLLRx RadioLLRx
Web Interface window	Radio LL RX <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioLLRx command reports the number of packets received over the air without data corruption.

22.22. Radio LL Tx

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio LL Tx	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.RadioLLTx RadioLLTx
Web Interface window	Radio LL TX <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioLLTx command reports the number of packets transmitted over the air. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: When viewing local diagnostics, if the Radio Bad CRC (on page 267) count is more than 15-20% of the total transmitted packets (the Radio LL Tx (on page 270) count), enabling the FEC Rate (on page 246) setting is beneficial.</p> </div>

22.23. Radio No Ack Tx

Important! FreeWave internal use only.

22.24. Radio Reliable Rx

Important! FreeWave internal use only.

22.25. Radio Reliable Tx

Important! FreeWave internal use only.

22.26. Radio Rexmit

Important! FreeWave internal use only.

22.27. Radio Rx

Important! Most of the [localDiagnostics](#) parameters are read-only.
The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio Rx	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.RadioRx</code> <code>RadioRx</code>
Web Interface window	Radio RX <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioRx command reports the number of data packets correctly received over the wireless RF link for this Endpoint.

22.28. Radio Sending Drop

Important! FreeWave internal use only.

22.29. Radio Timed Out

Important! FreeWave internal use only.

22.30. Radio Too Long

Important! FreeWave internal use only.

22.31. Radio Too Short

Important! FreeWave internal use only.

22.32. Radio Tx

Important! Most of the [localDiagnostics](#) parameters are read-only.
The information reported is dependent upon the connected Z9-P or Z9-PE.

Radio Tx	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.RadioTx</code> <code>RadioTx</code>
Web Interface window	Radio TX <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.RadioTx command reports the number of data packets scheduled to be transmitted.

22.33. Resets Detected

Important! FreeWave internal use only.

22.34. Resets Sent

Important! FreeWave internal use only.

22.35. Reset Stats

Reset Stats	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]

Reset Stats	
Setting	Description
CLI Command	<ul style="list-style-type: none"> localDiagnostics.resetStats=Now localDiagnostics.resetStats= resetStats=Now resetStats=
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Note: This parameter is only available in the CLI window.</p> </div>
Default Setting	N/A
Options	Now
Description	The localDiagnostics.resetStats command resets the local diagnostics counters.

22.36. Rx Success

Important! Most of the [localDiagnostics](#) parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Rx Success	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.RxSuccess RxSuccess
Web Interface window	Rx Success <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	100
Options	N/A
Description	The localDiagnostics.RxSuccess command reports the percentage of packets correctly received for this Endpoint.

22.37. Show Channel Diags

Show Channel Diags	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]

Show Channel Diags	
Setting	Description
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.showChannelDiags</code> <code>showChannelDiags</code>
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Note: This parameter is only available in the CLI window.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.showChannelDiags command reports the received signal level (RSSI) and Node ID (on page 322) of the last packet received on the displayed frequencies.

22.38. Show Node Diags

showNodeDiags	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.showNodeDiags</code> <code>showNodeDiags</code>
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Note: This parameter is only available in the CLI window.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.showNodeDiags command reports the channel frequency and signal level for the node selected by the Monitored Node (on page 265) parameter.

22.39. Supply Voltage

Important!: Most of the [localDiagnostics](#) parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Supply Voltage	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]

Supply Voltage	
Setting	Description
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.SupplyVoltage</code> <code>SupplyVoltage</code>
Web Interface window	Supply Voltage <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.SupplyVoltage command reports the supply voltage to the Z9-P or Z9-PE in units of voltage (V). <ul style="list-style-type: none"> localDiagnostics.SupplyVoltage is NOT supported on Z9-P, Z9-PE, Z9-PC, or Z9-PC-SR001 models. 0 (zero) indicates the individual radio does not support localDiagnostics.SupplyVoltage.

22.40. Timestamp

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Timestamp	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> <code>localDiagnostics.timestamp</code> <code>timestamp</code>
Web Interface window	Timestamp <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The localDiagnostics.timestamp command reports the time the Diagnostics Information was collected by the device.

22.41. Tx Availability

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Tx Availability	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.TxAvailability TxAvailability
Web Interface window	Tx Availability <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	100
Options	N/A
Description	The localDiagnostics.TxAvailability command reports the percentage of packets that were transmitted without back-off.

22.42. Tx Success

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

Tx Success	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.TxSuccess TxSuccess
Web Interface window	Tx Success <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	100
Options	N/A
Description	The localDiagnostics.TxSuccess command reports the percentage of packets that were transmitted with a successful ACK received.

22.43. VSWR (Signal Level)

Important! Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P or Z9-PE.

VSWR (Signal Level)	
Setting	Description
CLI / Web Page	[Page=localDiagnostics]
CLI Command	<ul style="list-style-type: none"> localDiagnostics.VSWR VSWR
Web Interface window	Signal Level <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 406) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	N/A
Description	<p>The localDiagnostics.VSWR command reports the value proportional to the VSWR (Voltage Standing Wave Ratio) measured from the last packet transmitted.</p> <ul style="list-style-type: none"> For the antenna port, the value can range from: <ul style="list-style-type: none"> 1 to 2 for an excellent match 2 to 10 for a good match 11 to 99 - user discretion > 100 for a poor match <p>Notes</p> <ul style="list-style-type: none"> VSWR is less accurate at higher power levels (>20 dBm). The reported VSWR is a value proportional to the VSWR. It is closer to VSWR at lower powers, but at higher power levels, it still increases with reflected power. VSWR may not function on Z9-P or Z9-PE models manufactured prior to September, 2018. If the Z9-P or Z9-PE always reports a VSWR value of 0 (zero), VSWR is not supported. The VSWR is instantaneous, not averaged. Each measurement can produce a different value; units that do support VSWR will occasionally report 0 (zero) due to an invalid measurement. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Investigate cable and antenna at higher VSWR levels.</p> </div>

23. Modbus Parameters

Note: See the [Modbus window](#) (on page 408).

[Modbus Device ID](#) (on page 279)

[Modbus RTU Over TCP](#) (on page 280)

[Modbus TCP](#) (on page 281)

[Modbus Layout](#) (on page 279)

[Read](#) (on page 281)

[Read Coils](#) (on page 282)

[Write](#) (on page 283)

[Write Coils](#) (on page 284)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 [frequencyKey](#) returns the current value of [frequencyKey](#).
Entering [frequencyKey=](#) is an implied change to [frequencyKey](#).
If a value is NOT included, it changes [frequencyKey](#) to 0 (zero).

23.1. Modbus Device ID

Modbus Device ID	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> • <code>modbus.modbusDeviceId=nnn</code> • <code>modbusDeviceId=nnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnn</code> designates the user-defined Modbus device ID.</p> </div>
Web Interface window	<p>Modbus Device ID</p> <ol style="list-style-type: none"> 1. In the Modbus Device ID text box, enter a user-defined Modbus device ID. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	1
Options	1 to 247
Description	The modbus.modbusDeviceId parameter designates the Modbus device ID the local device responds to during a Modbus TCP (on page 281) request over the network or a Modbus RTU Over TCP (on page 280) request coming in via COM1 or COM2.

23.2. Modbus Layout

Modbus Layout	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> • <code>modbus.modbusLayout</code> • <code>modbusLayout</code>
Web Interface window	<p>Modbus Layout</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is visible and read-only in the Web Interface selected from the System Info menu.</p> <p>See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A

Modbus Layout	
Setting	Description
Description	<p>The modbus.modbusLayout parameter reports the Modbus map for the local device.</p> <p>Example</p> <pre>>modbusLayout radioSettings.radioMode type:uint32_t Protocol address:31001 Number registers:2 Modbus FC:4 Address:1000 radioSettings.rfDataRate type:uint32_t Protocol address:31003 Number registers:2 Modbus FC:4 Address:1002 radioSettings.radioMaxRepeaters type:uint32_t Protocol address:31005 Number registers:2 Modbus FC:4 Address:1004 ... rfStats.DownRateAvg2 type:double Protocol address:32121 Number registers:4 Modbus FC:4 Address:2120 RESULT:0:OK ></pre>

23.3. Modbus RTU Over TCP

Modbus RTU Over TCP	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> modbus.modbusRtuOverTcp=nnnn modbusRtuOverTcp=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> designates the TCP port used for the Modbus RTU over TCP requests.</p> </div>
Web Interface window	<p>Modbus RTU Over TCP</p> <ol style="list-style-type: none"> In the Modbus Rtu Over TCP text box, enter the TCP port used for the Modbus RTU over TCP requests. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	5021
Options	0 (zero) to 65535

Modbus RTU Over TCP	
Setting	Description
Description	<p>The modbus.modbusRtuOverTcp parameter designates the TCP port used for the Modbus RTU over TCP requests.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Set to 0 (zero) to disable Modbus RTU over TCP requests.</p> </div>

23.4. Modbus TCP

Modbus TCP	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> • <code>modbus.modbusTcp=nnnn</code> • <code>modbusTcp=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> designates the TCP port used for the Modbus TCP requests.</p> </div>
Web Interface window	<p>Modbus TCP</p> <ol style="list-style-type: none"> 1. In the Modbus TCP text box, enter the TCP port used for the Modbus TCP requests. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	502
Options	0 (zero) to 65535
Description	<p>The modbus.modbusTcp parameter designates the TCP port used for the Modbus TCP requests.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Set to 0 (zero) to disable Modbus TCP.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: A reboot is required when changing the modbus.modbusTcp value for the change to take effect.</p> </div>

23.5. Read

read	
Setting	Description
CLI / Web Page	[Page=modbus]

read																			
Setting	Description																		
CLI Command	<ul style="list-style-type: none"> • <code>modbus.read</code> • <code>read</code> 																		
Web Interface window	Read <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Modbus window (on page 408) for parameter location.</p> </div>																		
Default Setting	N/A																		
Options	<table border="1"> <tbody> <tr> <td>Bool</td> <td>LongABCD</td> </tr> <tr> <td>Byte</td> <td>LongBADC</td> </tr> <tr> <td>FloatABCD</td> <td>LongCDAB</td> </tr> <tr> <td>FloatBADC</td> <td>LongDCBA</td> </tr> <tr> <td>FloatCDAB</td> <td>Raw</td> </tr> <tr> <td>FloatDCBA</td> <td>Unsigned</td> </tr> <tr> <td>IntABCD</td> <td>IntDCBA</td> </tr> <tr> <td>IntBADC</td> <td>Signed</td> </tr> <tr> <td>IntCDAB</td> <td></td> </tr> </tbody> </table>	Bool	LongABCD	Byte	LongBADC	FloatABCD	LongCDAB	FloatBADC	LongDCBA	FloatCDAB	Raw	FloatDCBA	Unsigned	IntABCD	IntDCBA	IntBADC	Signed	IntCDAB	
Bool	LongABCD																		
Byte	LongBADC																		
FloatABCD	LongCDAB																		
FloatBADC	LongDCBA																		
FloatCDAB	Raw																		
FloatDCBA	Unsigned																		
IntABCD	IntDCBA																		
IntBADC	Signed																		
IntCDAB																			
Description	<p>The modbus.read parameter creates a Modbus request from the CLI.</p> <p>Example</p> <pre>>read --srcId=1 --srcAddress=1000 --srcFc=FC4 -- type=longABCD --numElements=4 Id:1 Fc:4 Address: 1000 Type: LongABCD Value: 0 Id:1 Fc:4 Address: 1002 Type: LongABCD Value: 4000000 Id:1 Fc:4 Address: 1004 Type: LongABCD Value: 0 Id:1 Fc:4 Address: 1006 Type: LongABCD Value: 1 RESULT:0:OK ></pre>																		

23.6. Read Coils

Read Coils	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> • <code>modbus.readCoils</code> • <code>readCoils</code>

Read Coils	
Setting	Description
Web Interface window	Read Coils <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The modbus.readCoils parameter creates a Modbus request to read coils from the CLI. Example <pre>>readCoils --srcId=1 --srcAddress=100 --srcFc=FC1 --numElements=4 Id:1 Fc:1 Address: 100 Value: 1 Id:1 Fc:1 Address: 101 Value: 1 Id:1 Fc:1 Address: 102 Value: 1 Id:1 Fc:1 Address: 103 Value: 1 RESULT:0:OK</pre>

23.7. Write

Write	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> • <code>modbus.write</code> • <code>write</code>
Web Interface window	Write <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	N/A

Write																			
Setting	Description																		
Options	<table border="1"> <tr> <td>Bool</td> <td>LongABCD</td> </tr> <tr> <td>Byte</td> <td>LongBADC</td> </tr> <tr> <td>FloatABCD</td> <td>LongCDAB</td> </tr> <tr> <td>FloatBADC</td> <td>LongDCBA</td> </tr> <tr> <td>FloatCDAB</td> <td>Raw</td> </tr> <tr> <td>FloatDCBA</td> <td>Unsigned</td> </tr> <tr> <td>IntABCD</td> <td>IntDCBA</td> </tr> <tr> <td>IntBADC</td> <td>Signed</td> </tr> <tr> <td>IntCDAB</td> <td></td> </tr> </table>	Bool	LongABCD	Byte	LongBADC	FloatABCD	LongCDAB	FloatBADC	LongDCBA	FloatCDAB	Raw	FloatDCBA	Unsigned	IntABCD	IntDCBA	IntBADC	Signed	IntCDAB	
Bool	LongABCD																		
Byte	LongBADC																		
FloatABCD	LongCDAB																		
FloatBADC	LongDCBA																		
FloatCDAB	Raw																		
FloatDCBA	Unsigned																		
IntABCD	IntDCBA																		
IntBADC	Signed																		
IntCDAB																			
Description	<p>The modbus.write parameter creates a Modbus write request from the CLI to write to a holding register.</p> <p>Example</p> <pre>>write --srcId=1 --srcAddress=100 --type=intabcd --value=1024 RESULT:0:OK</pre>																		

23.8. Write Coils

Write Coils	
Setting	Description
CLI / Web Page	[Page=modbus]
CLI Command	<ul style="list-style-type: none"> modbus.writeCoils writeCoils
Web Interface window	<p>Write Coils</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Modbus window (on page 408) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The modbus.writeCoils parameter creates a Modbus write request from the CLI to write to the coils.</p> <p>Example</p> <pre>>writeCoils --srcId=1 --srcAddress=100 --value=0x55 --numElements=4 RESULT:0:OK</pre>

23.9. Modbus Use Cases

The Modbus feature allows for radio diagnostics and radio settings to be read via Modbus. Settings are read only.

The three methods of connecting to the radio are:

- [Modbus TCP \(on page 285\)](#),
- [Modbus RTU over TCP \(on page 285\)](#), and
- [Modbus RTU using COM1 \(on page 286\)](#)
or
[Modbus RTU using COM2 \(on page 286\)](#) serial ports.

COM1 or COM2 can be configured for Modbus pass thru.

This will take any request that comes in through any one of the three methods and convert it to a serial Modbus RTU request. This request is sent out the configured serial port to a serial Modbus device.

This allows the Z9-P or Z9-PE to act as a Modbus TCP to serial Modbus gateway.

23.9.1. Connecting to a Device via Modbus

Modbus TCP

1. On the Z9-P or Z9-PE, connect to port 502.
2. Use the Modbus TCP protocol.
3. In the CLI, enter `modbus . modbusTcp=nnnn` to change the port.

Note: Where `nnnn` designates the TCP port used for the Modbus TCP requests. Set to 0 (zero) to disable Modbus TCP. See [Modbus TCP \(on page 281\)](#) for additional information.

Modbus RTU over TCP

1. On the Z9-P or Z9-PE, connect to port 5021.
2. Use the Modbus RTU protocol.
3. In the CLI, enter `modbus . modbusRtuOverTcp=nnnn` to change the port.

Note: Where `nnnn` designates the TCP port used for the Modbus RTU over TCP requests. Set to 0 (zero) to disable Modbus RTU over TCP requests. See [Modbus RTU Over TCP \(on page 280\)](#) for additional information.

Modbus RTU using COM1

1. Connect the device to the COM1 serial port.
2. Configure the COM port [Baudrate \(on page 225\)](#) and other settings to match the serial Modbus RTU device.
3. Change the COM1 [Handler \(on page 230\)](#) to `Com1.handler=ModbusRTU`.
4. Send in Modbus requests via COM1.

Modbus RTU using COM2

1. Connect the device to the COM2 serial port.
2. Configure the COM port [Baudrate \(on page 225\)](#) and other settings to match the serial Modbus RTU device.
3. Change the COM1 [Handler \(on page 230\)](#) to `Com2.handler=ModbusRTU`.
4. Send in Modbus requests via COM2.

23.10. Reading Local Diagnostics and Radio Settings using Modbus

Note: See [Modbus Device ID \(on page 279\)](#) for additional information.

The local device ID is set using `modbus.modbusDeviceId=nnnn`.

23.10.1. Reading from an External Modbus RTU Serial Device using COM1

1. Connect the device to the COM1 serial port.
2. Configure the COM port [Baudrate \(on page 225\)](#) and other settings to match the serial Modbus device.
3. Change the COM1 [Handler \(on page 230\)](#) to `Com1.handler=ModbusPassthru`.

Notes

- Incoming requests that are not for the local Z9-P or Z9-PE device or for IOEX are sent out COM1.
- Responses are returned out the port that the request came in on.
- The protocol is converted from Modbus TCP to Modbus RTU and back where necessary.

23.10.2. Reading from the External Modbus RTU Serial Device using COM2

1. Connect the device to the COM2 serial port.
2. Configure the COM port [Baudrate \(on page 225\)](#) and other settings to match the serial Modbus device.
3. Change the COM2 [Handler \(on page 230\)](#) to `Com2.handler=ModbusPassthru`.

Notes

- Incoming requests that are not for the local Z9-P or Z9-PE device or for IOEX are sent out COM2.
- Responses are returned out the port that the request came in on.
- The protocol is converted from Modbus TCP to Modbus RTU and back where necessary.

24. Network Parameters

Note: See the [Network window](#) (on page 410).

[Arp Filter Enabled](#) (on page 289)

[Gateway](#) (on page 289)

[IP Address](#) (on page 290)

[MAC Address](#) (on page 290)

[MTU](#) (on page 291)

[Nameserver Address 1](#) (on page 292)

[Nameserver Address 2](#) (on page 293)

[Netmask](#) (on page 293)

[Netmask Filter Enabled](#) (on page 294)

[STP Enabled](#) (on page 295)

[Txqueuelen](#) (on page 296)

[VLAN MGMT](#) (on page 297)

[VLAN Tag](#) (on page 297)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

24.1. Arp Filter Enabled

Arp Filter Enabled	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> Enable the parameter: <code>network.arpFilterEnabled=True</code> Disable the parameter: <code>network.arpFilterEnabled=False</code>
Web Interface window	<p>Arp Filter Enabled</p> <ol style="list-style-type: none"> Click the Arp Filter Enabled list box arrow and select True to enable the parameter. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	False
Options	<ul style="list-style-type: none"> True False
Description	<p>The <code>network.arpFilterEnabled</code> setting enables ARP filter in the bridge firewall. This allows only ARP communication that is in the Netmask (on page 293) parameter to enter the radio network.</p>

24.2. Gateway

Gateway	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.gateway=nnn.nnn.nnn.nnn</code> <code>gateway=nnn.nnn.nnn.nnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! Where <code>nnn.nnn.nnn.nnn</code> is the Gateway IP address for the network.</p> </div>
Web Interface window	<p>Gateway</p> <ol style="list-style-type: none"> In the Gateway text box, enter the Gateway IP address for the network. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	192.168.111.1
Options	N/A

Gateway	
Setting	Description
Description	<p>The network.gateway parameter designates the Gateway IP address for the network.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! The use of a Gateway here is NOT related to the radioSettings.radioMode=Gateway or radioSettings.radioMode=Endpoint.</p> </div>

24.3. IP Address

IP Address	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.ip_address=nnn.nnn.nnn.nnn</code> <code>ip_address=nnn.nnn.nnn.nnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! Where <code>nnn.nnn.nnn.nnn</code> is the IP Address assigned to each Z9-P or Z9-PE.</p> </div>
Web Interface window	<p>IP Address</p> <ol style="list-style-type: none"> In the IP Address text box, enter the IP address of the Z9-P or Z9-PE assigned by the IT department for the network. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	192.168.111.100
Options	N/A
Description	The network.ip_address parameter designates the IP address of the Z9-P or Z9-PE.

24.4. MAC Address

MAC Address	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.mac_address</code> <code>mac_address</code>

MAC Address	
Setting	Description
Web Interface window	MAC Address <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The <code>network.mac_address</code> command reports the MAC Address of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! This parameter is read-only and is unique for each radio.</p> </div> <p>Notes about the MAC Address Table</p> <ul style="list-style-type: none"> • 1024 apps and programs are allowed to talk directly to the Z9-P or Z9-PE. • 4096 entries are allowed for the Z9-P or Z9-PE links. • If 4096 is exceeded, old entries are deleted but they can be re-learned.

24.5. MTU

MTU	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> • <code>network.mtu=nnnn</code> • <code>mtu=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is the maximum transmission unit.</p> </div>
Web Interface window	MTU <ol style="list-style-type: none"> 1. In the MTU text box, enter the maximum transmission unit. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	1500
Options	<ul style="list-style-type: none"> • The minimum value is 100. • The maximum value is 65521.

MTU	
Setting	Description
Description	<p>The network.mtu parameter designates the maximum transmission unit (MTU) frame size for the Z9-P or Z9-PE.</p> <p>Notes</p> <ul style="list-style-type: none"> The MTU size only effects communications that originate or terminate on this device, such as the web services or the Terminal Servers. All other traffic passing through the radio network is affected by this setting. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! The value MUST BE increased to support jumbo size frames that exceed the normal 1500 byte MTU.</p> </div>

24.6. Nameserver Address 1

Nameserver Address 1	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.nameserver_address1=nnn.nnn.nnn.nnn</code> <code>nameserver_address1=nnn.nnn.nnn.nnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnn.nnn.nnn.nnn</code> is a user-defined DNS IP address.</p> </div>
Web Interface window	<p>Nameserver Address 1</p> <ol style="list-style-type: none"> Optional: In the Nameserver Address 1 text box, enter a user-defined DNS IP address. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	<p>8.8.8.8</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Google Public DNS.</p> </div>
Options	User-defined DNS IP address.
Description	The network.nameserver_address1 parameter designates the DNS for name-to-address resolution.

24.7. Nameserver Address 2

Nameserver Address 2	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.nameserver_address2=nnn.nnn.nnn.nnn.</code> <code>nameserver_address2=nnn.nnn.nnn.nnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnn.nnn.nnn.nnn</code> is a user-defined DNS IP address.</p> </div>
Web Interface window	<p>Nameserver Address 2</p> <ol style="list-style-type: none"> Optional: In the Nameserver Address 2 text box, enter a user-defined DNS IP address.. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	<p>8.8.4.4</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Google Public DNS.</p> </div>
Options	User-defined DNS IP address.
Description	The network.nameserver_address2 parameter designates the DNS for name-to-address resolution.

24.8. Netmask

Netmask	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.netmask=nnn.nnn.nnn.nnn</code> <code>netmask=nnn.nnn.nnn.nnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnn.nnn.nnn.nnn</code> is the Netmask of the Z9-P or Z9-PE.</p> </div>
Web Interface window	<p>Netmask</p> <ol style="list-style-type: none"> In the Netmask text box, enter the Netmask of the Z9-P or Z9-PE. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	255.255.255.0

Netmask	
Setting	Description
Options	N/A
Description	The network.netmask parameter designates the Netmask of the Z9-P or Z9-PE.

24.9. Netmask Filter Enabled

Netmask Filter Enabled	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • <code>network.netmaskFilterEnabled=true</code> • <code>netmaskFilterEnabled=true</code> • Disable: <ul style="list-style-type: none"> • <code>network.netmaskFilterEnabled=false</code> • <code>netmaskFilterEnabled=false</code>
Web Interface window	<p>Netmask Filter Enabled</p> <ol style="list-style-type: none"> 1. Click the Netmask Filter Enabled list box arrow and select True to enable the bridge firewall and restrict network communication to current IPv4 subnet. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the Netmask Filter Enabled is enabled (set to False). See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	False
Options	<ul style="list-style-type: none"> • True • False

Netmask Filter Enabled	
Setting	Description
Description	<p>The network.netmaskFilterEnabled enables a bridge firewall to restrict network communication to the current IPv4 subnet.</p> <p>Notes</p> <ul style="list-style-type: none"> Allows ONLY IPv4, TCP, UDP, ICMP (ping), and ARP communication that is in the network.netmask parameter subnet to enter into the radio network. VLAN tagged packets are filtered out because the radio is not considered on the VLAN and therefore VLAN packets cannot be on the same subnet. Enabling Netmask Filter can prevent non-radio Ethernet traffic from adversely affecting the performance and capacity of the radio network. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! ZumLink acts as a layer 2 switch. ALL Ethernet and Multicast packets are passed when IP Netmask Filter is NOT enabled.</p> </div>

24.10. STP Enabled

STP Enabled	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> Enable: <ul style="list-style-type: none"> <code>network.stpEnabled=true</code> <code>stpEnabled=true</code> Disable: <ul style="list-style-type: none"> <code>network.stpEnabled=false</code> <code>stpEnabled=false</code>
Web Interface window	<p>STP Enabled</p> <ol style="list-style-type: none"> Click the STP Enabled list box arrow and select True to enable the Spanning Tree Protocol. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the STP Enabled is NOT enabled (set to False). See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	False
Options	<ul style="list-style-type: none"> True False
Description	The network.stpEnabled setting enables the Spanning Tree Protocol.

24.11. Txqueuelen

Txqueuelen	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> network.txqueuelen=nnnn txqueuelen=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is the maximum number of packets to hold in the transmit queue.</p> </div>
Web Interface window	<p>Txqueuelen</p> <ol style="list-style-type: none"> In the Txqueuelen text box, enter the maximum number of packets to hold in the transmit queue. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	25
Options	<ul style="list-style-type: none"> The minimum value is 1. The maximum value is 1000.
Description	<p>The network.txqueuelen parameter designates the maximum number of packets that can be buffered before they are rejected by the radio.</p> <p>Notes</p> <ul style="list-style-type: none"> The radio is still trying to send packets as soon as it receives them. If the queue size is too small in an Ethernet network with a high rate of small packets, then packets could be lost. Increasing TX Queue Length may increase throughput if there is a lot of network chatter that causes packets to be lost at the network layer. Increasing TX Queue Length can increase latency if the packets are arriving at the Ethernet interface at an average rate that is above the capacity of the radio link. <div style="border: 1px solid black; padding: 5px; margin-top: 10px; background-color: #e0e0e0;"> <p>Example: <code>network.txqueuelen=750</code> allows 750 Ethernet packets buffered in the transmit queue.</p> </div>

24.12. VLAN MGMT

VLAN MGMT	
Setting	Description
CLI / Web Page	[Page=network]
CLI Command	<ul style="list-style-type: none"> <code>network.vlanMgmt=nnnn</code> <code>vlanMgmt=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> designates the Management VLAN ID for the Z9-P or Z9-PE.</p> </div>
Web Interface window	<p>VLAN MGMT</p> <ol style="list-style-type: none"> In the Vlan MGMT text box, enter the Management VLAN ID. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	0 (zero) to 4094
Description	<p>The network.vlanMgmt parameter designates the Management VLAN ID for the Z9-P or Z9-PE.</p> <ul style="list-style-type: none"> If the network.vlanMgmt is set, users can only access the device from the same VLAN ID. If the VLAN Tag (on page 297) is set on an Ethernet port, that port cannot be used to access the network.vlanMgmt. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: network.vlanMgmt must be different from any of the network.vlanTag IDs.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Set to 0 (zero) to disable Management VLAN.</p> </div>

24.13. VLAN Tag

VLAN Tag	
Setting	Description
CLI / Web Page	[Page=network]

VLAN Tag	
Setting	Description
CLI Command	<ul style="list-style-type: none"> <code>network.vlanTag=nnnn</code> <code>vlanTag=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> designates the VLAN Tag ID.</p> </div>
Web Interface window	<p>VLAN Tag</p> <ol style="list-style-type: none"> In the Vlan Tag text box, enter the VLAN ID. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Network window (on page 410) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	0 (zero) to 4094
Description	<p>The network.vlanTag parameter:</p> <ul style="list-style-type: none"> removes the VLAN ID for traffic transmitted from the Z9-P or Z9-PE to VLAN-incapable equipment and adds a VLAN ID for traffic received on the Z9-P or Z9-PE. <p>Notes</p> <ul style="list-style-type: none"> Set to 0 (zero) to disable VLAN tagging for the Ethernet port and allow VLAN tags to pass unchanged through the Z9-P or Z9-PE. The VLAN Tag ID is set on the Z9-P or Z9-PE Ethernet port. Egress traffic tagged with the VLAN ID has the tag stripped and sent out the Ethernet port. Ingress traffic to the Ethernet port has the VLAN tag with that ID added. Ingress traffic to the Ethernet port with the VLAN tag has the VLAN tag with that ID added. (802.11ad double tag)

25. Network StatsParameters

Note: See the [Network Stats window](#) (on page 417).

[RX Bytes](#) (on page 300)

[RX Dropped](#) (on page 300)

[RX Errors](#) (on page 301)

[RX Packets](#) (on page 301)

[TX Bytes](#) (on page 302)

[TX Dropped](#) (on page 302)

[TX Errors](#) (on page 303)

[TX Packets](#) (on page 303)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

25.1. RX Bytes

RX Bytes	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> • <code>networkStats.rx_bytes</code> • <code>rx_bytes</code>
Web Interface window	RX Bytes <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The networkStats.rx_bytes command reports the number of bytes received from the radio network. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

25.2. RX Dropped

RX Dropped	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> • <code>networkStats.rx_dropped</code> • <code>rx_dropped</code>
Web Interface window	RX Dropped <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The networkStats.rx_dropped command reports the number of Ethernet packets received from the radio network that were dropped at the Ethernet interface. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

25.3. RX Errors

RX Errors	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> networkStats.rx_errors rx_errors
Web Interface window	RX Errors <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The networkStats.rx_errors command reports the number of Ethernet packets received from the radio network that had Ethernet errors. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

25.4. RX Packets

RX Packets	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> networkStats.rx_packets rx_packets
Web Interface window	RX Packets <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The networkStats.rx_packets command reports the number of Ethernet packets received from the radio network. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

25.5. TX Bytes

TX Bytes	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> networkStats.tx_bytes tx_bytes
Web Interface window	TX Bytes <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The networkStats.tx_bytes command reports the number of bytes of Ethernet packets received from the Ethernet port and sent over the radio network. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

25.6. TX Dropped

TX Dropped	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> networkStats.tx_dropped tx_dropped
Web Interface window	TX Dropped <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A

TX Dropped	
Setting	Description
Description	<p>The networkStats.tx_dropped command reports the number of Ethernet packets received from the Ethernet port but dropped because the transmit queue is full.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: An increase of this counter may indicate that increasing the Txqueuelen (on page 296) parameter may improve overall network performance.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: This is a Read-only parameter.</p> </div>

25.7. TX Errors

TX Errors	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> • <code>networkStats.tx_errors</code> • <code>tx_errors</code>
Web Interface window	<p>TX Errors</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The networkStats.tx_errors command reports the number of Ethernet packets received from the Ethernet port that were in error.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: This is a Read-only parameter.</p> </div>

25.8. TX Packets

TX Packets	
Setting	Description
CLI / Web Page	[Page=networkStats]
CLI Command	<ul style="list-style-type: none"> • <code>networkStats.tx_packets</code> • <code>tx_packets</code>

TX Packets	
Setting	Description
Web Interface window	TX Packets <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Network Stats window (on page 417) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The networkStats.tx_packets command reports the number of Ethernet packets received from the Ethernet port and sent over the radio network. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

26. NTP Parameters

Note: See the [NTP window](#) (on page 419).

[NTP Address \(1 to 5\)](#) (on page 306)

[NTP Date](#) (on page 307)

[NTP Reference](#) (on page 308)

[NTP Restart](#) (on page 309)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 [frequencyKey](#) returns the current value of [frequencyKey](#).
Entering [frequencyKey=](#) is an implied change to [frequencyKey](#).
If a value is NOT included, it changes [frequencyKey](#) to 0 (zero).

26.1. NTP Address (1 to 5)

NTP Address (1 to 5)	
Setting	Description
CLI / Web Page	[Page=ntp]
CLI Command	<ul style="list-style-type: none"> ntp.ntp_address1=nnn.nnn.nnn.nnn ntp.ntp_address2=nnn.nnn.nnn.nnn ntp.ntp_address3=nnn.nnn.nnn.nnn ntp.ntp_address4=nnn.nnn.nnn.nnn ntp.ntp_address5=nnn.nnn.nnn.nnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnn.nnn.nnn.nnn is the IP address of the servers used for synchronizing time.</p> </div>
Web Interface window	<p>NTP Address 1 NTP Address 2 NTP Address 3 NTP Address 4 NTP Address 5</p> <ol style="list-style-type: none"> In the NTP Address 2 to 5 text boxes, enter the IP address of the servers used for synchronizing time. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the NTP Address 1 is time.nist.gov. See the NTP window (on page 419) for parameter location.</p> </div>
Default Setting	<ul style="list-style-type: none"> ntp_address1: time.nist.gov ntp_address2-5: 0.0.0.0
Options	N/A

NTP Address (1 to 5)	
Setting	Description
Description	<p>The ntp.ntp_address1-5 parameter designates the IP address of the server used for synchronizing time.</p> <p>Notes</p> <ul style="list-style-type: none"> This can be a server such as time.nist.gov, time1.google.com or it can be the IP address of another radio in the network. A maximum of five NTP servers are allowed. The fields in the NTP Parameters (on page 305) parameters are not validated by the system. Use 0.0.0.0 to skip a specific server. <p>Example: Enter ntp.ntp_address2=0.0.0.0 to skip a second server, if it's available.</p> <p> A common use is to have all of the Endpoints and Repeaters use the IP address of the Gateway radio then the entire network will stay synchronized to the Gateway time.</p>

26.2. NTP Date

NTP Date	
Setting	Description
CLI / Web Page	[Page=ntp]
CLI Command	<ul style="list-style-type: none"> ntp.ntpDate=now ntpDate=now
Web Interface window	<p>NTP Date</p> <ol style="list-style-type: none"> In the NTP Date text box, enter Now to synchronize the local clock with the time from the NTP servers specified in the NTP Address (1 to 5) (on page 306) settings. Click the Update button to save the change. <p>Note: See the NTP window (on page 419) for parameter location.</p>
Default Setting	N/A
Options	Now

NTP Date	
Setting	Description
Description	<p>The ntp.ntpDate parameter sets the local time from other NTP servers on the network.</p> <ul style="list-style-type: none"> The server with the best clock, as defined by the NTP protocol, is used. The fields in the NTP Parameters (on page 305) parameters are not validated by the system.

26.3. NTP Reference

NTP Reference	
Setting	Description
CLI / Web Page	[Page=ntp]
CLI Command	<ul style="list-style-type: none"> <code>ntp.ntpReference=NETWORK_TIME_SERVER</code> <ul style="list-style-type: none"> The reference is from other systems on the network. <code>ntp.ntpReference=REFCLK_LOCALCLOCK</code> <ul style="list-style-type: none"> The reference is generated by the local clock.
Web Interface window	<p>NTP Reference</p> <ol style="list-style-type: none"> Click the NTP Reference list box arrow and select either NETWORK_TIME_SERVER or REFCLK_LOCALCLOCK. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the NTP window (on page 419) for parameter location.</p> </div>
Default Setting	NETWORK_TIME_SERVER
Options	<ul style="list-style-type: none"> NETWORK_TIME_SERVER REFCLK_LOCALCLOCK
Description	<p>The ntp.ntpReference parameter designates the time correction from either a local clock or over the network clock reference for NTP.</p> <p>Notes</p> <ul style="list-style-type: none"> NTP is always running. NETWORK_TIME_SERVER: The clock designation is from a network clock. REFCLK_LOCALCLOCK: The clock designation is from the local clock. If no server address is set in NTP Address (1 to 5) (on page 306), the reference is to the REFCLK_LOCALCLOCK. If any NTP Address (1 to 5) is valid then, at startup and whenever NTP restarts, the system clock is set from the NTP servers over the network. The fields in the NTP Parameters (on page 305) parameters are not validated by the system.

26.4. NTP Restart

NTP Restart	
Setting	Description
CLI / Web Page	[Page=ntp]
CLI Command	<ul style="list-style-type: none"> ntp.ntpRestart=now ntpRestart=now
Web Interface window	<p>NTP Restart</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note: This parameter is read-only in the Web Interface. See the NTP window (on page 419) for parameter location.</p> </div>
Default Setting	N/A
Options	Now
Description	<p>The ntp.ntpRestart parameter restarts the NTP system.</p> <ul style="list-style-type: none"> If any NTP Address (1 to 5) (on page 306) is valid, then the system clock is set from the NTP servers over the network at the time the command is run. The fields in the NTP Parameters (on page 305) parameters are not validated by the system.

27. Radio Settings Parameters

Note: See the [Radio Settings window - Endpoint](#) (on page 421).

[Beacon Burst Count](#) (on page 311)

[Beacon Interval](#) (on page 312)

[Frequency Key](#) (on page 313)

[Frequency Masks](#) (on page 315)

[LNA Bypass](#) (on page 319)

[Max Link Distance in Miles](#) (on page 320)

[Network ID](#) (on page 321)

[Node ID](#) (on page 322)

[Radio Frequency](#) (on page 323)

[Radio Hopping Mode](#) (on page 324)

[Radio Max Repeaters](#) (on page 327)

[Radio Mode](#) (on page 329)

[Radio Repeater Slot](#) (on page 330)

[RF Data Rate](#) (on page 332)

[TX Power](#) (on page 334)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

27.1. Beacon Burst Count

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Beacon Burst Count	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> radioSettings.beaconBurstCount=n beaconBurstCount=n <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where n is any number between 1 and 7.</p> </div>
Web Interface window	<p>Beacon Burst Count</p> <ol style="list-style-type: none"> In the Beacon Burst Count text box, enter the number of consecutive beacons to send per Beacon Interval time. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	3
Options	Any number between 1 and 7.
Description	<p>The radioSettings.beaconBurstCount setting designates the number of consecutive beacons to send per Beacon Interval time.</p> <p>Notes</p> <ul style="list-style-type: none"> The radioSettings.beaconBurstCount is set only on the Gateway device. The Endpoint radios obtain this value from a Gateway with the same networkId via the beacon frame. This setting is only used when radiosettings.radioHoppingMode=Hopping_On. Increasing the number of beacons may improve RF link reliability in noisy environments. Decreasing the number of beacons may improve throughput in environments where interference is minimal. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Set the Beacon Burst Count (on page 311) to 2 or more for optimal throughput when Repeaters are used and the RF environment is noisy. This increases the number of beacons sent in a beacon interval.</p> </div>

27.2. Beacon Interval

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Beacon Interval	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> • radioSettings.beaconInterval=TWENTY_FIVE_MS <ul style="list-style-type: none"> • beaconInterval=TWENTY_FIVE_MS • radioSettings.beaconInterval=FIFTY_MS <ul style="list-style-type: none"> • beaconInterval=FIFTY_MS • radioSettings.beaconInterval=ONE_HUNDRED_MS <ul style="list-style-type: none"> • beaconInterval=ONE_HUNDRED_MS • radioSettings.beaconInterval=TWO_HUNDRED_MS <ul style="list-style-type: none"> • beaconInterval=TWO_HUNDRED_MS • radioSettings.beaconInterval=FOUR_HUNDRED_MS <ul style="list-style-type: none"> • beaconInterval=FOUR_HUNDRED_MS
Web Interface window	<p>Beacon Interval</p> <ol style="list-style-type: none"> 1. Click the Beacon Interval list box arrow and select how often a Gateway radio sends out a beacon packet and changes to the next radio frequency in the hopping pattern. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	ONE_HUNDRED_MS
Options	<ul style="list-style-type: none"> • TWENTY_FIVE_MS • FIFTY_MS • ONE_HUNDRED_MS • TWO_HUNDRED_MS • FOUR_HUNDRED_MS

Beacon Interval	
Setting	Description
Description	<p>The <code>radioSettings.beaconInterval</code> controls how often a Gateway radio sends out a beacon packet and changes to the next radio frequency in the hopping pattern.</p> <p>Notes</p> <ul style="list-style-type: none"> The <code>radioSettings.beaconInterval</code> is set only on the Gateway device. The Endpoint radios obtain this value from a Gateway with the same <code>networkId</code> via the beacon frame. This setting is only used when <code>radioSettings.radioHoppingMode=Hopping On</code>. A shorter Beacon Interval may improve the RF link reliability in noisy environments. <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">  <p>Tip A longer Beacon Interval may improve throughput in environments where interference is minimal.</p> </div>

27.3. Frequency Key

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Frequency Key	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> <code>radioSettings.frequencyKey=Key0</code> <ul style="list-style-type: none"> <code>frequencyKey=Key0</code> <code>radioSettings.frequencyKey=Key1 to Key16</code> <ul style="list-style-type: none"> <code>frequencyKey=Key1 to Key16</code>
Web Interface window	<p>Frequency Key</p> <ol style="list-style-type: none"> Click the Frequency Key list box arrow and select the Key number used as an index to select a hopping table. Click the Update button to save the change. <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	Key0 (zero)

Frequency Key																			
Setting	Description																		
Options	<ul style="list-style-type: none"> Key0 (zero) Key1 to Key16 <p>Valid frequencyKey Values</p> <table border="1"> <thead> <tr> <th colspan="2">Data Rate of 115.2K</th> </tr> <tr> <th>Frequency Key Values</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Key0 to Key14</td> <td>Select classic hop tables.</td> </tr> <tr> <td>Key15</td> <td>Select standard randomized hop table.</td> </tr> <tr> <td>Key16</td> <td>Select sequential hop table in reverse order of center frequencies.</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">All Other Data Rates</th> </tr> <tr> <th>Frequency Key Values</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Key0</td> <td>Select standard randomized hop table.</td> </tr> <tr> <td>Key1</td> <td>Select sequential hop table in reverse order of center frequencies.</td> </tr> </tbody> </table>	Data Rate of 115.2K		Frequency Key Values	Description	Key0 to Key14	Select classic hop tables.	Key15	Select standard randomized hop table.	Key16	Select sequential hop table in reverse order of center frequencies.	All Other Data Rates		Frequency Key Values	Description	Key0	Select standard randomized hop table.	Key1	Select sequential hop table in reverse order of center frequencies.
Data Rate of 115.2K																			
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All Other Data Rates																			
Frequency Key Values	Description																		
Key0	Select standard randomized hop table.																		
Key1	Select sequential hop table in reverse order of center frequencies.																		

Frequency Key	
Setting	Description
Description	<p>The radioSettings.frequencyKey setting designates the Key number used as an index to select a hopping table.</p> <p>Notes</p> <ul style="list-style-type: none"> Use a unique Frequency Key setting to use different hop patterns for each ZumLink network. This setting is only used when radioSettings.radioHoppingMode=Hopping_On. <ul style="list-style-type: none"> The number of available frequency keys is based on the number of hopping sequences in the hop table. An invalid frequency key setting is determined by being outside of the specified range. <ul style="list-style-type: none"> If an invalid frequency key setting is found, the radioSettings.frequencyKey is NOT changed. A frequency key setting is also invalid if the frequency key setting is larger than the number of hopping tables configured for a specific RF Data Rate (on page 332). <ul style="list-style-type: none"> In this instance, the radioSettings.frequencyKey is set to Key0 (zero). <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! The Endpoint radios obtain this value from a Gateway with the same Network ID (on page 321) via the beacon frame. After communications are established, any change of this value are picked up by the Endpoints.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> Tip When using different hop patterns on each network, interference caused by neighboring ZumLink networks can be minimized.</p> </div>

27.4. Frequency Masks

Important! Only [Radio Settings Parameters](#) (on page 310) that apply to the current [Radio Mode](#) (on page 329), [RF Data Rate](#) (on page 332), and [Radio Hopping Mode](#) (on page 324), and are visible in the CLI and the Web Interface and can be changed.

Frequency Masks	
Setting	Description
CLI / Web Page	[Page=radioSettings]

Frequency Masks	
Setting	Description
CLI Command	<ul style="list-style-type: none"> radioSettings.frequencyMasks=nnnn frequencyMasks=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the specified format of the frequency range to mask shown in:</p> <p>A. Single Channel Format,</p> <p>B. Range of Channels Format, or</p> <p>C. Combination of Channels Format.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! Hop table frequency masking masks the channels that fall within the range plus or minus one-half ($\frac{1}{2}$) the channel bandwidth.</p> </div>
Web Interface window	<p>Frequency Masks</p> <ol style="list-style-type: none"> In the Frequency Masks text box, enter the exact specified format of the frequency range to mask. Click the Update button to save the change. Wait a few seconds the for the radio to process the command. Refresh the radio Web Interface and review the Frequency Masks text box to verify the mask was accepted. If the frequency mask setting is NOT what was requested, click the Radio Settings Helpers menu. Figure 241 <div style="text-align: center; margin: 10px 0;">  </div> <p style="text-align: center;">Figure 241: Radio Settings Helpers menu</p> <ol style="list-style-type: none"> In the Radio Settings Helpers window (on page 429), review the Frequency Masks Errors (on page 337) to determine the error that exists in the frequency mask string. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	Blank

Frequency Masks	
Setting	Description
Options	<div style="border: 1px solid orange; padding: 5px; margin-bottom: 10px;">  Caution: ONLY A comma MUST separate the values - NOT a comma with a space. </div> <p>Use this information in examples A to C:</p> <ul style="list-style-type: none"> • xxx is a value between 902-927 MHz. • yyyy is a value between .0000-.9999 MHz. <p>A. Single Channel Format</p> <ul style="list-style-type: none"> • A single entry masks the specified frequency plus the bandwidth on each side of the center frequency as a function of the rfDataRate. • <code>frequencyMasks=xxx.yyyy,xxx.yyyy,xxx.yyyy</code> <p>B. Range of Channels Format</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Important! If a radio channel intersects with the mask limits, it will be masked and not used.</p> </div> <ul style="list-style-type: none"> • <code>frequencyMasks=xxx.yyyy-xxx.yyyy,xxx.yyyy-xxx.yyyy</code> <p>C. Combination of Channels Format</p> <ul style="list-style-type: none"> • <code>frequencyMasks=xxx.yyyy-xxx.yyyy,xxx.yyyy</code>

Frequency Masks	
Setting	Description
Description	<p>The <code>radioSettings.frequencyMasks</code> setting designates specific frequencies or a set of frequencies in the hopping pattern to remove from usage.</p> <div style="border: 1px solid orange; padding: 5px; margin: 10px 0;">  Caution: <code>radioSettings.frequencyMasks</code> entries MUST BE less than 128 bytes. </div> <p>Notes</p> <ul style="list-style-type: none"> This setting is only used when <code>radioSettings.radioHoppingMode=Hopping_On</code>. All radios in the network MUST use the same value for this parameter. When Frequency Masks is enabled, interference fixed at certain frequencies within the spectrum can be avoided by the transmitter. Least significant zeros are NOT required. <ul style="list-style-type: none"> .9, .09, .009 are valid entries as well as .9000, .0900, .0090. The <code>radioSettings.frequencyMasks</code> parameter needs to be re-entered when moving between RF Data Rate (on page 332). <div style="border: 1px solid gray; padding: 5px; margin: 10px 0;">  Type <code>frequencyMasks=</code> and press <Enter> to clear all Frequency Mask entries. </div> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Important!: Special rules must be applied for the 115.2 and 250 kbps data rates to enforce regulatory rules.</p> </div> <p>Notes for 115.2 and 250 kbps Rates for Regulatory Compliance</p> <p>For 115.2 kbps:</p> <ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is > 50, TX Power (on page 334) can be set to values up to and including 30 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. If the number of hopping channels contained in the hop table is < 50, all masking is removed and all of the channels contained in the hop table are re-enabled. <code>radioSettings.txPower</code> is NOT automatically changed. <p>For 250 kbps:</p> <ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is > 50, TX Power (on page 334) can be set to values up to and including 30 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. If the number of hopping channels contained in the hop table is >= 25, but < 50, <code>radioSettings.txPower</code> can be set to values up to and including 24 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is automatically reduced to 24 dBm.

Frequency Masks

Setting	Description
	<ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is < 25, all masking is removed and all of the channels contained in the hop table are re-enabled. radioSettings.txPower is NOT automatically changed.

27.5. LNA Bypass

Important!: Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

LNA Bypass

Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> Enable LNA: <ul style="list-style-type: none"> radioSettings.lnaBypass=0 lnaBypass=0 Bypass LNA: <ul style="list-style-type: none"> radioSettings.lnaBypass=1 lnaBypass=1
Web Interface window	<p>LNA Bypass</p> <ol style="list-style-type: none"> In the LNA Bypass text box, enter 1 to bypass the Low Noise Amplifier (LNA) and reduce the radio module receive signal by 10dB. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	<ul style="list-style-type: none"> 0 1
Description	<p>When set to 1, the radioSettings.lnaBypass parameter bypasses the Low Noise Amplifier (LNA) and reduces the radio module receive signal by 10 dB.</p> <div style="border: 1px solid gray; padding: 10px; margin-top: 10px;">  <p>Tip It can be useful to bypass the LNA if there is a presence of strong signals in band and packet reception is not good.</p> </div>

27.6. Max Link Distance in Miles

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Max Link Distance in Miles	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> radioSettings.maxLinkDistanceinMiles=nnn maxLinkDistanceinMiles=nnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnn</code> is the maximum one-way distance (in miles) between any nodes in the network.</p> </div>
Web Interface window	<p>Max Link Distance in Miles</p> <ol style="list-style-type: none"> In the Max Link Distance in Miles text box, enter the maximum one-way distance (in miles) used to set the maximum expected propagation delay between any Endpoints in the network. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	20 miles
Options	<ul style="list-style-type: none"> The minimum value is 5 miles. The maximum value is 120 miles.
Description	<p>The radioSettings.maxLinkDistanceinMiles parameter designates the maximum one-way distance (in miles) used to set the maximum expected propagation delay between any Endpoints in the network.</p> <p>Notes</p> <ul style="list-style-type: none"> If the parameter is set too small, then packets are retransmitted unnecessarily and could significantly reduce throughput. If the parameter is set larger than the maximum propagation delay, it will take longer than needed to retransmit lost packets. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Set a slightly larger number than needed. All Endpoints in the network that communicate with each other should use the same distance value.</p> </div>

27.7. Network ID

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Network ID	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> radioSettings.networkId=nnnn networkId=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the network identifier which subdivides traffic on radio units.</p> </div>
Web Interface window	<p>Network ID</p> <ol style="list-style-type: none"> In the Network ID text box, enter the network identifier that subdivides traffic on radio units. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	51966
Options	<ul style="list-style-type: none"> The minimum value is 2. The maximum value is 65535.
Description	<p>The radioSettings.networkId parameter designates the network identifier which subdivides traffic on radio units.</p> <p>Notes</p> <ul style="list-style-type: none"> Radio units can only communicate with other units that have the same radioSettings.networkId setting. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! If radios are on the same frequency, they still receive data from radios of a different networkId, but the data is dropped.</p> </div>

27.8. Node ID

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Node ID	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> • <code>radioSettings.nodeId=nnnn</code> • <code>nodeId=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is a user-designated <code>nodeId</code> instead of the auto-generated <code>nodeId</code>.</p> </div>
Web Interface window	<p>Node ID</p> <ol style="list-style-type: none"> 1. In the Node ID text box, enter a user-designated nodeId instead of the auto-generated nodeId. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	Predetermined by the Z9-P or Z9-PE, this is an auto-generated, unique number from 2 through 65533.
Options	N/A
Description	<p>The radioSettings.nodeId parameter designates the unique ID of the device.</p> <p>Notes</p> <ul style="list-style-type: none"> • Each radio with the same networkId must have a UNIQUE nodeId. • Otherwise, two or more nodes will unicast an acknowledgment that may collide. • The Gateway or Gateway-Repeater device ALWAYS has a nodeId of value 1. It cannot be changed.

27.9. Radio Frequency

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Radio Frequency																	
Setting	Description																
CLI / Web Page	[Page=radioSettings]																
CLI Command	<ul style="list-style-type: none"> radioSettings.radioFrequency=nnn.nnnn radioFrequency=nnn.nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnn.nnnn is the operating center frequency.</p> </div>																
Web Interface window	<p>Radio Frequency</p> <ol style="list-style-type: none"> In the Radio Frequency text box, enter the operating center frequency. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>																
Default Setting	915.0000 for the Standard Hop Set - 900 MHz Channels (on page 467)																
Options	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Valid Ranges</th> </tr> <tr> <th>Data Rate</th> <th>MHz Range</th> </tr> </thead> <tbody> <tr> <td>4 Mbps</td> <td>904.5504 - 925.7472</td> </tr> <tr> <td>1.5 Mbps (Beta)</td> <td>903.2562 - 925.8354</td> </tr> <tr> <td>1 Mbps</td> <td>903.0528 - 927.0144</td> </tr> <tr> <td>500 kbps</td> <td>902.7072 - 927.3600</td> </tr> <tr> <td>250 kbps</td> <td>902.5344 - 927.4176</td> </tr> <tr> <td>115.2 kbps</td> <td>902.4768 - 927.5904</td> </tr> </tbody> </table>	Valid Ranges		Data Rate	MHz Range	4 Mbps	904.5504 - 925.7472	1.5 Mbps (Beta)	903.2562 - 925.8354	1 Mbps	903.0528 - 927.0144	500 kbps	902.7072 - 927.3600	250 kbps	902.5344 - 927.4176	115.2 kbps	902.4768 - 927.5904
Valid Ranges																	
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250 kbps	902.5344 - 927.4176																
115.2 kbps	902.4768 - 927.5904																

Radio Frequency	
Setting	Description
Description	<p>The radioSettings.radioFrequency parameter designates the operating center frequency in MHz.</p> <p>Notes</p> <ul style="list-style-type: none"> All radios in the network MUST use the same value for this parameter. This setting is only used when radioSettings.radioHoppingMode=Hopping_Off. The range of this parameter is dependent on the RF Data Rate (on page 332) setting. The frequency interval is 100 Hz. The minimum value increases and the maximum value decreases as the radioSettings.rfDataRate increases. <ul style="list-style-type: none"> The increase in channel bandwidth affects these ranges. If the radioSettings.radioFrequency parameter is set too close to the band edge for the current radioSettings.rfDataRate, the radio module rejects the setting. A minimum of 3 hopping channels are supported when radioSettings.rfDataRate = RATE_4M, RATE_1M, and RATE_500K. <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Use a single radioSettings.radioFrequency if radioSettings.radioHoppingMode=Hopping_Off.</p> </div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p>Important!: A few seconds are needed to apply the change; allow some time prior to reading back this value.</p> </div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p> Tip Read back this value after setting it to determine if it was accepted by the Z9-P or Z9-PE.</p> </div>

27.10. Radio Hopping Mode

Important!: Only [Radio Settings Parameters](#) (on page 310) that apply to the current [Radio Mode](#) (on page 329), [RF Data Rate](#) (on page 332), and [Radio Hopping Mode](#) (on page 324), and are visible in the CLI and the Web Interface and can be changed.

Radio Hopping Mode	
Setting	Description
CLI / Web Page	[Page=radioSettings]

Radio Hopping Mode	
Setting	Description
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • <code>radiosettings.radioHoppingMode=Hopping_On</code> • <code>radioHoppingMode=Hopping_On</code> • Disable: <ul style="list-style-type: none"> • <code>radiosettings.radioHoppingMode=Hopping_Off</code> • <code>radioHoppingMode=Hopping_Off</code>
Web Interface window	<p>Radio Hopping Mode</p> <ol style="list-style-type: none"> 1. Click the Radio Hopping Mode list box arrow and select Off to disable frequency hopping. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	Hopping_On
Options	<ul style="list-style-type: none"> • Hopping_Off • Hopping_On

Radio Hopping Mode	
Setting	Description
Description	<p>The <code>radioSettings.radioHoppingMode</code> parameter enables frequency hopping.</p> <p>Notes</p> <ul style="list-style-type: none"> All radios in the network MUST use the same value for this parameter. For <code>rfDataRate</code> values of 115.2 and 250 kbps, the <code>radioSettings.radioHoppingMode</code> is forced On and CANNOT be set to <code>radioSettings.radioHoppingMode=Hopping_Off</code>. For <code>rfDataRate</code> values of 500 kbps, 1 Mbps, and 4 Mbps, the choice of the selected hopping mode is based on network frequency planning and channel conditions. A Gateway is required when the <code>radioSettings.radioHoppingMode=Hopping_On</code>. A Gateway is NOT required when the <code>radioSettings.radioHoppingMode=Hopping_Off</code>. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Important! Special rules must be applied for the 115.2 and 250 kbps data rates to enforce regulatory rules.</p> </div> <p>Notes for 115.2 and 250 kbps Rates for Regulatory Compliance</p> <p>For 115.2 kbps:</p> <ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is > 50, <code>TX Power</code> (on page 334) can be set to values up to and including 30 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. If the number of hopping channels contained in the hop table is < 50, all masking is removed and all of the channels contained in the hop table are re-enabled. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. <p>For 250 kbps:</p> <ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is > 50, <code>TX Power</code> (on page 334) can be set to values up to and including 30 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. If the number of hopping channels contained in the hop table is ≥ 25, but < 50, <code>radioSettings.txPower</code> can be set to values up to and including 24 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is automatically reduced to 24 dBm. If the number of hopping channels contained in the hop table is < 25, all masking is removed and all of the channels contained in the hop table are re-enabled. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed.

27.11. Radio Max Repeaters

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Radio Max Repeaters	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> • radioSettings.radioMaxRepeaters=n • radioMaxRepeaters=n <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where n is the number of Repeater slots in the network.</p> </div>
Web Interface window	<p>Radio Max Repeaters</p> <ol style="list-style-type: none"> 1. In the Radio Max Repeaters text box, enter the number of Repeater slots in the network. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	0 (zero)
Options	<ul style="list-style-type: none"> • 0 (zero) • 1 • 2 • 3

Radio Max Repeaters	
Setting	Description
Description	<p>The <code>radioSettings.radioMaxRepeaters</code> parameter designates the maximum Repeater slots in the network when the <code>radioSettings.radioHoppingMode=Hopping_On</code>.</p> <p>Notes</p> <ul style="list-style-type: none"> The Endpoint radios obtain this value from a Gateway with the same <code>networkId</code> via the beacon frame. The <code>radioSettings.radioMaxRepeaters</code> is set on the network Gateway device and the Gateway beacon carries this information. If <code>radioSettings.radioMaxRepeaters=0</code>: <ul style="list-style-type: none"> Set the value to 0 (zero) when there are no Endpoint-Repeaters or when <code>radioSettings.radioHoppingMode=Hopping_Off</code>. If <code>radioSettings.radioMaxRepeaters=n</code>: <ul style="list-style-type: none"> If the network has one Repeater, set this to 1. If the network has two Repeaters, set this to 2. If the network has three or more Repeaters, set this to 3. Set the value to match the number of overlapping Repeaters, with a maximum of 3. Set the value to the maximum number of repeater slots used in the network when Endpoint-Repeaters are present in the network and when the <code>radioSettings.radioHoppingMode=Hopping_On</code>. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Setting this value too high adds unnecessary latency to the network.</p> </div> <p>Communication Method</p> <p>The Z9-P or Z9-PE use Listen Before Talk (LBT) and Carrier Sense Multiple Access (CSMA). There are no assigned slots. The radios transmit when the channel is clear.</p> <ul style="list-style-type: none"> The Gateway broadcasts packets to all Endpoints and Endpoint-Repeaters within range. The Endpoints unicast packets back to the Gateway or downstream Endpoint-Repeaters. The Gateway acknowledges the Endpoint or Endpoint-Repeater packets. <p>FreeWave's traditional protocol has a Gateway Time Slot and an Endpoint Time Slot within a frame.</p> <ul style="list-style-type: none"> The Gateway transmits in its slot and listens in the Endpoint slot. The Endpoint transmits its slot and listens in the Gateway slot.

27.12. Radio Mode

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Radio Mode	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> • radioSettings.radioMode=Gateway <ul style="list-style-type: none"> • radioMode=Gateway • radioSettings.radioMode=Endpoint <ul style="list-style-type: none"> • radioMode=Endpoint • radioSettings.radioMode=Gateway_Repeater <ul style="list-style-type: none"> • radioMode=Gateway_Repeater • radioSettings.radioMode=Endpoint_Repeater <ul style="list-style-type: none"> • radioMode=Endpoint_Repeater
Web Interface window	<p>Radio Mode</p> <ol style="list-style-type: none"> 1. Click the Radio Mode list box arrow and select the device type to designate the Z9-P or Z9-PE as. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	Endpoint
Options	<ul style="list-style-type: none"> • Endpoint • Endpoint-Repeater • Gateway • Gateway-Repeater

Radio Mode	
Setting	Description
Description	<p>The <code>radioSettings.radioMode</code> parameter designates the device type.</p> <p>Notes</p> <ul style="list-style-type: none"> Each network can have only ONE Gateway or Gateway-Repeater device. <ul style="list-style-type: none"> See Repeaters (on page 197) for additional information. The remaining devices MUST BE configured as Endpoints or Endpoint-Repeaters. The Gateway or Gateway-Repeater device ALWAYS has a <code>nodeId</code> of value 1. It cannot be changed. The Endpoint or Endpoint-Repeater <code>nodeId</code> values are 2 through 65535. A Gateway is required when the <code>radioSettings.radioHoppingMode=Hopping_On</code>. A Gateway is NOT required when the <code>radioSettings.radioHoppingMode=Hopping_Off</code>. The Gateway-Repeater repeats packets. The Endpoint-Repeater has a unique <code>nodeId</code> and repeats packets and master beacons. <ul style="list-style-type: none"> See Repeaters (on page 197) for additional information.

27.13. Radio Repeater Slot

Important!: Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

Radio Repeater Slot	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> <code>radioSettings.radioRepeaterSlot=n</code> <code>radioRepeaterSlot=n</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>n</code> is the Repeater slot.</p> </div>

Radio Repeater Slot	
Setting	Description
Web Interface window	<p>Radio Repeater Slot</p> <ol style="list-style-type: none"> In the Radio Repeater Slot text box, enter which repeater slot the Endpoint-Repeater uses. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: The Radio Repeater Slot parameter is only visible when the Z9-P or Z9-PE is designated as an Endpoint-Repeater. See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	1
Options	<ul style="list-style-type: none"> 1 2 3
Description	<p>The radioSettings.radioRepeaterSlot parameter designates which repeater slot, up to the Radio Max Repeaters setting, the Endpoint-Repeater uses.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! This setting is only available when radioSettings.radioMode=Endpoint_Repeater.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> The radioSettings.radioRepeaterSlot is set on the Endpoint-Repeater device when radiosettings.radioHoppingMode=Hopping_On. This setting does NOT apply when radiosettings.radioHoppingMode=Hopping_Off. Repeater slots must be unique for Repeaters that are in communication range so the beacons do not collide. Endpoint-Repeaters can share a slot number when they do not overlap and form longer repeater chains. The number of entered Repeater slots cannot be larger than the numbered entered in the Radio Max Repeaters (on page 327) setting.

27.14. RF Data Rate

Important! Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

RF Data Rate	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> • radioSettings.rfDataRate=RATE_4M <ul style="list-style-type: none"> • rfDataRate=RATE_4M • radioSettings.rfDataRate=RATE_1M <ul style="list-style-type: none"> • rfDataRate=RATE_1M • radioSettings.rfDataRate=RATE_1.5M_BETA_FEATURE <ul style="list-style-type: none"> • rfDataRate=RATE_1.5M_BETA_FEATURE • radioSettings.rfDataRate=RATE_500K <ul style="list-style-type: none"> • rfDataRate=RATE_500K • radioSettings.rfDataRate=RATE_250K <ul style="list-style-type: none"> • rfDataRate=RATE_250K • radioSettings.rfDataRate=RATE_115.2K <ul style="list-style-type: none"> • rfDataRate=RATE_115.2K
Web Interface window	<p>RF Data Rate</p> <ol style="list-style-type: none"> 1. Click the RF Data Rate list box arrow and select the RF link data rate in bits per second. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	RATE_500K
Options	<ul style="list-style-type: none"> • RATE_4M (4 Mbps mode) • RATE_1M (1 Mbps mode) • RATE_1.5M_BETA_FEATURE • RATE_500K (500 kbps mode) • RATE_250K (250 kbps mode) • RATE_115.2K (115.2 kbps mode)

RF Data Rate	
Setting	Description
Description	<p>The <code>radioSettings.rfDataRate</code> parameter designates the RF link data rate in bits per second.</p> <p>Notes</p> <ul style="list-style-type: none"> All radios in the network MUST use the same value for this parameter. A higher RF link data rate provides more throughput but at the expense of link distance or fade margin. When changing from lower data rates to higher ones (e.g., <code>rfDataRate=RATE_115.2K</code> to <code>rfDataRate=RATE_1M</code>), the Radio Frequency (on page 323) may be set back to the default if the frequency would have been out of band. When selecting data rates of either <code>rfDataRate=RATE_115.2K</code> or <code>rfDataRate=RATE_250K</code>, <code>radioSettings.radioHoppingMode</code> is automatically forced to <code>radiosettings.radioHoppingMode=Hopping_On</code> and cannot be turned off. For all other data rates, the <code>radioSettings.radioHoppingMode</code> remains at its current setting. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Important!: Special rules must be applied for the 115.2 and 250 kbps data rates to enforce regulatory rules.</p> </div> <p>Notes for 115.2 and 250 kbps Rates for Regulatory Compliance</p> <p>For 115.2 kbps:</p> <ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is > 50, TX Power (on page 334) can be set to values up to and including 30 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. If the number of hopping channels contained in the hop table is < 50, all masking is removed and all of the channels contained in the hop table are re-enabled. <code>radioSettings.txPower</code> is NOT automatically changed. <p>For 250 kbps:</p> <ul style="list-style-type: none"> If the number of hopping channels contained in the hop table is > 50, TX Power (on page 334) can be set to values up to and including 30 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. If the number of hopping channels contained in the hop table is >= 25, but < 50, <code>radioSettings.txPower</code> can be set to values up to and including 24 dBm. <ul style="list-style-type: none"> <code>radioSettings.txPower</code> is automatically reduced to 24 dBm. If the number of hopping channels contained in the hop table is < 25, all masking is removed and all of the channels contained in the hop table are re-enabled.

RF Data Rate	
Setting	Description
	<ul style="list-style-type: none"> <code>radioSettings.txPower</code> is NOT automatically changed. <div style="border: 1px solid gray; padding: 5px; margin: 5px 0;"> <p>FREEWAVE Recommends: Use a single <code>radioSettings.radioFrequency</code> if <code>radiosettings.radioHoppingMode=Hopping_Off</code>.</p> </div> <div style="border: 1px solid orange; padding: 5px; margin: 5px 0;"> <p> Caution: The <code>RATE_1.5M_BETA_FEATURE</code> data rate is a Beta feature NOT recommended for production deployment.</p> </div>

27.15. TX Power

Important! Only Radio Settings Parameters (on page 310) that apply to the current Radio Mode (on page 329), RF Data Rate (on page 332), and Radio Hopping Mode (on page 324), and are visible in the CLI and the Web Interface and can be changed.

TX Power	
Setting	Description
CLI / Web Page	[Page=radioSettings]
CLI Command	<ul style="list-style-type: none"> <code>radioSettings.txPower=nn</code> <code>txPower=nn</code> <div style="border: 1px solid gray; padding: 5px; margin: 5px 0;"> <p>Note: Where <code>nn</code> is the RF output transmit power.</p> </div> <div style="border: 1px solid gray; padding: 5px; margin: 5px 0;"> <p>Important! Entering a decimal value changes the <code>txpower</code> to 0 (zero).</p> </div> <div style="border: 1px solid gray; padding: 5px; margin: 5px 0;"> <p>FREEWAVE Recommends: Use whole numbers only.</p> </div>
Web Interface window	<p>TX Power</p> <ol style="list-style-type: none"> Click the Tx Power list box arrow and select the dB RF output transmit power level for the Z9-P or Z9-PE. Click the Update button to save the change. <div style="border: 1px solid gray; padding: 5px; margin: 5px 0;"> <p>Note: See the Radio Settings window - Endpoint (on page 421) for parameter location.</p> </div>
Default Setting	<ul style="list-style-type: none"> 30

TX Power	
Setting	Description
Options	<ul style="list-style-type: none"> The minimum value is 10. The maximum value is 30.
Description	<p>The radioSettings.txPower setting designates the dB RF output transmit power for the Z9-P or Z9-PE.</p> <p>Notes</p> <ul style="list-style-type: none"> Output power is limited to maximum of 30dBm or 1 Watt. Use a higher power to increase link margin. Use a lower transmit power to reduce interference when multiple radio links are in close proximity. The maximum radioSettings.txPower can be limited if the radiosettings.radioHoppingMode=Hopping_On. <ul style="list-style-type: none"> See Frequency Masks (on page 315) for additional details. <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">  <p>Entering txpower=0 or radiosettings.txpower=0 changes the output power to the minimum or 10 dB.</p> </div>

28. Radio Settings Helpers Parameters

Note: See the [Radio Settings Helpers window \(on page 429\)](#).

- [Frequency Masks Errors \(on page 337\)](#)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

28.1. Frequency Masks Errors

Frequency Masks Errors	
Setting	Description
CLI / Web Page	[Page=radioSettingsHelpers]
CLI Command	<ul style="list-style-type: none"> radioSettingsHelpers.frequencyMasksErrors radioSettingsHelpers
Web Interface window	Frequency Masks Errors <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Radio Settings Helpers window (on page 429) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The radioSettingsHelpers.frequencyMasksErrors command reports the results of any errors in the Frequency Masks (on page 315) . <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

29. Runtime Environment Parameters

Note: See the [Runtime Environment window \(on page 431\)](#).

[Rte Installed by Apps Version \(on page 339\)](#)

[Rte Reset \(on page 339\)](#)

[Rte Template Version \(on page 340\)](#)

[Rte Version \(on page 341\)](#)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

29.1. Rte Installed by Apps Version

Rte Installed by Apps Version	
Setting	Description
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	<ul style="list-style-type: none"> <code>runtimeEnvironment.rteInstalledByAppsVersion</code> <code>rteInstalledByAppsVersion</code>
Web Interface window	Rte Installed by Apps Version <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 431) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The runtimeEnvironment.rteInstalledByAppsVersion parameter reports the version number of the firmware used to install the runtime developer environment. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! The firmware that installed the runtime developer environment may have a different version than the developer environment itself.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

29.2. Rte Reset

Rte Reset	
Setting	Description
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	<ul style="list-style-type: none"> <code>runtimeEnvironment.rteReset=Cancel</code> <ul style="list-style-type: none"> <code>rteReset=Cancel</code> <code>runtimeEnvironment.rteReset=Hard</code> <ul style="list-style-type: none"> <code>rteReset=Hard</code> <code>runtimeEnvironment.rteReset=Now</code> <ul style="list-style-type: none"> <code>rteReset=Now</code>
Web Interface window	Rte Reset <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 431) for parameter location.</p> </div>

Rte Reset	
Setting	Description
Default Setting	N/A
Options	<ul style="list-style-type: none"> Cancel Hard Now
Description	<p>The <code>runtimeEnvironment.rteReset</code> parameter designates the update or reset of the runtime application environment.</p> <p>Notes</p> <ul style="list-style-type: none"> <code>runtimeEnvironment.rteReset=Cancel</code> is used to REMOVE the <code>rteReset=Hard</code> command BEFORE the next boot of the Z9-P or Z9-PE. <code>runtimeEnvironment.rteReset=Hard</code> completely resets the file system of the runtime application environment to match the latest installed developer user package. <ul style="list-style-type: none"> This will stage the development runtimeEnvironment to be applied on the next reboot. The runtime application environment reset takes place at the time of next boot. <hr/> <div style="border: 1px solid black; padding: 5px; display: inline-block;">  Warning! ALL User-generated content and settings in Z9-P or Z9-PE ARE DELETED after the next reboot! </div> <hr/> <code>runtimeEnvironment.rteReset=Now</code> <ul style="list-style-type: none"> This reboots the Z9-P or Z9-PE and copies the Linux application environment into the runtime location. This will take several minutes to complete. The larger the IQ Application Environment, the longer the time needed.

29.3. Rte Template Version

Rte Template Version	
Setting	Description
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	<ul style="list-style-type: none"> <code>runtimeEnvironment.rteTemplateVersion</code> <code>rteTemplateVersion</code>
Web Interface window	<p>Rte Template Version</p> <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 431) for parameter location.</p> </div>

Rte Template Version	
Setting	Description
Default Setting	N/A
Options	N/A
Description	<p>The runtimeEnvironment.rteTemplateVersion parameter reports the version number for the IQ environment template.</p> <p>This is the IQ environment applied when executing the rteReset=hard command.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See Rte Reset (on page 339) for additional information. This is a Read-only parameter.</p> </div>

29.4. Rte Version

Rte Version	
Setting	Description
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	<ul style="list-style-type: none"> • <code>runtimeEnvironment.rteVersion</code> • <code>rteVersion</code>
Web Interface window	<p>Rte Version</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 431) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The runtimeEnvironment.rteVersion parameter reports the version number for the active IQ environment</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: If this setting is blank, the application environment has not been initialized. This is a Read-only parameter.</p> </div>

30. Security Parameters

Note: See the [Security window](#) (on page 433).

[Enable Ethernet Login](#) (on page 343)

[Ethernet PTP Interface](#) (on page 343)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 **frequencyKey** returns the current value of **frequencyKey**.
Entering **frequencyKey=** is an implied change to **frequencyKey**.
If a value is NOT included, it changes **frequencyKey** to 0 (zero).

30.1. Enable Ethernet Login

Enable Ethernet Login	
Setting	Description
CLI / Web Page	[Page=security]
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • <code>security.enableEthernetLogin=true</code> • <code>enableEthernetLogin=true</code> • Disable: <ul style="list-style-type: none"> • <code>security.enableEthernetLogin=false</code> • <code>enableEthernetLogin=false</code>
Web Interface window	<p>Enable Ethernet Login</p> <ol style="list-style-type: none"> 1. Click the Enable Ethernet Login list box arrow and select False to disable SSH logins. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the Enable Ethernet Login is enabled (set to True). See the Security window (on page 433) for parameter location.</p> </div>
Default Setting	True
Options	<ul style="list-style-type: none"> • True • False
Description	<p>The security.enableEthernetLogin parameter enables SSH logins.</p> <ul style="list-style-type: none"> • When Disabled, the device no longer responds to SSH connection requests. • This parameter also disables any SSH-based services, such as SCP. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: This parameter does NOT affect website logins.</p> <p>This parameter requires a reboot to apply the changes, either by executing the <code>config.reset=now</code> CLI command or power cycling the Z9-P or Z9-PE. See Reset (on page 240) for additional information.</p> </div>

30.2. Ethernet PTP Interface

Ethernet PTP Interface	
Setting	Description
CLI / Web Page	[Page=security]

Ethernet PTP Interface	
Setting	Description
CLI Command	<ul style="list-style-type: none"> • Enable: <ul style="list-style-type: none"> • <code>security.enablePtpInterface=true</code> • <code>enablePtpInterface=true</code> • Disable: <ul style="list-style-type: none"> • <code>security.enablePtpInterface=false</code> • <code>enablePtpInterface=false</code>
Web Interface window	<p>Ethernet PTP Interface</p> <ol style="list-style-type: none"> 1. Click the Ethernet PTP Interface list box arrow and select False to disable the PTP (drag-and-drop) interface. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the Ethernet PTP Interface is enabled (set to True). See the Security window (on page 433) for parameter location.</p> </div>
Default Setting	True
Options	<ul style="list-style-type: none"> • True • False
Description	<p>The <code>security.enablePtpInterface</code> parameter enables the PTP (drag-and-drop) interface.</p> <p>When Disabled, the Z9-P or Z9-PE no longer appears in Windows® File Explorer as <code><serialnumber></code> when connected to a computer using the Micro-USB cable.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code><serialnumber></code> is the name of the Z9-P or Z9-PE.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important! The <code>security.enablePtpInterface</code> setting does NOT disable serial connections through the Micro-USB cable.</p> <p>This parameter requires a reboot to apply the changes, either by executing the <code>config.reset=now</code> CLI command or power cycling the Z9-P or Z9-PE.</p> <p>See Reset (on page 240) for additional information.</p> </div>

31. Services Parameters

Note: See the [Services window \(on page 435\)](#).

[Time Out CLI \(on page 346\)](#)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

31.1. Time Out CLI

Time Out CLI	
Setting	Description
CLI / Web Page	[Page=services]
CLI Command	<ul style="list-style-type: none"> • <code>services.timeOutCli=nnnn</code> • <code>timeOutCli=nnnn</code> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where <code>nnnn</code> is the number of seconds of idle time.</p> </div>
Web Interface window	<p>Time Out CLI</p> <ol style="list-style-type: none"> 1. In the Time Out CLI text box, enter the number of seconds of idle time before the CLI connection is closed. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Services window (on page 435) for parameter location.</p> </div>
Default Setting	900
Options	<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>FREEWAVE Recommends: Enter any number between 60 and 3600.</p> </div>
Description	<p>The services.timeOutCli parameter designates the number of seconds of idle time before the CLI connection is closed.</p> <hr/> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> Warning! DO NOT enter 0 (zero). 0 disables the timeout.</p> </div>

32. SNMP Parameters

Note: See the [SNMP window](#) (on page 437).

[RO Community Name](#) (on page 348)

[RW Community Name](#) (on page 348)

[SNMP User](#) (on page 349)

[V1 Enabled](#) (on page 350)

[V2C Enabled](#) (on page 351)

[V3 Enabled](#) (on page 352)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

32.1. RO Community Name

RO Community Name	
Setting	Description
CLI / Web Page	[Page=SNMP]
CLI Command	<ul style="list-style-type: none"> • <code>snmp.roCommunityName=enter_unique_name_here</code> • <code>roCommunityName=enter_unique_name_here</code> <p>Note: Where <code>enter_unique_name_here</code> is a user-designated name.</p>
Web Interface window	<p>RO Community Name</p> <ol style="list-style-type: none"> 1. In the RO Community Name text box, enter the user-designated name for SNMP V1/V2C Read-only access. 2. Click the Update button to save the change. <p>Note: See the SNMP window (on page 437) for parameter location.</p>
Default Setting	public
Options	Maximum of 31 characters.
Description	<p>The <code>snmp.roCommunityName</code> parameter designates the user-defined name for SNMP V1/V2C read-only access.</p> <p>Important!: Special characters are allowed EXCEPT # but they may not be compatible with 3rd-party SNMP managers.</p>

32.2. RW Community Name

RW Community Name	
Setting	Description
CLI / Web Page	[Page=SNMP]
CLI Command	<ul style="list-style-type: none"> • <code>snmp.rwCommunityName=enter_unique_name_here</code> • <code>rwCommunityName=enter_unique_name_here</code> <p>Note: Where <code>enter_unique_name_here</code> is a user-designated name.</p>

RW Community Name	
Setting	Description
Web Interface window	RW Community Name <ol style="list-style-type: none"> In the RW Community Name text box, enter the user-designated name for SNMP V1/V2C Read-Write access. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the SNMP window (on page 437) for parameter location.</p> </div>
Default Setting	private
Options	Maximum of 31 characters.
Description	The snmp.rwCommunityName parameter designates the user-defined name for SNMP V1/V2C read-write access. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: Special characters are allowed EXCEPT # but they may not be compatible with 3rd-party SNMP managers.</p> </div>

32.3. SNMP User

SNMP User	
Setting	Description
CLI / Web Page	[Page=SNMP]
CLI Command	<ul style="list-style-type: none"> • Add User**: <ul style="list-style-type: none"> • snmpUser=add <username> <div style="border: 1px solid gray; padding: 5px; margin-top: 5px;"> <p>Example: snmpUser=add <username> <ReadOnly or ReadWrite> <MD5 or SHA> <Authentication Passphrase> <AES or DES> <Encryption Passphrase></p> </div> • Modify User**: <ul style="list-style-type: none"> • snmpUser=modify <username> <div style="border: 1px solid gray; padding: 5px; margin-top: 5px;"> <p>Example: snmpUser modify <username> <ReadOnly or ReadWrite> <MD5 or SHA> <Authentication Passphrase> <AES or DES> <Encryption Passphrase></p> </div> • Remove User: <ul style="list-style-type: none"> • snmpUser=remove <username> • View All Users: <ul style="list-style-type: none"> • snmpUser=show

SNMP User	
Setting	Description
Web Interface window	SNMP User <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the SNMP window (on page 437) for parameter location.</p> </div>
Default Setting	Blank
Options	<ul style="list-style-type: none"> • Add User • Modify User • Remove User • View All Users <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: **Add or Modify access authorization options are:</p> <ul style="list-style-type: none"> • <AES> <Encryption Passphrase> • <DES> <Encryption Passphrase> • <MD5> <Authentication Passphrase> • <ReadOnly> • <ReadWrite> • <SHA> <Authentication Passphrase> </div>
Description	The snmp.snmpUser parameter manages the SNMP V3 users. <div style="border: 1px solid black; padding: 5px; margin-top: 10px; background-color: #f0f0f0;"> <p>Example: <code>snmpUser=add <username> <AES> <Encryption Passphrase></code>. <code>snmpUser=modify <username> <ReadWrite></code></p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: The Passphrase requires a minimum of 8 characters.</p> </div>

32.4. V1 Enabled

V1 Enabled	
Setting	Description
CLI / Web Page	[Page=SNMP]

V1 Enabled	
Setting	Description
CLI Command	<ul style="list-style-type: none"> • Enable SNMP V1: <ul style="list-style-type: none"> • <code>snmp.v1Enabled=true</code> • <code>v1Enabled=true</code> • Disable SNMP V1: <ul style="list-style-type: none"> • <code>snmp.v1Enabled=false</code> • <code>v1Enabled=false</code>
Web Interface window	<p>V1 Enabled</p> <ol style="list-style-type: none"> 1. Click the V1 Enabled list box arrow and select True to enable SNMP V1. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the SNMP window (on page 437) for parameter location.</p> </div>
Default Setting	False
Options	False
Description	<p>The <code>snmp.v1Enabled</code> parameter enables SNMP V1.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: For security, the protocol SNMP v1 is read-only.</p> </div>

32.5. V2C Enabled

V2C Enabled	
Setting	Description
CLI / Web Page	[Page=SNMP]
CLI Command	<ul style="list-style-type: none"> • Enable SNMP V2C: <ul style="list-style-type: none"> • <code>snmp.v2cEnabled=true</code> • <code>v2cEnabled=true</code> • Disable SNMP V2C: <ul style="list-style-type: none"> • <code>snmp.v2cEnabled=false</code> • <code>v2cEnabled=false</code>
Web Interface window	<p>V2C Enabled</p> <ol style="list-style-type: none"> 1. Click the V2C Enabled list box arrow and select True to enable SNMP V2C. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the v2c Enabled is NOT enabled (set to False). See the SNMP window (on page 437) for parameter location.</p> </div>

V2C Enabled	
Setting	Description
Default Setting	False
Options	<ul style="list-style-type: none"> • True • False
Description	The snmp.v2cEnabled parameter enables SNMP V2C.

32.6. V3 Enabled

V3 Enabled	
Setting	Description
CLI / Web Page	[Page=SNMP]
CLI Command	<ul style="list-style-type: none"> • Enable SNMP V3: <ul style="list-style-type: none"> • <code>snmp.v3Enabled=true</code> • <code>v3Enabled=true</code> • Disable SNMP V3: <ul style="list-style-type: none"> • <code>snmp.v3Enabled=false</code> • <code>v3Enabled=false</code>
Web Interface window	<p>V3 Enabled</p> <ol style="list-style-type: none"> 1. Click the V3 Enabled list box arrow and select True to enable SNMP V3. 2. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: By default, the v3 Enabled is NOT enabled (set to False). See the SNMP window (on page 437) for parameter location.</p> </div>
Default Setting	False
Options	<ul style="list-style-type: none"> • True • False
Description	The snmp.v3Enabled parameter enables SNMP V3.

33. System Parameters

Important! The [Page=system] parameters are only available in the CLI window.
See the [Access the CLI and Change the IP Address and nodeId](#) (on page 61) procedure for CLI access.

[dump](#) (on page 354)

[dumpFormat](#) (on page 354)

[dumpPage](#) (on page 355)

[dumpTag](#) (on page 356)

[filter](#) (on page 356)

[help](#) (on page 356)

[login](#) (on page 357)

[logout](#) (on page 357)

[pages](#) (on page 358)

[password](#) (on page 358)

[passwordRestoreDefaults](#) (on page 359)

[showLayout](#) (on page 359)

[tags](#) (on page 359)

[whoami](#) (on page 360)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 [frequencyKey](#) returns the current value of [frequencyKey](#).
Entering [frequencyKey=](#) is an implied change to [frequencyKey](#).
If a value is NOT included, it changes [frequencyKey](#) to 0 (zero).

33.1. dump

dump	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> system.dump dump
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Important! The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The system.dump command reports all of the device configuration and status values using the format specified in dumpFormat (on page 354).</p> <div style="border: 1px solid black; padding: 5px;"> <p>Note: This is a Read-only parameter.</p> </div>

33.2. dumpFormat

dumpFormat	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> system.dumpFormat=Full dumpFormat=Full system.dumpFormat=Json dumpFormat=Json system.dumpFormat=Result dumpFormat=Result system.dumpFormat=Short dumpFormat=Short system.dumpFormat=Verbose dumpFormat=Verbose

dumpFormat	
Setting	Description
Web Interface window	<p>Important! The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p>
Default Setting	Short
Options	N/A
Description	<p>The system.dumpFormat parameter designates the format of the output of commands and setting changes.</p> <p>Notes</p> <ul style="list-style-type: none"> dumpFormat=Full - Shows each setting with its fully-qualified name and value (page.setting=value). dumpFormat=Json - Shows the output results in JavaScript Object Notation (Json). dumpFormat=Result - This setting is identical to dumpFormat=Full. dumpFormat=Short - Shows the page name in a header row, then each setting indented with its value. dumpFormat=Verbose This setting shows: <ul style="list-style-type: none"> The fully-qualified name and value (the same as the dumpFormat=Full). The header row (the same as the dumpFormat=Short).

33.3. dumpPage

dumpPage	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> <code>system.dumpPage=enter_page_name_here</code> <code>dumpPage=enter_page_name_here</code> <p>Note: Where <code>enter_page_name_here</code> is a CLI page.</p>
Web Interface window	<p>Important! The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p>
Default Setting	N/A
Options	N/A

dumpPage	
Setting	Description
Description	<p>The system.dumpPage command reports all device configuration and status values for the specified page, using the format specified in dumpFormat (on page 354).</p> <p>Example: Enter <code>dumpPage=SNMP</code> to show the SNMP settings.</p> <p>Note: This is a Read-only parameter.</p>

33.4. dumpTag

Important!: FreeWave internal use only.

33.5. filter

Important!: FreeWave internal use only.

33.6. help

help	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> system.help help help <parameter> <ul style="list-style-type: none"> to see help for a specific parameter
Web Interface window	<p>Important!: The [Page=system] parameters are only available in the CLI window.</p> <p>See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p>
Default Setting	N/A
Options	N/A

help	
Setting	Description
Description	The system.help command lists the help.txt file.
	<div style="border: 1px solid black; padding: 5px;"> <p>Important! Help information is only available for active parameters.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>Example: If the ZumLink is designated as a Gateway, the Help information for radioSettings.nodeld is NOT provided since the nodeld parameter cannot be changed.</p> </div>

33.7. login

password	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<code>system.login=[username], [password]</code>
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Important! The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeld (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A
Description	The system.login command logs the user into the Z9-P or Z9-PE.

33.8. logout

logout	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> • <code>system.logout</code> • <code>logout</code>
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Important! The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeld (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A

logout	
Setting	Description
Options	N/A
Description	The logout command logs out of the CLI session.

33.9. pages

pages	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> system.pages pages
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Important!: The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A
Description	The system.pages command lists all of the pages of settings and commands in the Z9-P or Z9-PE.

33.10. password

password	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	system.password=[oldpassword], [newpassword], [newpassword]
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Important!: The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	N/A

password	
Setting	Description
Description	<p>The system.password parameter designates the password.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Important!: Must be logged in to the Z9-P or Z9-PE.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0; background-color: #e0e0e0;"> <p>Example: <code>system.password=admin,12345,12345</code>.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: An error message appears when there is an error in typing the new password command.</p> </div>

33.11. passwordRestoreDefaults

passwordRestoreDefaults	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> <code>system.passwordRestoreDefaults</code> <code>passwordRestoreDefaults</code>
Web Interface window	<div style="border: 1px solid black; padding: 5px;"> <p>Important!: The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p> </div>
Default Setting	N/A
Options	Now
Description	<p>The system.passwordRestoreDefaults command resets both the admin and devuser account passwords to factory defaults.</p> <ul style="list-style-type: none"> After executing this command, the Z9-P or Z9-PE must be rebooted by either: <ul style="list-style-type: none"> executing the <code>reset now</code> command (see Reset (on page 240)) or power-cycling the Z9-P or Z9-PE.

33.12. showLayout

Important!: FreeWave internal use only.

33.13. tags

Important!: FreeWave internal use only.

33.14. whoami

whoami	
Setting	Description
CLI / Web Page	[Page=system]
CLI Command	<ul style="list-style-type: none"> • <code>system.whoami</code> • <code>whoami</code>
Web Interface window	<p>Important! The [Page=system] parameters are only available in the CLI window. See the Access the CLI and Change the IP Address and nodeId (on page 61) procedure for CLI access.</p>
Default Setting	N/A
Options	N/A
Description	<p>The system.whoami command reports the user currently logged in.</p> <p>Note: This is a Read-only parameter.</p>

34. System Info Parameters

Note: See the [System Info window](#) (on page 439).

[Device Configuration](#) (on page 362)

[Device Firmware Version](#) (on page 362)

[Device ID](#) (on page 363)

[Device Model](#) (on page 363)

[Device Name](#) (on page 364)

[Hop Table Version](#) (on page 364)

[Layout Hash](#) (on page 365)

[Licenses](#) (on page 365)

[Model Code](#) (on page 366)

[Radio Firmware Version](#) (on page 366)

[Radio Model](#) (on page 367)

[Radio Model Code](#) (on page 367)

[Radio Serial Number](#) (on page 368)

[Reset Info](#) (on page 368)

[Rte Template Version](#) (on page 369)

[Rte Version](#) (on page 369)

[Serial Number](#) (on page 370)

[Theme Version](#) (on page 370)



The parameter syntax is: `page.parameter=value`.
Parameters with unique names can be specified as `parameter=value`.

Note: In the CLI, 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 `frequencyKey` returns the current value of `frequencyKey`.
Entering `frequencyKey=` is an implied change to `frequencyKey`.
If a value is NOT included, it changes `frequencyKey` to 0 (zero).

34.1. Device Configuration

Device Configuration	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> systemInfo.deviceConfiguration deviceConfiguration
Web Interface window	Device Configuration <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.deviceConfiguration command reports the device configuration of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.2. Device Firmware Version

Device Firmware Version	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> systemInfo.deviceFirmwareVersion deviceFirmwareVersion
Web Interface window	Device Firmware Version <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.deviceFirmwareVersion command reports the device firmware version of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: For the IQ Application Environment, see Verify Activation.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.3. Device ID

Device ID	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.deviceId=nnnn</code> • <code>deviceId</code> <p>Note: Where <code>nnnn</code> is a user-designated device ID.</p>
Web Interface window	Device ID <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p>
Default Setting	1
Options	N/A
Description	The systemInfo.deviceId parameter designates the Device Identifier selected for the Z9-P or Z9-PE.

34.4. Device Model

Device Model	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.deviceModel</code> • <code>deviceModel</code>
Web Interface window	Device Model <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p>
Default Setting	N/A
Options	N/A
Description	The systemInfo.deviceModel command reports the device model. <p>Note: This is a Read-only parameter.</p>

34.5. Device Name

Device Name	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> systemInfo.deviceName=nnnn deviceName=nnnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnnn is the user-defined name for the Z9-P or Z9-PE.</p> </div>
Web Interface window	<p>Device Name</p> <ol style="list-style-type: none"> In the Device Name text box, enter the user-defined name for the Z9-P or Z9-PE. Click the Update button to save the change. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.deviceName parameter designates the user-defined name for the Z9-P or Z9-PE.

34.6. Hop Table Version

Hop Table Version	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> systemInfo.hopTableVersion hopTableVersion
Web Interface window	<p>Hop Table Version</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The systemInfo.hopTableVersion command reports the radio Hop Table Version of the Z9-P or Z9-PE.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.7. Layout Hash

Layout Hash	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.layoutHash</code> • <code>layoutHash</code>
Web Interface window	Layout Hash <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.layoutHash command reports the Unique Layout Identifier. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.8. Licenses

Licenses	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.licenses</code> • <code>licenses</code>
Web Interface window	Licenses <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	None
Options	N/A
Description	The systemInfo.licenses command reports all of the license information. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: For the IQ Application Environment, see Verify Activation.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.9. Model Code

Model Code	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.modelCode</code> • <code>modelCode</code>
Web Interface window	Model Code <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.modelCode command reports the model code of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.10. Radio Firmware Version

Radio Firmware Version	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.radioFirmwareVersion</code> • <code>radioFirmwareVersion</code>
Web Interface window	Radio Firmware Version <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.radioFirmwareVersion command reports the radio firmware version of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.11. Radio Model

Radio Model	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.radioModel</code> • <code>radioModel</code>
Web Interface window	Radio Model <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	AMT0100AA
Options	N/A
Description	The systemInfo.radioModel command reports the radio model of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.12. Radio Model Code

Radio Model Code	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.radioModelCode</code> • <code>radioModelCode</code>
Web Interface window	Radio Model Code <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.radioModelCode command reports the radio model code of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.13. Radio Serial Number

Radio Serial Number	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.radioSerialNumber</code> • <code>radioSerialNumber</code>
Web Interface window	Radio Serial Number <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.radioSerialNumber command reports the radio serial number of the Z9-P or Z9-PE. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This is a Read-only parameter.</p> </div>

34.14. Reset Info

Reset Info	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.resetInfo</code> • <code>resetInfo</code>
Web Interface window	Reset Info <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systemInfo.resetInfo parameter commands the radio to reset the information.

34.15. Rte Template Version

Rte Template Version	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> systeminfo.rteTemplateVersion rteTemplateVersion
Web Interface window	Rte Template Version <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	The systeminfo.rteTemplateVersion command reports the version number for the IQ environment template. Notes <ul style="list-style-type: none"> This is the IQ environment applied when executing the rteReset=hard command. See Rte Reset (on page 339) for additional information. For the IQ Application Environment, see Verify Activation. This is a Read-only parameter.

34.16. Rte Version

Rte Version	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> systeminfo.rteVersion rteVersion
Web Interface window	Rte Version <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A

Rte Version	
Setting	Description
Description	<p>The systeminfo.rteVersion command reports the version number for the active IQ environment.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: If this setting is blank, the application environment has not been initialized. For the IQ Application Environment, see Verify Activation.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: This is a Read-only parameter.</p> </div>

34.17. Serial Number

Serial Number	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.serialNumber</code> • <code>serialNumber</code>
Web Interface window	<p>Serial Number</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</p> </div>
Default Setting	N/A
Options	N/A
Description	<p>The systemInfo.serialNumber command reports the serial number of the Z9-P or Z9-PE.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: This is a Read-only parameter.</p> </div>

34.18. Theme Version

Theme Version	
Setting	Description
CLI / Web Page	[Page=systemInfo]
CLI Command	<ul style="list-style-type: none"> • <code>systemInfo.themeVersion</code> • <code>themeVersion</code>

Theme Version	
Setting	Description
Web Interface window	Theme Version <div style="border: 1px solid black; padding: 5px;">Note: This parameter is read-only in the Web Interface. See the System Info window (on page 439) for parameter location.</div>
Default Setting	N/A
Options	N/A
Description	<div style="border: 1px solid black; padding: 5px;">Note: FreeWave internal use only. This is a Read-only parameter.</div>

35. Terminal Server Relay Parameters

Note: See the [Terminal Server Relay window](#) (on page 441).

[Remote Termserv IP Address](#) (on page 373)

[Termserv Relay Mapping](#) (on page 373)



The parameter syntax is: page.parameter=value.
Parameters with unique names can be specified as parameter=value.

Note: In the CLI, 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 **frequencyKey** returns the current value of **frequencyKey**.
Entering **frequencyKey=** is an implied change to **frequencyKey**.
If a value is NOT included, it changes **frequencyKey** to 0 (zero).

35.1. Remote Termserv IP Address

Remote Termserv IP Address	
Setting	Description
CLI / Web Page	[Page=TerminalServerRelay]
CLI Command	<ul style="list-style-type: none"> TerminalServerRelay.remote_termserv_ip_address=nnn.nnn.nnn.nnn remote_termserv_ip_address=nnn.nnn.nnn.nnn <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: Where nnn.nnn.nnn.nnn is the IP address for the remote terminal server.</p> </div>
Web Interface window	<p>Remote Termserv IP Address</p> <ol style="list-style-type: none"> In the Remote Termserv IP Address text box, enter the IP address for the remote terminal server. Click the Update button to save the change. Restart the Z9-P or Z9-PE for the changes to be implemented. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Terminal Server Relay window (on page 441) for parameter location.</p> </div>
Default Setting	0.0.0.0
Options	N/A
Description	<ul style="list-style-type: none"> The TerminalServerRelay.remote_termserv_ip_address= parameter designates the IP address of the remote terminal server. The TerminalServerRelay.remote_termserv_ip_address=nnn.nnn.nnn.nnn changes the IP address of the remote terminal server.

35.2. Termserv Relay Mapping

Termserv Relay Mapping	
Setting	Description
CLI / Web Page	[Page=TerminalServerRelay]

Termserve Relay Mapping	
Setting	Description
CLI Command	<ul style="list-style-type: none"> • TerminalServerRelay.termserve_relay_mapping=TERMSERV_RELAY_DISABLED • termserve_relay_mapping=TERMSERV_RELAY_DISABLED • TerminalServerRelay.termserve_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM • termserve_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM • TerminalServerRelay.termserve_relay_mapping=LOCAL_COM1_TO_REMOTE_COM1 • termserve_relay_mapping=LOCAL_COM1_TO_REMOTE_COM1 • TerminalServerRelay.termserve_relay_mapping=LOCAL_COM2_TO_REMOTE_COM2 • termserve_relay_mapping=LOCAL_COM2_TO_REMOTE_COM2 • TerminalServerRelay.termserve_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_COM1 • termserve_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_COM1 • TerminalServerRelay.termserve_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_COM2 • termserve_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_COM2 • TerminalServerRelay.termserve_relay_mapping=LOCAL_COM1_TO_REMOTE_BOTH_COM • termserve_relay_mapping=LOCAL_COM1_TO_REMOTE_BOTH_COM • TerminalServerRelay.termserve_relay_mapping=LOCAL_COM2_TO_REMOTE_BOTH_COM • termserve_relay_mapping=LOCAL_COM2_TO_REMOTE_BOTH_COM
Web Interface window	<p>Termserve Relay Mapping</p> <ol style="list-style-type: none"> 1. Click the Termserve Relay Mapping list box arrow and select a setting used for the transfer of a bi-directional byte stream between two serial device servers. 2. Click the Update button to save the change. 3. Restart the Z9-P or Z9-PE for the changes to be implemented. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: See the Terminal Server Relay window (on page 441) for parameter location.</p> </div>
Default Setting	TERMSERV_RELAY_DISABLED

Termserve Relay Mapping	
Setting	Description
Options	<ul style="list-style-type: none"> • TERMSERV_RELAY_DISABLED <ul style="list-style-type: none"> • Data forwarding between local and remote COM ports is disabled. • LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM (on page 380). <ul style="list-style-type: none"> • Data is forwarded between the local COM1 and remote COM1 ports. • Data is forwarded between the local COM2 and remote COM2 ports. • LOCAL_COM1_TO_REMOTE_COM1 (on page 381). <ul style="list-style-type: none"> • Data is forwarded between the local COM1 and remote COM1 ports. • LOCAL_COM2_TO_REMOTE_COM2 (on page 382). <ul style="list-style-type: none"> • Data is forwarded between the local COM2 and remote COM2 ports. • LOCAL_BOTH_COM_TO_REMOTE_COM1 (on page 383). <ul style="list-style-type: none"> • Data is forwarded between the local COM1 and remote COM1 ports. • Data is forwarded between the local COM2 and remote COM1 ports. • LOCAL_BOTH_COM_TO_REMOTE_COM2 (on page 384). <ul style="list-style-type: none"> • Data is forwarded between the local COM1 and remote COM2 ports. • Data is forwarded between the local COM2 and remote COM2 ports. • LOCAL_COM1_TO_REMOTE_BOTH_COM (on page 385). <ul style="list-style-type: none"> • Data is forwarded between the local COM1 and remote COM1 ports. • Data is forwarded between the local COM1 and remote COM2 ports. • LOCAL_COM2_TO_REMOTE_BOTH_COM (on page 386). <ul style="list-style-type: none"> • Data is forwarded between the local COM2 and remote COM1 ports. • Data is forwarded between the local COM2 and remote COM2 ports.

Termserv Relay Mapping	
Setting	Description
Description	<p>The TerminalServerRelay.termserv_relay_mapping parameter is used to transfer a bi-directional byte stream between two serial device servers.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Important! If using Terminal Server Relay Parameters (on page 372), the TCP port numbers designated in the Terminal Server Port (on page 235) MUST BE be consistent across all involved radios.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>FREEWAVE Recommends: If using the Terminal Server Port parameter, keep the TCP port numbers as their defaults.</p> </div> <p>Notes</p> <ul style="list-style-type: none"> • The data relay is only supported between the terminal server on this Z9-P or Z9-PE radio and the terminal server on a separate Z9-P or Z9-PE radio in the same IP network. See Terminal Server Relay Examples (on page 377). • For the relay function to operate, COM1 must be assigned to port 5041 and and COM2 must be assigned to port 5042 on both the local and remote terminal servers. • The TerminalServerRelay.termserv_relay_mapping should only be enabled on one side of the connection. • When the Termserv Relay Mapping (on page 373) parameter is designated and the Flow Control (on page 229) parameter is set to Hardware, the COM port's flow control does not function.

36. Terminal Server Relay Examples

- [Connected Terminal Servers and Terminal Server Relay \(on page 378\)](#)
- [LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM \(on page 380\)](#)
- [LOCAL_COM1_TO_REMOTE_COM1 \(on page 381\)](#)
- [LOCAL_COM2_TO_REMOTE_COM2 \(on page 382\)](#)
- [LOCAL_BOTH_COM_TO_REMOTE_COM1 \(on page 383\)](#)
- [LOCAL_BOTH_COM_TO_REMOTE_COM2 \(on page 384\)](#)
- [LOCAL_COM1_TO_REMOTE_BOTH_COM \(on page 385\)](#)
- [LOCAL_COM2_TO_REMOTE_BOTH_COM \(on page 386\)](#)
- [Example: Multicast \(on page 387\)](#)

36.1. Connected Terminal Servers and Terminal Server Relay

Figure 242 shows the Terminal Servers and the Terminal Server Relay (client) connected together through the Bridge.

- The Bridge connects the Ethernet interface with the radio interface.
- The Terminal Servers are connected to the COM ports.
- From any network interface you can get to the Terminal Servers.

The Terminal Server Relay is designed to connect the local Terminal Servers (hence the COM ports) to any remote Terminal Server.

- This connection could be over the Ethernet or radio interface.
- It does not matter since it is a TCP connection.
- Each terminal server can have 20 concurrent TCP connections.
- Expects COM1 to be on port 5041 for both local and remote units.
- Expects COM2 to be on port 5042 for both local and remote units.

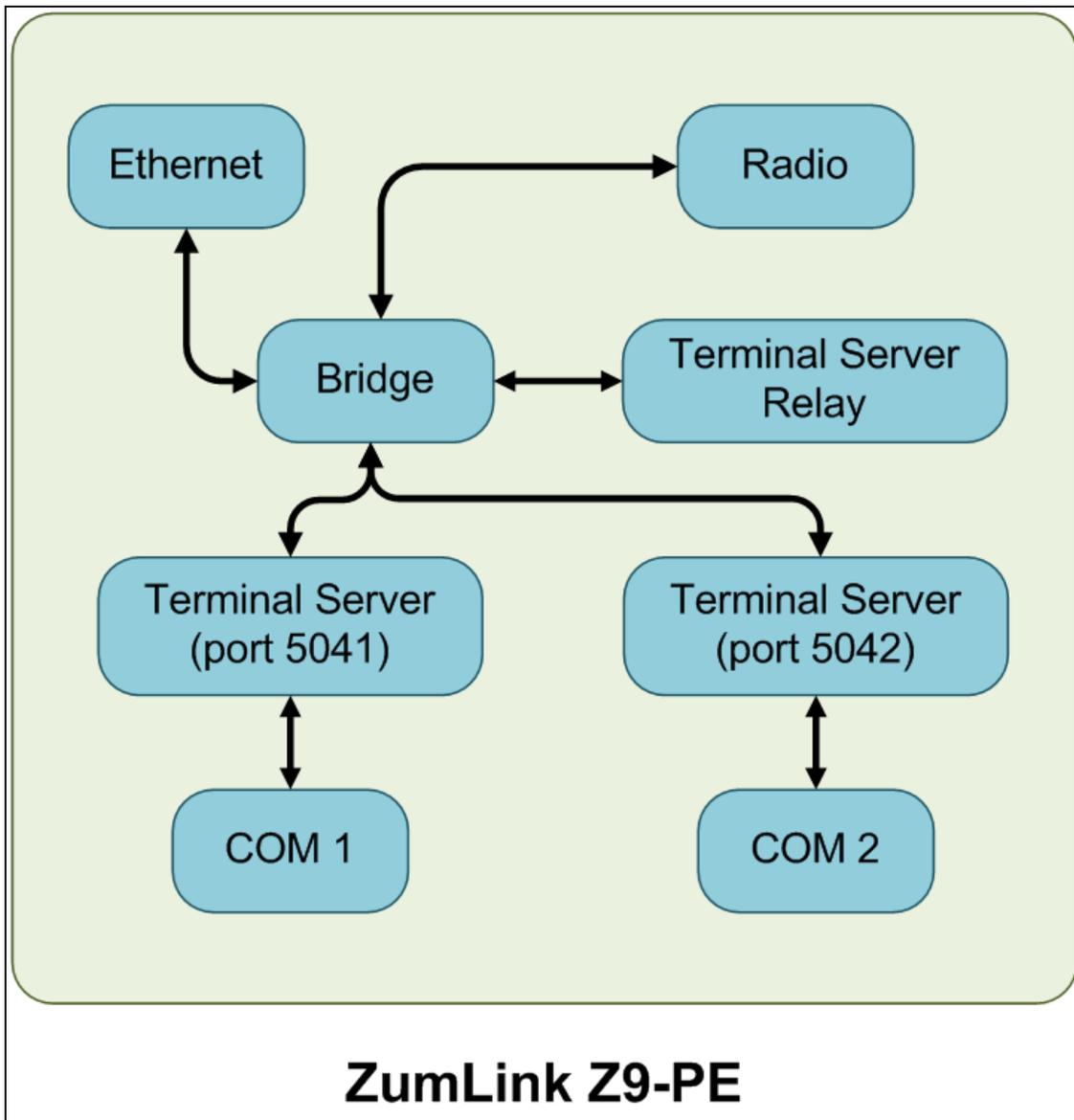


Figure 242: Terminal Servers and Terminal Server Relay (Client) Connected Together through the Bridge

36.2. LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM

Figure 243 illustrates the Terminal Server Relay command:

LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM.

- Data is forwarded between the local COM1 and remote COM1 ports.
- Data is forwarded between the local COM2 and remote COM2 ports.

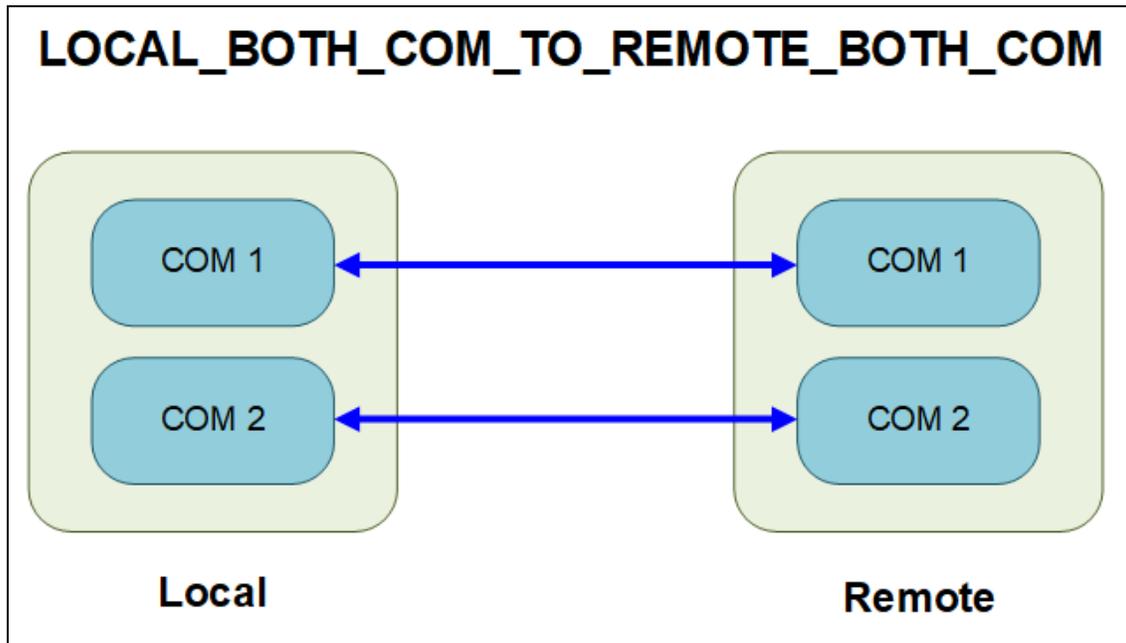


Figure 243: Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM

36.3. LOCAL_COM1_TO_REMOTE_COM1

Figure 244 illustrates the Terminal Server Relay command:

LOCAL_COM1_TO_REMOTE_COM1.

- Data is forwarded between the local COM1 and remote COM1 ports.

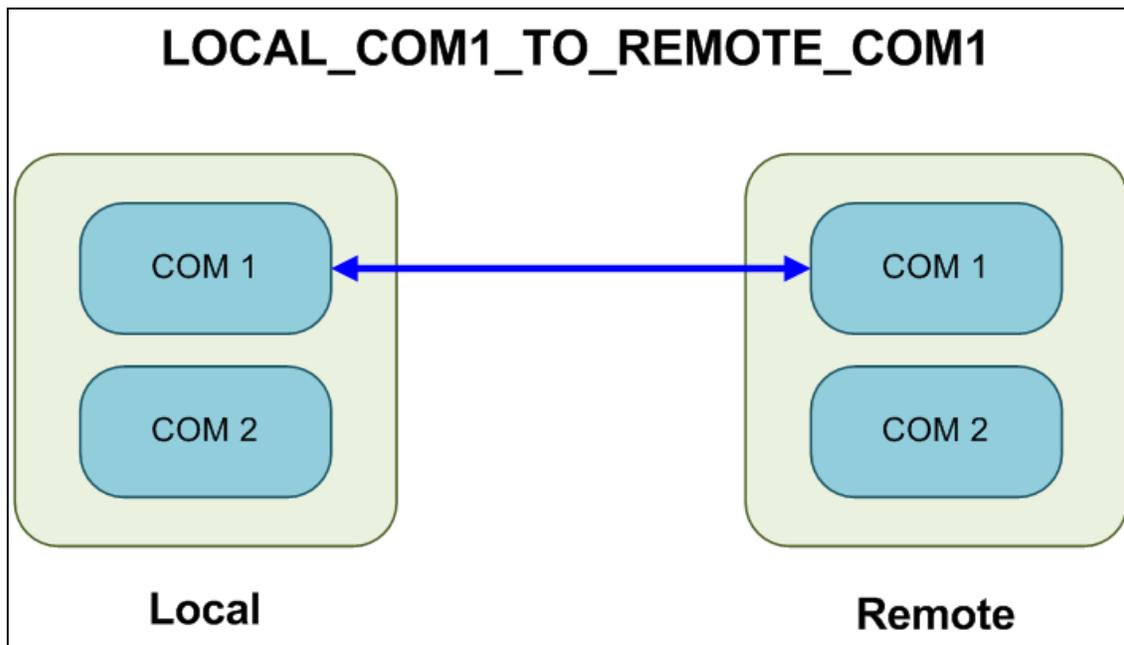


Figure 244: Terminal Server Relay command:

LOCAL_COM1_TO_REMOTE_COM1

36.4. LOCAL_COM2_TO_REMOTE_COM2

Figure 245 illustrates the Terminal Server Relay command:

LOCAL_COM2_TO_REMOTE_COM2.

- Data is forwarded between the local COM2 and remote COM2 ports.

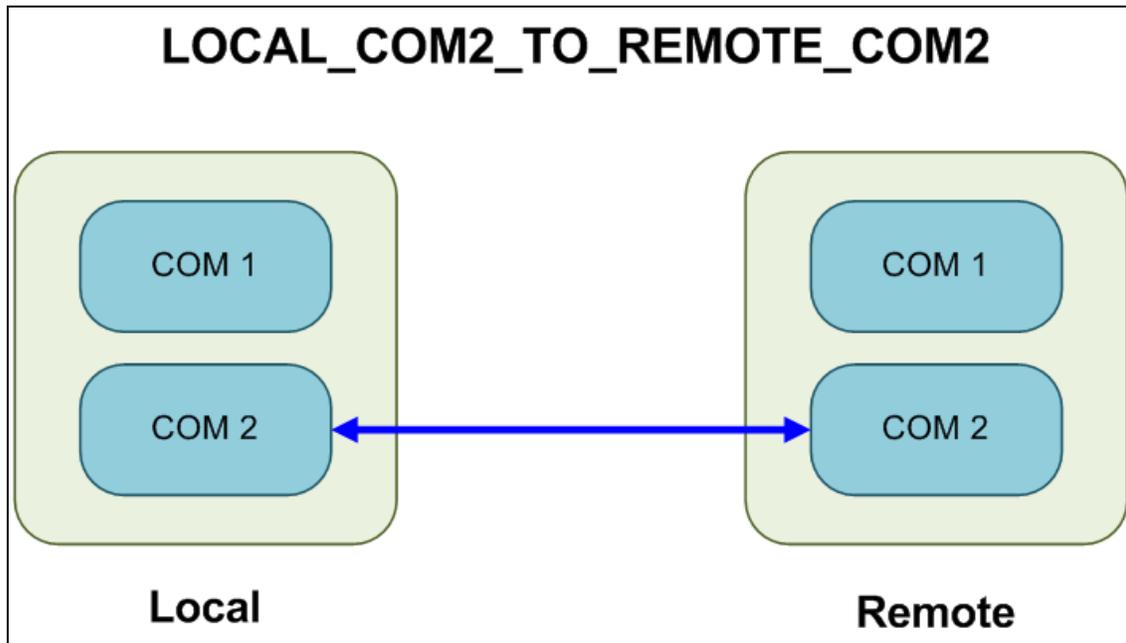


Figure 245: Terminal Server Relay command:

LOCAL_COM2_TO_REMOTE_COM2

36.5. LOCAL_BOTH_COM_TO_REMOTE_COM1

Figure 246 illustrates the Terminal Server Relay command:

LOCAL_BOTH_COM_TO_REMOTE_COM1.

- Data is forwarded between the local COM1 and remote COM1 ports.
- Data is forwarded between the local COM2 and remote COM1 ports.

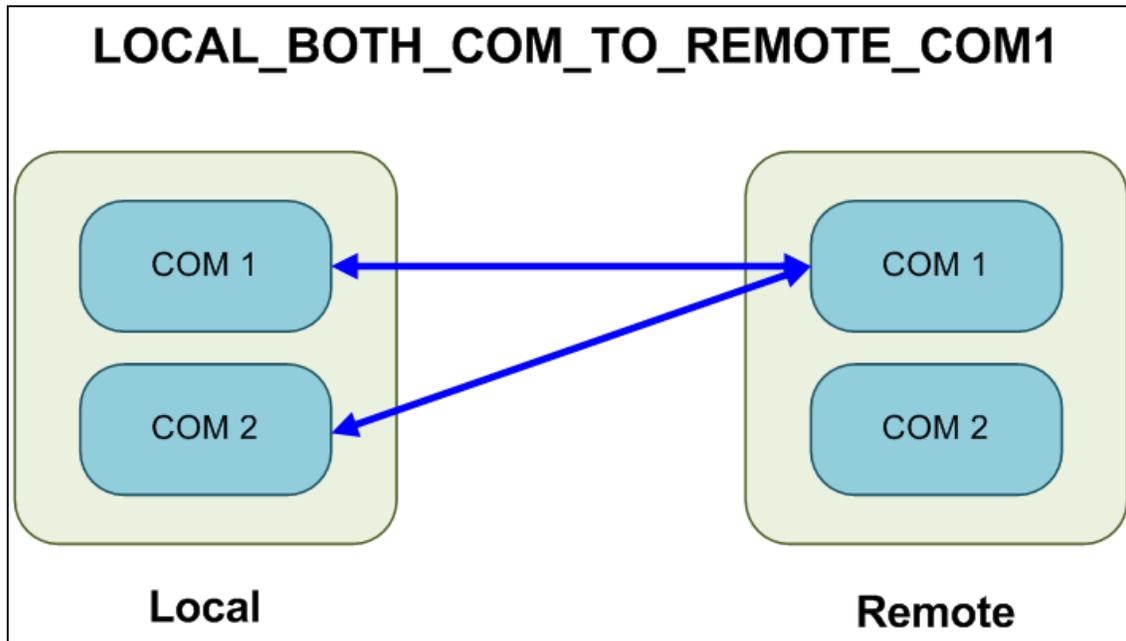


Figure 246: Terminal Server Relay command:

LOCAL_BOTH_COM_TO_REMOTE_COM1

36.6. LOCAL_BOTH_COM_TO_REMOTE_COM2

Figure 247 illustrates the Terminal Server Relay command:

LOCAL_BOTH_COM_TO_REMOTE_COM2.

- Data is forwarded between the local COM1 and remote COM2 ports.
- Data is forwarded between the local COM2 and remote COM2 ports.

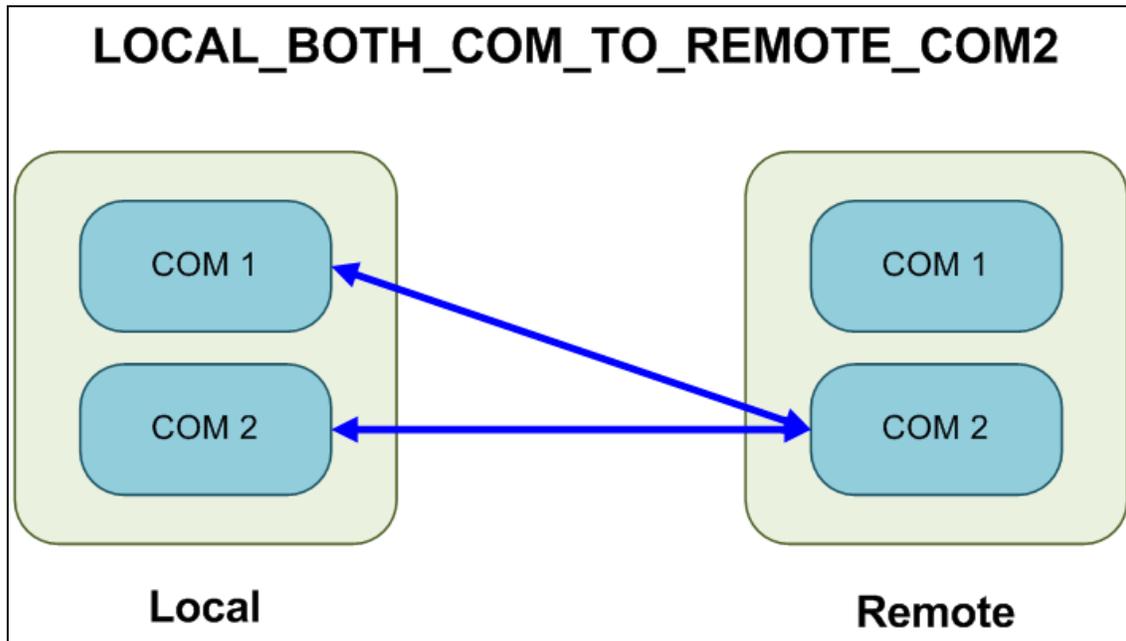


Figure 247: Terminal Server Relay command:

LOCAL_BOTH_COM_TO_REMOTE_COM2

36.7. LOCAL_COM1_TO_REMOTE_BOTH_COM

Figure 248 illustrates the Terminal Server Relay command:

LOCAL_COM1_TO_REMOTE_BOTH_COM

- Data is forwarded between the local COM1 and remote COM1 ports.
- Data is forwarded between the local COM1 and remote COM2 ports.

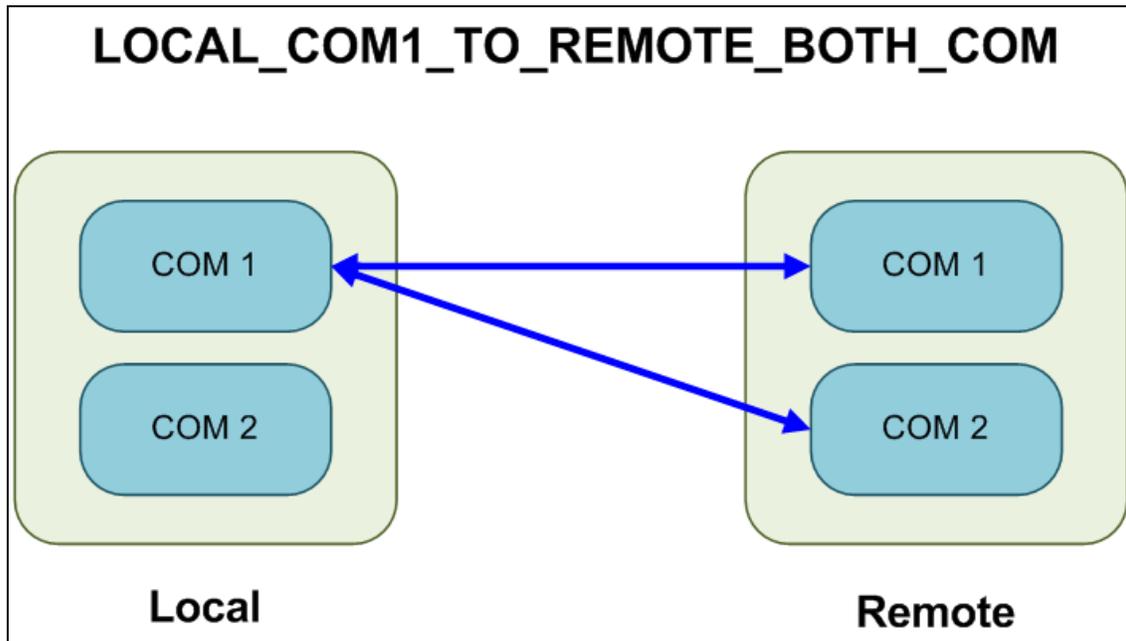


Figure 248: Terminal Server Relay command:

LOCAL_COM1_TO_REMOTE_BOTH_COM

36.8. LOCAL_COM2_TO_REMOTE_BOTH_COM

Figure 249 illustrates the Terminal Server Relay command:

LOCAL_COM2_TO_REMOTE_BOTH_COM

- Data is forwarded between the local COM2 and remote COM1 ports.
- Data is forwarded between the local COM2 and remote COM2 ports.

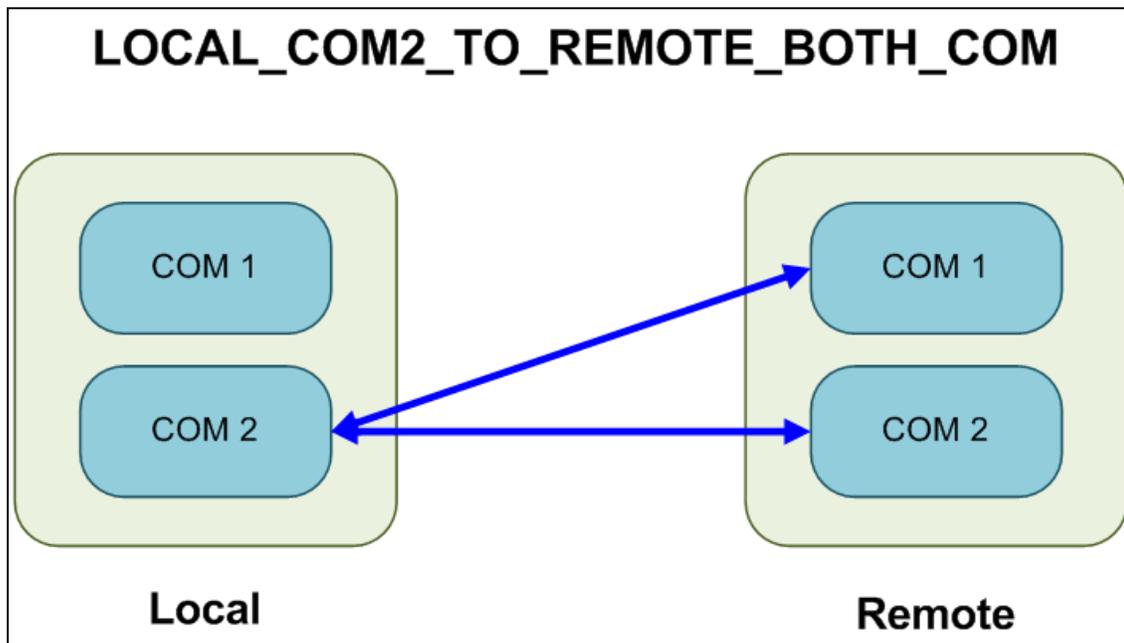


Figure 249: Terminal Server Relay command:

LOCAL_COM2_TO_REMOTE_BOTH_COM

36.9. Example: Multicast

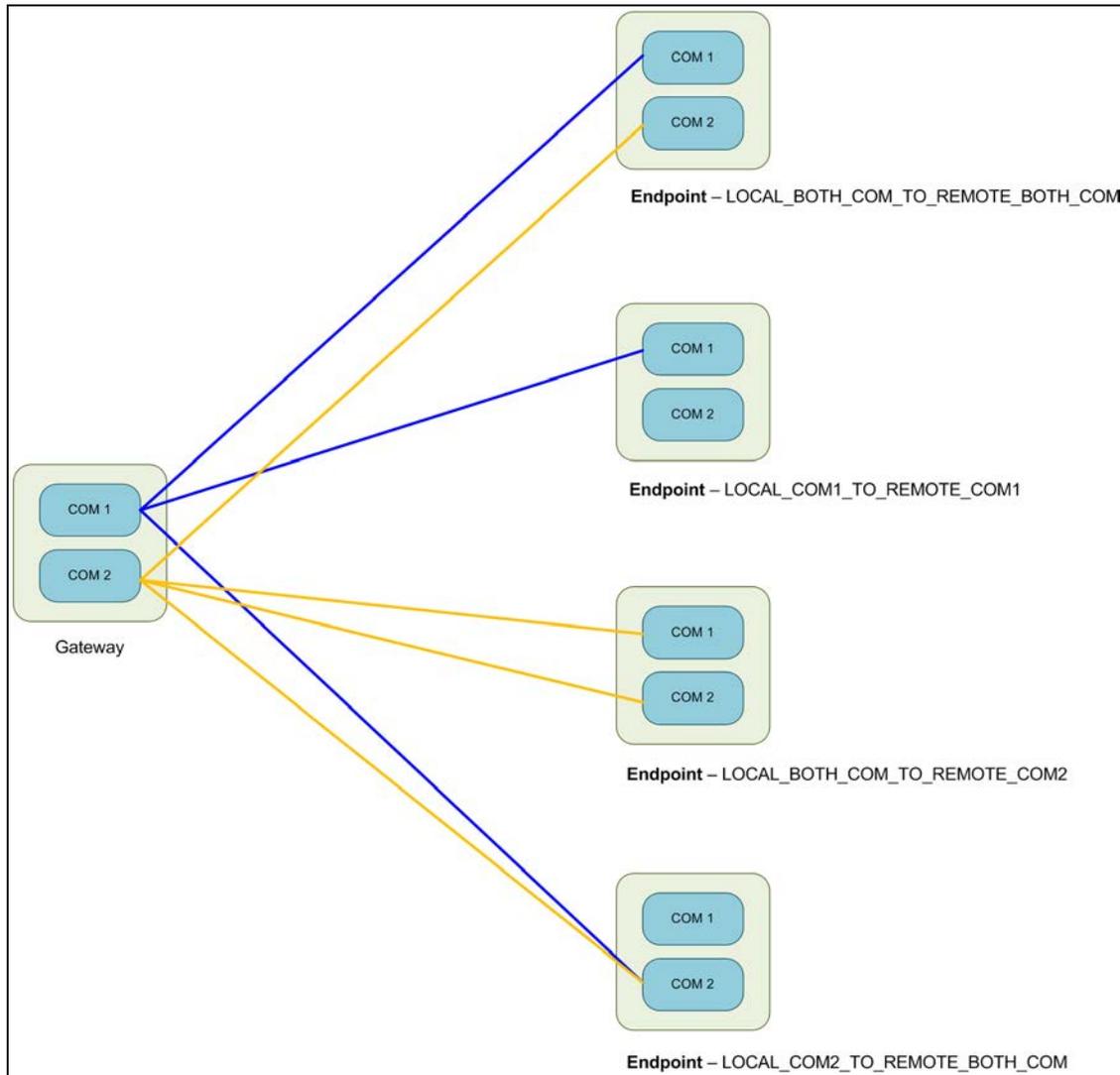


Figure 250: Example: Multicast

37. Web Interface

The available windows are:

- [COM window \(on page 389\)](#)
- [Config window \(on page 391\)](#)
- [Data Path window \(on page 393\)](#)
- [Date window \(on page 395\)](#)
- [Encryption window \(on page 397\)](#)
- [File Upload window \(on page 399\)](#)
- [Help window \(on page 401\)](#)
- [Home window \(on page 403\)](#)
- [Io Ex Com window \(on page 404\)](#)
- [Local Diagnostics window \(on page 406\)](#)
- [Modbus window \(on page 408\)](#)
- [Network window \(on page 410\)](#)
- [Network Diagnostics window \(on page 412\)](#)
- [Network Stats window \(on page 417\)](#)
- [NTP window \(on page 419\)](#)
- [Radio Settings window - Endpoint \(on page 421\)](#)
- [Radio Settings Helpers window \(on page 429\)](#)
- [Runtime Environment window \(on page 431\)](#)
- [Security window \(on page 433\)](#)
- [Services window \(on page 435\)](#)
- [SNMP window \(on page 437\)](#)
- [System Info window \(on page 439\)](#)
- [Terminal Server Relay window \(on page 441\)](#)
- [User Data - Drag and Drop window \(on page 443\)](#)

37.1. COM window

The **COM** windows are used to read and change information about the communication settings of the Z9-P or Z9-PE.

Note: See the [COM Parameters \(on page 224\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 251](#)

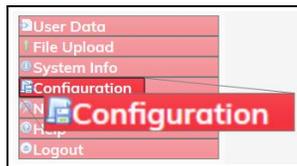


Figure 251: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

5. Click either the **COM1** or **COM2** tab to access their respective COM parameters. [Figure 252](#) or [Figure 253](#)

Note: The parameters for **COM1** and **COM2** are the same except for the [Terminal Server Port \(on page 235\)](#) parameter setting.
See the [COM Parameters \(on page 224\)](#) for detailed information about the parameters.



Figure 252: COM1 window



Figure 253: COM2 window

- Optional: On the **Menu** list, click the **Configuration** link to [Change the COM Parameters \(on page 117\)](#).

37.2. Config window

The **Config** window is used to reset the radio, restore factory defaults, view IQ license status.

Note: See the [Config Parameters \(on page 238\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **System Info** link. [Figure 254](#)



Figure 254: System Info link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Config** tab to access the **Config** parameters. [Figure 255](#)

Important!: The information in this window is read-only.
The parameters in this window can only be changed in the CLI.
See the [Access the CLI and Change the IP Address and nodeId \(on page 61\)](#) procedure for CLI access.
See the [Config Parameters \(on page 238\)](#) for detailed information about the parameters.

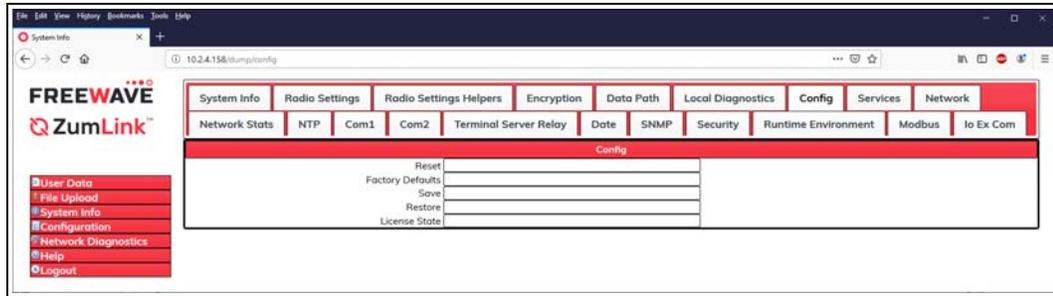


Figure 255: Config window

37.3. Data Path window

The **Data Path** window is used to define more advanced data path features.

Note: See the [Data Path Parameters \(on page 242\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 256](#)

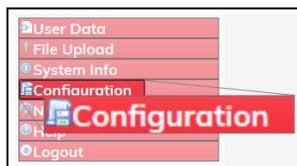


Figure 256: Configuration link

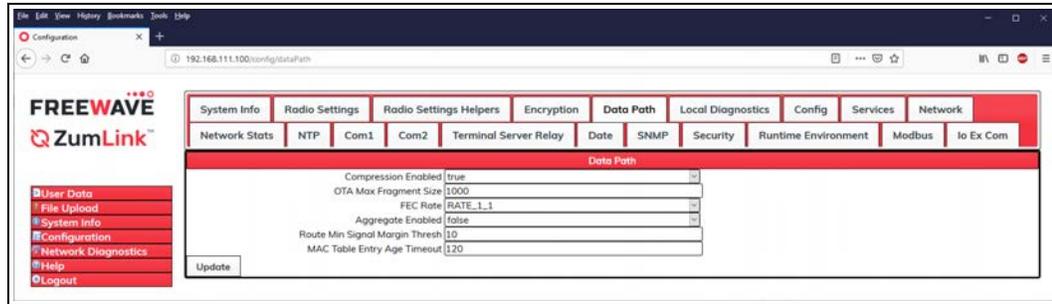
The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Data Path** tab to access the **Data Path** parameters. [Figure 257](#)

Note: The information in this window is read-only.
See the [Data Path Parameters \(on page 242\)](#) for detailed information about the parameters.

**Figure 257: Data Path window**

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Data Path Parameters \(on page 120\)](#).

37.4. Date window

The **Date** window is used to view the Z9-P or Z9-PE operation and application uptime.

Note: See the [Date Parameters \(on page 251\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 258](#)

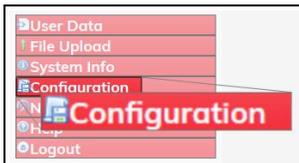


Figure 258: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Date** tab to access the **Date** parameters. [Figure 259](#)

Note: The information in this window is read-only.
See the [Date Parameters \(on page 251\)](#) for detailed information about the parameters.

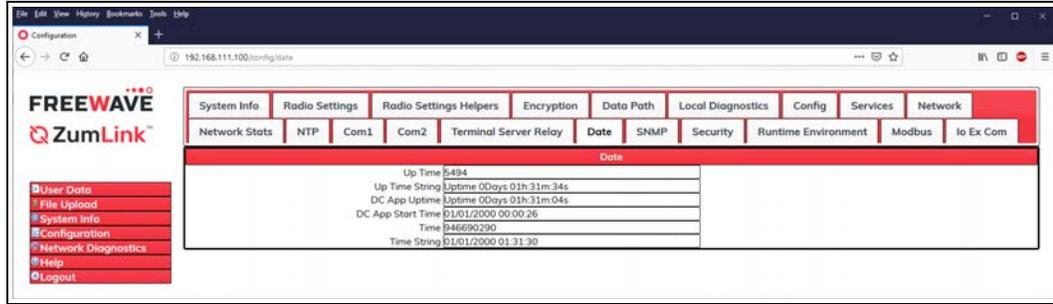


Figure 259: Date window

37.5. Encryption window

The **Encryption** window is used to enable or disable encryption on the Z9-P or Z9-PE.

Note: See the [Encryption Parameters \(on page 256\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 260](#)

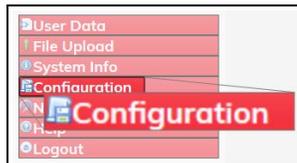


Figure 260: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Encryption** tab to access the **Encryption** parameters. [Figure 261](#)

Note: See the [Encryption Parameters \(on page 256\)](#) for detailed information about the parameters.

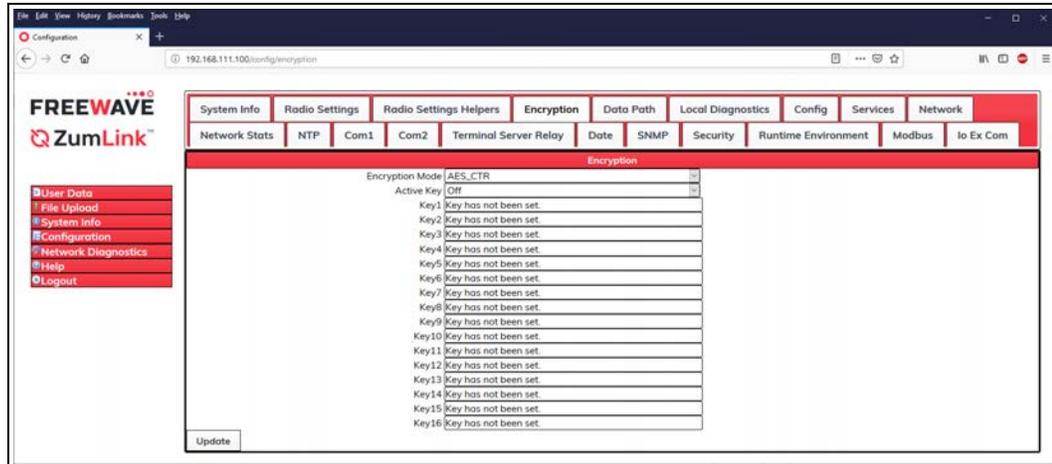


Figure 261: Encryption window

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Encryption Parameters](#) (on page 122).

37.6. File Upload window

The **File Upload** window is used to search for and upload these file types into the Z9-P or Z9-PE:

Extension	File Type
.cfg; .cfg.txt	Configuration changes
.fcf; .fcf.txt	Radio module Firmware updates
.pkg; .pkg.txt	Interface board Firmware updates

Access and Window Description

Note: The images in this procedure are for **Windows® 7** and/or **Windows® 10** and **Firefox®**.

1. Verify the [Setup the Computer IP Address Configuration](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.

If the IP address was changed, enter that IP Address.

See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **File Upload** link. [Figure 262](#)

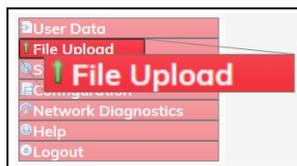


Figure 262: File Upload link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **File Upload** window opens. [Figure 263](#)

Note: If the **User Name** or **Password** were changed, enter the applicable information.

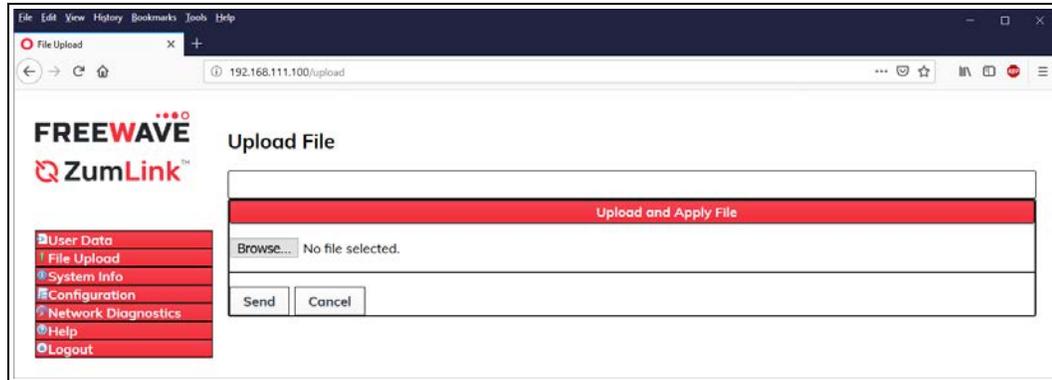


Figure 263: File Upload window

6. Optional: Complete the [Firmware Update \(on page 29\)](#) for the Z9-P or Z9-PE.

File Upload window	
Control Title	Control Description
Browse button	Click to open the Microsoft® File Upload dialog box. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Note: The Browse button title is dependent on the chosen browser.</p> </div>
Send button	Click to start the update process on the Z9-P or Z9-PE.
Cancel button	Click to cancel the file transfer if already started or refresh the window and clear the selected file.

37.7. Help window

The **Help** window is used to read information about the settings of the Z9-P or Z9-PE.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Help** link. [Figure 264](#)

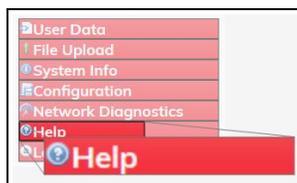


Figure 264: Help link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Login** dialog box closes and the **Help** window opens. [Figure 265](#)

Note: The information in this window is read-only.

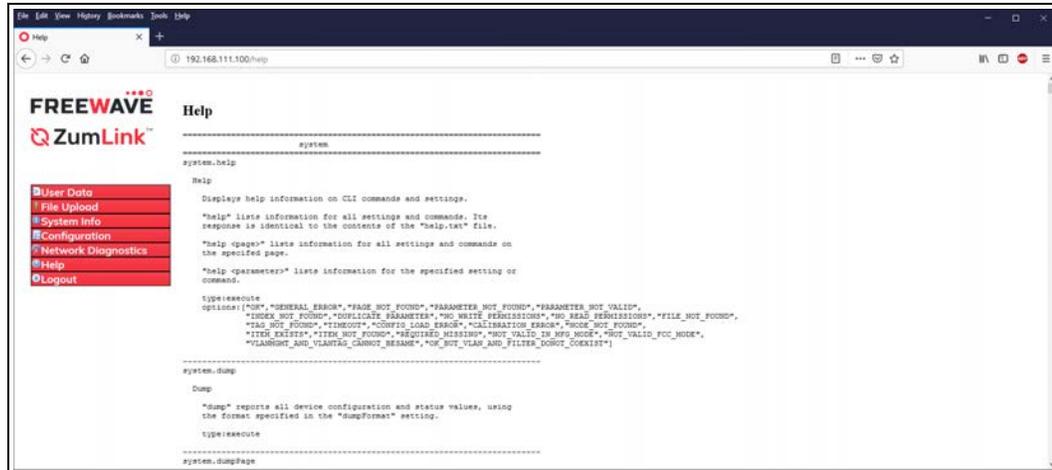


Figure 265: Help window

37.8. Home window

The **Home** window is the default window that opens when the Web Interface is used.

It is used to:

- View basic System information of the connected Z9-P or Z9-PE.
- Provide links to other windows of the Z9-P or Z9-PE.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The Z9-P or Z9-PE **Home** window opens. [Figure 266](#)

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.

If the IP address was changed, enter that IP Address.

See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

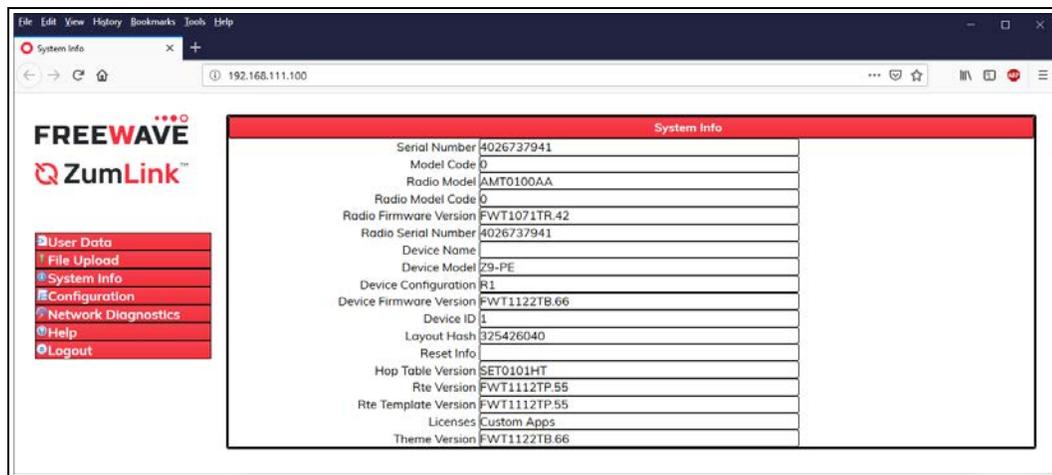


Figure 266: Home (System Info) window

Note: The information in this window is read-only.

37.9. Io Ex Com window

The **ioExCom** window is used to designate the [Modbus Device ID \(on page 279\)](#) of the connected IOEX device that responds to during a Modbus TCP request over the network or a Modbus RTU request coming in via COM1 or COM2.

Note: See the [IO Ex Com Parameters \(on page 260\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 267](#)

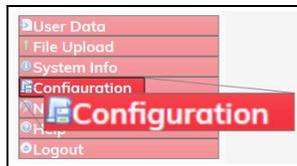


Figure 267: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Io Ex Com** tab to access the **Io Ex Com** parameters. [Figure 268](#)

Note: See the [IO Ex Com Parameters \(on page 260\)](#) for detailed information about the parameters.

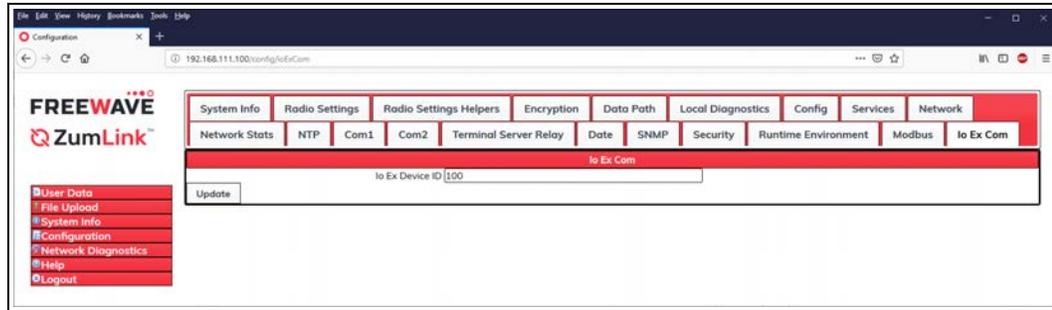


Figure 268: Io Ex Com window

Note: The information in this window is read-only.

37.10. Local Diagnostics window

The **Local Diagnostics** window is used to view diagnostic info about the Z9-P or Z9-PE.

Note: See the [Local Diagnostics Parameters \(on page 261\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 269](#)

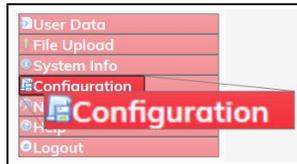


Figure 269: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Local Diagnostics** tab to access the **Local Diagnostics** parameters. [Figure 270](#)

Note: See the [Local Diagnostics Parameters \(on page 261\)](#) for detailed information about the parameters.

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the Local Diagnostics - Monitored Node \(on page 125\)](#).

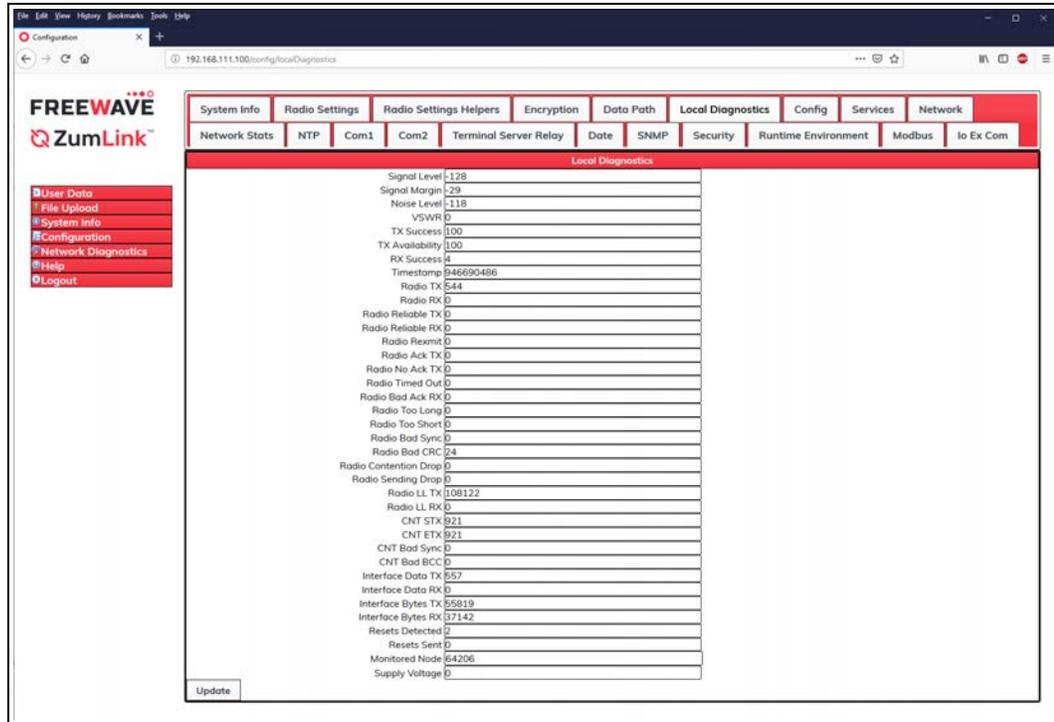


Figure 270: Local Diagnostics window

37.11. Modbus window

The **Modbus** window is used to view Modbus information about the Z9-P or Z9-PE.

Note: See the [Modbus Parameters \(on page 278\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 271](#)

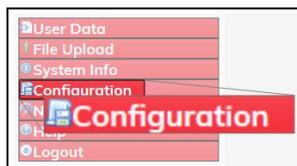


Figure 271: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Modbus** tab to access the **Modbus** parameters. [Figure 272](#)

Note: See the [Modbus Parameters \(on page 278\)](#) for detailed information about the parameters.

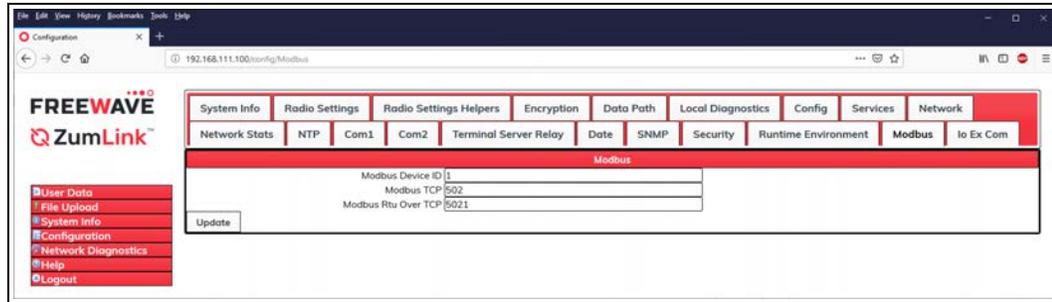


Figure 272: Modbus window

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the Modbus Parameters \(on page 127\)](#).
8. Optional:
 - a. On the **Menu** list, click the **System Info** link.
The [System Info window \(on page 439\)](#) opens.
 - b. Click the **Modbus** tab.
The **Modbus** window opens in Read-only mode to view the information for these parameters: [37.11](#)
 - [Modbus Layout \(on page 279\)](#)
 - [Read \(on page 281\)](#)
 - [Read Coils \(on page 282\)](#)
 - [Write \(on page 283\)](#)
 - [Write Coils \(on page 284\)](#)

37.12. Network window

The **Network** window is used to provide network information for the Z9-P or Z9-PE.

Note: See the [Network Parameters \(on page 288\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 273](#)

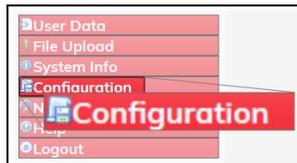


Figure 273: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Network** tab to access the **Network** parameters. [Figure 274](#)

Note: See the [Network Parameters \(on page 288\)](#) for detailed information about the parameters.

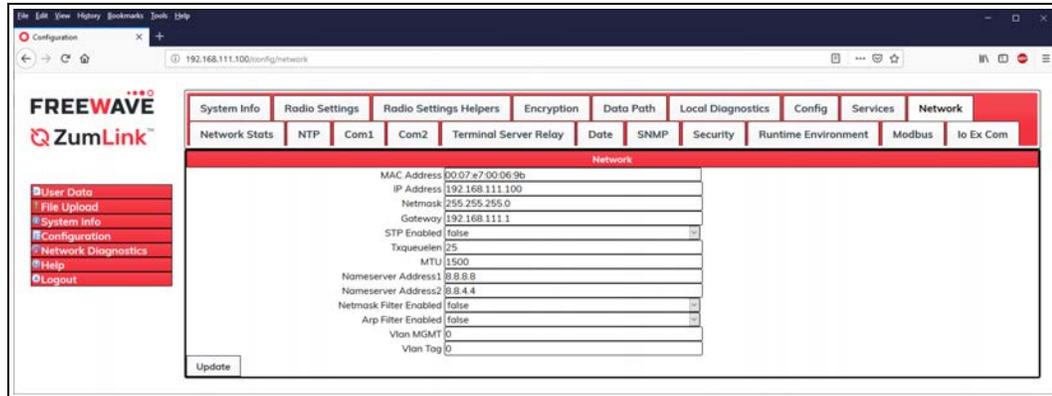


Figure 274: Network window

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Network Parameters \(on page 129\)](#).

37.13. Network Diagnostics window

The **Network Diagnostics** window is used to:

- Discover other Endpoints in the network.
- Show hops and their paths from the Gateway.
- Show the link quality (RSSI and Margin).
- Show neighbors.

Important! A Gateway is required in the network to use this window.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Network Diagnostics** link.

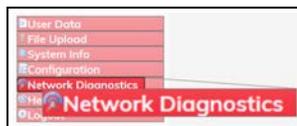


Figure 275: Network Diagnostics link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Network Diagnostics** window opens, scanning the network. [Figure 276](#)

The diagram takes a few moments to render.

The **Options** list box default selection is **Margin**.

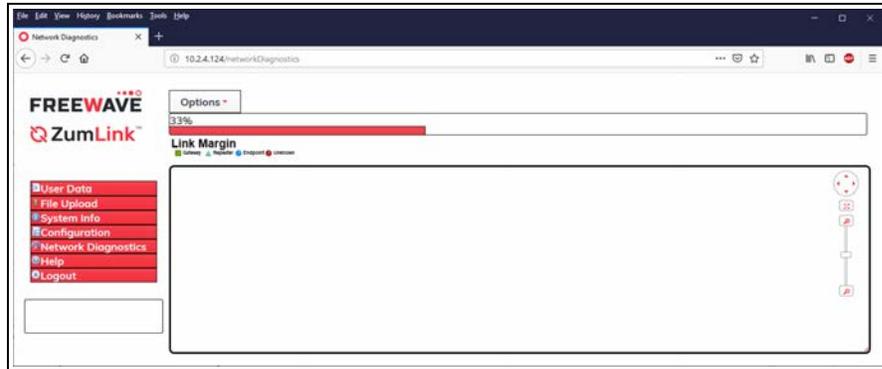


Figure 276: Network Diagnostics window - Scanning Network

The **Link Margin** connections appear in the **Network Diagram**.

Network Diagnostics window		
Control Area	Control Title	Control Description
Options list box		Click the Options list box arrow and select a connections diagram option.
Options list box	Show Big Graph	Select the Show Big Graph option to view the Network Diagram in a large format.
Options list box	Show Table	In the Options list box, select the Show Table option to view the radio connection table of the selected device below the Network Diagram . Note: See Show Table in the Network Diagnostics Window (on page 167) to view network and device information in a table format.
Options list box	Save Image	Select the Save Image option to open the Save Image dialog box. Note: See Save a Network Diagram Image (on page 163) to save the Network Diagram as a .PNG file.
Options list box	Gateway IP	Select the Gateway IP option to open the Add Device IP dialog box and add a Gateway IP address. Note: See Add a Gateway Device IP Address (on page 154) for additional information.

Network Diagnostics window		
Control Area	Control Title	Control Description
Options list box	Clear Display	<p>Click Clear Display to erase the network diagram in the window.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Note: In the Options list box, click Refresh Network Diagnostics to show the network in the window.</p> </div>
Options list box	Save Network Diagnostics	<p>Select the Save Network Diagnostics option to open the Opening network_diag.json dialog box.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Note: See Save Network Diagnostics (on page 160) to save the current network performance reading for later review and to monitor network performance over time.</p> </div>
Options list box	Download Support Bundle	<p>Select the Download Support Bundle option to open the Opening support_bundle_nnn.zip dialog box.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Note: Where <code>nnn</code> is the selected device in the Network Diagram.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  Use the Opening support_bundle_nnn.zip dialog box to save the current network performance reading to send to FreeWave Technical Support for faster issue resolution. </div>
Options list box	Refresh Network Diagnostics	<p>Select the Refresh Network Diagnostics option to updated the current network performance reading.</p>
Options list box	Clear All Stats	<p>Select the Clear All Stats option to reset the Local Diagnostics Parameters (on page 261), Network StatsParameters (on page 299), and Network Diagnostics.</p>
Options list box	Clear Stats	<p>Select the Clear Stats option to clear only the local diagnostics.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: This does NOT clear the Network StatsParameters (on page 299) or Network Diagnostics.</p> </div>

Network Diagnostics window		
Control Area	Control Title	Control Description
Options list box	Margin	<p>Click the Options list box arrow and select the Margin option to show the Link Margin connections in the Network Diagram.</p> <p>Note: See View the Network Diagnostics - Margin (on page 175) for a diagram example.</p>
Options list box	RSSI	<p>Click the Options list box arrow and select the RSSI option to show the RSSI connections in the Network Diagram.</p> <p>Note: See View the Network Diagnostics - RSSI (on page 180) for a diagram example.</p>
Options list box	Tx Rate	<p>Click the Options list box arrow and select the Tx Rate option to show the Tx Rate connections in the Network Diagram.</p> <p>Note: See View the Network Diagnostics - Tx Rate (on page 187) for a diagram example.</p>
Options list box	Rx Rate	<p>Click the Options list box arrow and select the Rx Rate option to show the Rx Rate connections in the Network Diagram.</p> <p>Note: See View the Network Diagnostics - Rx Rate (on page 185) for a diagram example.</p>
Options list box	Margin with Neighbors	<p>Click the Options list box arrow and select the Margin with Neighbors option to show the Margin with Neighbors connections in the Network Diagram.</p> <p>Note: See View the Network Diagnostics - Margin with Neighbors (on page 177) for a diagram example.</p>
Options list box	RSSI with Neighbors	<p>Click the Options list box arrow and select the RSSI with Neighbors option to show the RSSI with Neighbors connections in the Network Diagram.</p> <p>Note: See View the Network Diagnostics - RSSI with Neighbors (on page 182) for a diagram example.</p>

Network Diagnostics window		
Control Area	Control Title	Control Description
Options list box	Breadthfirst	<p>Click the Options list box arrow and select the Breadthfirst option to show the Breadthfirst connections in the Network Diagram.</p> <p>Note: See the View the Network Diagnostics - Breadthfirst (on page 169) for a diagram example.</p>
Options list box	Cose-bilkent	<p>Click the Options list box arrow and select the Cose-bilkent option to show the Cose-bilkent connections in the Network Diagram.</p> <p>Note: See the View the Network Diagnostics - Cose-bilkent (on page 171) for a diagram example.</p>
Options list box	Grid	<p>Click the Options list box arrow and select the Grid option to show the Grid connections in the Network Diagram.</p> <p>Note: See the View the Network Diagnostics - Grid (on page 173) for a diagram example.</p>
Options list box	Dagre	<p>When Dagre is select, the network diagram shows possible loops in a complicated network.</p> <p>Note: By default, Dagre is selected.</p>
Options list box	Paused	<p>When Paused is selected, no updates or layout changes are made in the network diagram.</p>
Options list box	Updating Layout	<p>When Updating Layout is select, the node layouts are automatically set by the computer.</p> <p>Note: By default, Updating Layout is selected.</p>

37.14. Network Stats window

The **Network Stats** window is used to view received, dropped, or sent Ethernet packet information.

Note: See the [Network StatsParameters \(on page 299\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 277](#)

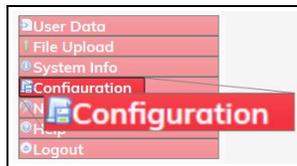


Figure 277: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Network Stats** tab to access the **Network Stats** parameters. [Figure 278](#)

Note: The information in this window is read-only.
See the [Network StatsParameters \(on page 299\)](#) for detailed information about the parameters.

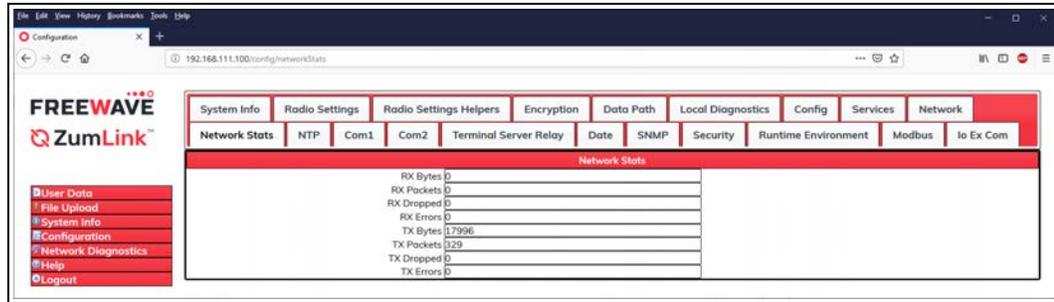


Figure 278: Network Stats window

37.15. NTP window

The **NTP** window is used to designate the date and time used on the Z9-P or Z9-PE.

Note: See the [NTP Parameters \(on page 305\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 279](#)

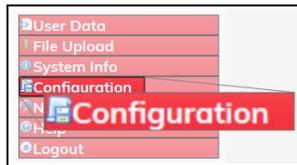


Figure 279: Configuration link

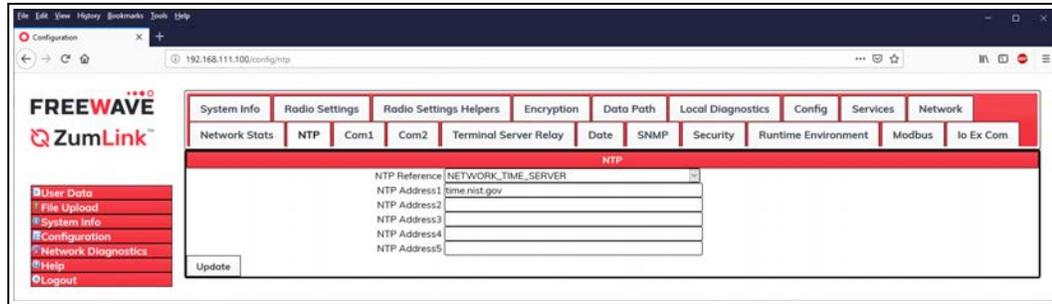
The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **NTP** tab to access the **NTP** parameters. [Figure 280](#)

Note: The information in this window is read-only.
See the [NTP Parameters \(on page 305\)](#) for detailed information about the parameters.

**Figure 280: NTP window**

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the NTP Parameters \(on page 131\)](#).

37.16. Radio Settings window - Endpoint

The **Radio Settings** window is used to define the key parameters of an Endpoint Z9-P or Z9-PE.

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 281](#)

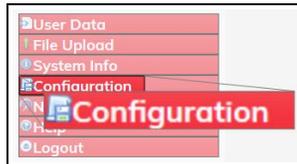


Figure 281: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters. [Figure 282](#)

Note: By default, the [Radio Mode \(on page 329\)](#) parameter is set to **Endpoint**.
See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

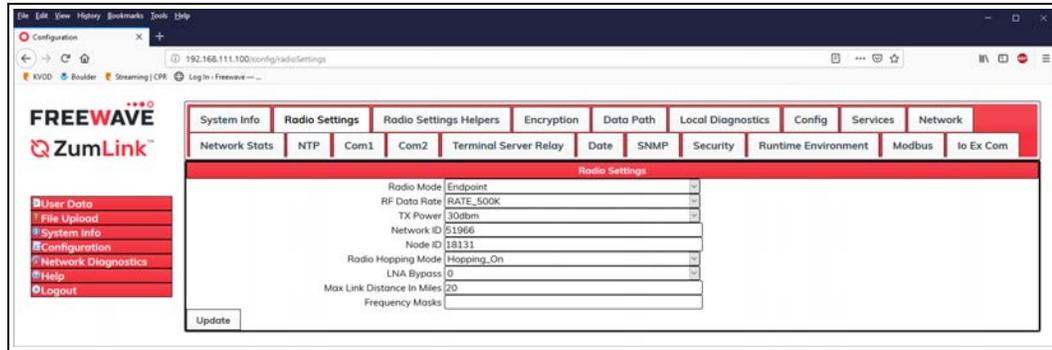


Figure 282: Radio Settings window - Endpoint

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Radio Settings Parameters - Endpoint](#) (on page 133).

Important!: Only [Radio Settings Parameters](#) (on page 310) that apply to the current [Radio Mode](#) (on page 329), [RF Data Rate](#) (on page 332), and [Radio Hopping Mode](#) (on page 324), and are visible in the CLI and the Web Interface and can be changed.

37.16.1. Radio Settings window - Endpoint-Repeater

The **Radio Settings** window is used to define the key parameters of an Endpoint-Repeater Z9-P or Z9-PE.

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 283](#)

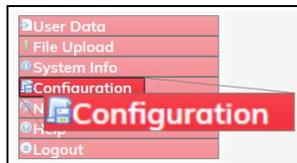


Figure 283: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.

Note: By default, the [Radio Mode \(on page 329\)](#) parameter is set to **Endpoint**.
See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

7. Click the **Radio Mode** list box arrow and select **Endpoint_Repeater**. [Figure 284](#)



Figure 284: Radio Settings window - Endpoint_Repeater

8. Optional: On the **Menu** list, click the **Configuration** link to [Change the Radio Settings Parameters - Endpoint-Repeater](#) (on page 135).

Important! Only [Radio Settings Parameters](#) (on page 310) that apply to the current [Radio Mode](#) (on page 329), [RF Data Rate](#) (on page 332), and [Radio Hopping Mode](#) (on page 324), and are visible in the CLI and the Web Interface and can be changed.

37.16.2. Radio Settings window - Gateway

The **Radio Settings** window is used to define the key parameters of an Gateway Z9-P or Z9-PE.

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 285](#)

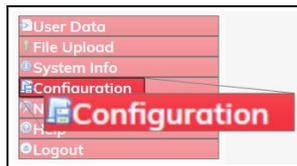


Figure 285: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.

Note: By default, the [Radio Mode \(on page 329\)](#) parameter is set to **Endpoint**.
See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

7. Click the **Radio Mode** list box arrow and select **Gateway**. [Radio Settings window - Gateway \(on page 426\)](#)

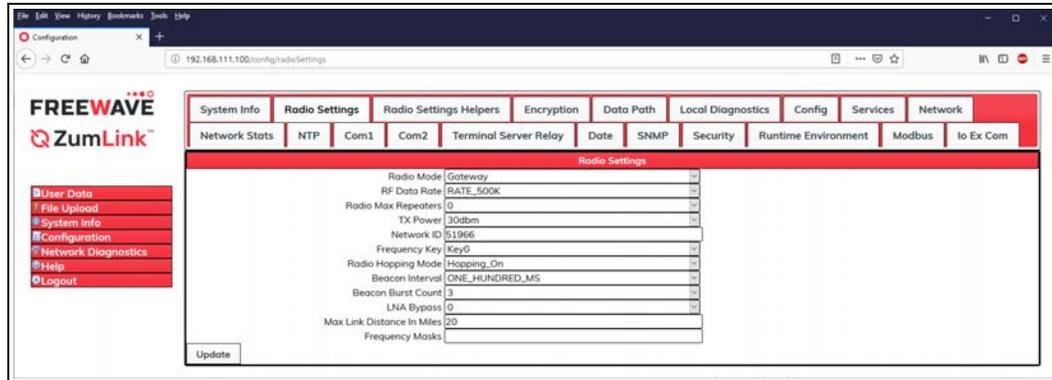


Figure 286: Radio Settings window - Gateway

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Radio Settings Parameters - Gateway \(on page 137\)](#).

Important!: Only [Radio Settings Parameters \(on page 310\)](#) that apply to the current [Radio Mode \(on page 329\)](#), [RF Data Rate \(on page 332\)](#), and [Radio Hopping Mode \(on page 324\)](#), and are visible in the CLI and the Web Interface and can be changed.

37.16.3. Radio Settings window - Gateway-Repeater

The **Radio Settings** window is used to define the key parameters of an Gateway-Repeater Z9-P or Z9-PE.

Note: See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 287](#)

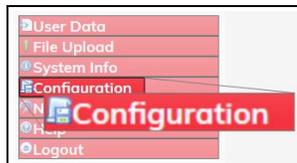


Figure 287: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings** tab to access the **Radio Settings** parameters.

Note: By default, the [Radio Mode \(on page 329\)](#) parameter is set to **Endpoint**.
See the [Radio Settings Parameters \(on page 310\)](#) for detailed information about the parameters.

7. Click the **Radio Mode** list box arrow and select **Gateway_Repeater**. [Figure 288](#)

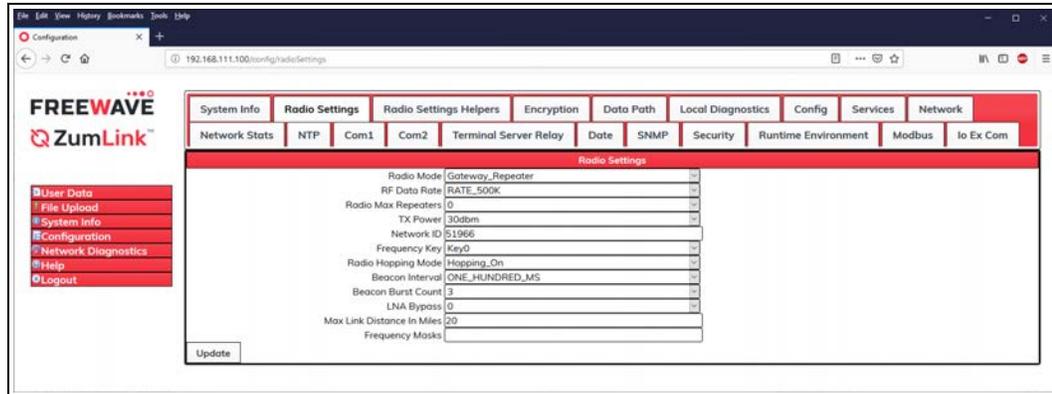


Figure 288: Radio Settings window - Gateway_Repeater

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Radio Settings Parameters - Gateway-Repeater](#) (on page 140).

Important! Only [Radio Settings Parameters](#) (on page 310) that apply to the current [Radio Mode](#) (on page 329), [RF Data Rate](#) (on page 332), and [Radio Hopping Mode](#) (on page 324), and are visible in the CLI and the Web Interface and can be changed.

37.17. Radio Settings Helpers window

The **Radio Settings Helpers** window is used to determine the error that exists in the frequency mask string.

Note: This window is only available if the [Radio Hopping Mode \(on page 324\)](#) parameter is set to **Hopping_On**.

See the [Radio Settings Helpers Parameters \(on page 336\)](#) for detailed information about the parameters.

See [Frequency Masks \(on page 315\)](#) for usage.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.

If the IP address was changed, enter that IP Address.

See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 289](#)

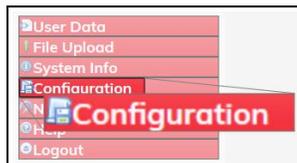


Figure 289: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Radio Settings Helpers** tab to access the **Radio Settings Helpers** parameter. [Figure 290](#)

Note: The information in this window is read-only.

See the [Radio Settings Helpers Parameters \(on page 336\)](#) for detailed information about the parameters.

See [Frequency Masks \(on page 315\)](#) for usage.



Figure 290: Radio Settings Helpers window

37.18. Runtime Environment window

The **Runtime Environment** window is used to provide information specific to the Linux Runtime Environment.

Note: See the [Runtime Environment Parameters \(on page 338\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 291](#)

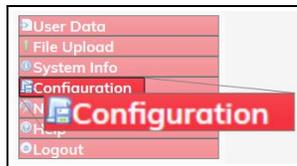


Figure 291: Configuration link

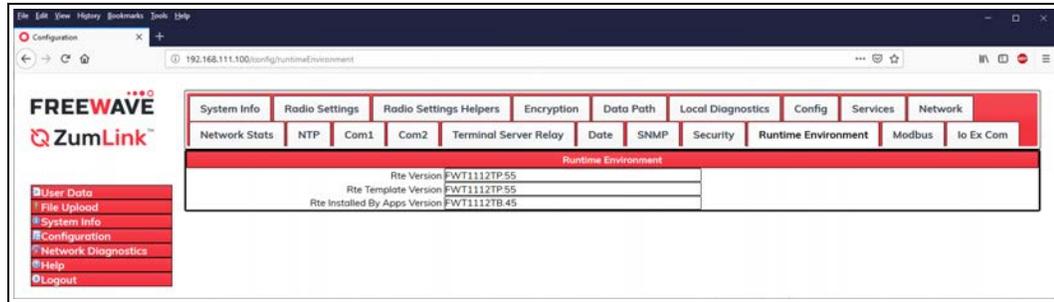
The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Runtime Environment** tab to access The **Runtime Environment** parameters. [Figure 292](#)

Note: The information in this window is read-only.
See the [Runtime Environment Parameters \(on page 338\)](#) for detailed information about the parameters.

**Figure 292: Runtime Environment window**

37.19. Security window

The **Security** window is used to enable or disable the drag-n-drop interface and SSH access.

Note: See the [Security Parameters \(on page 342\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 293](#)

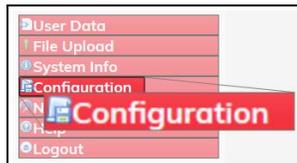


Figure 293: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

5. Click the **Security** tab to access the **Security** parameters. [Figure 294](#)

Note: See the [Security Parameters \(on page 342\)](#) for detailed information about the parameters.

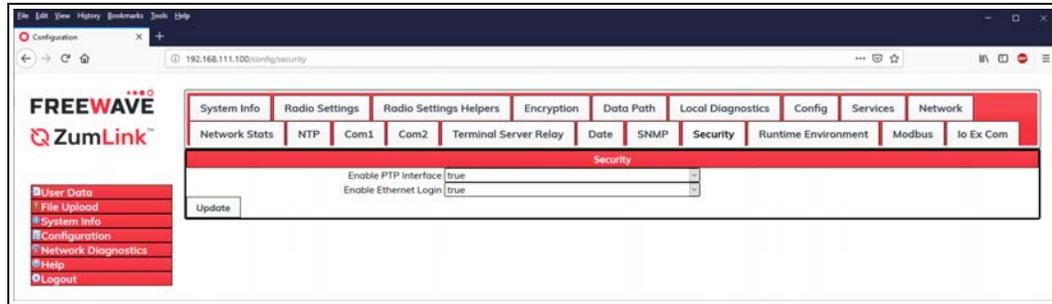


Figure 294: Security window

- Optional: On the **Menu** list, click the **Configuration** link to [Change the Security Parameters \(on page 143\)](#).

37.20. Services window

The **Services** window is used to enter the number of seconds of idle time before the CLI connection is closed.

Note: See the [Services Parameters \(on page 345\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 295](#)

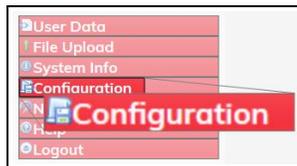


Figure 295: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Services** tab to access the **Services** parameters. [Figure 296](#)

Note: See the [Services Parameters \(on page 345\)](#) for detailed information about the parameters.

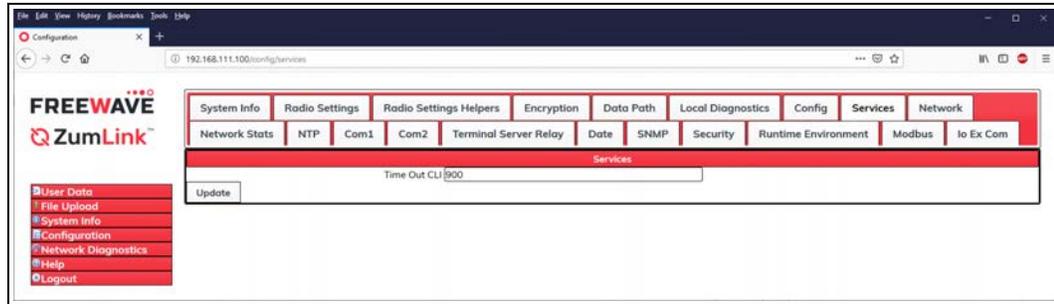


Figure 296: Services window

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the Services Parameters \(on page 145\)](#).

37.21. SNMP window

The **SNMP** window is used to enable, disable, and define SNMP access.

Note: See the [SNMP Parameters \(on page 347\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 297](#)

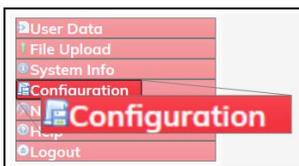


Figure 297: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **SNMP** tab to access the **SNMP** parameters.

Note: See the [SNMP Parameters \(on page 347\)](#) for detailed information about the parameters.

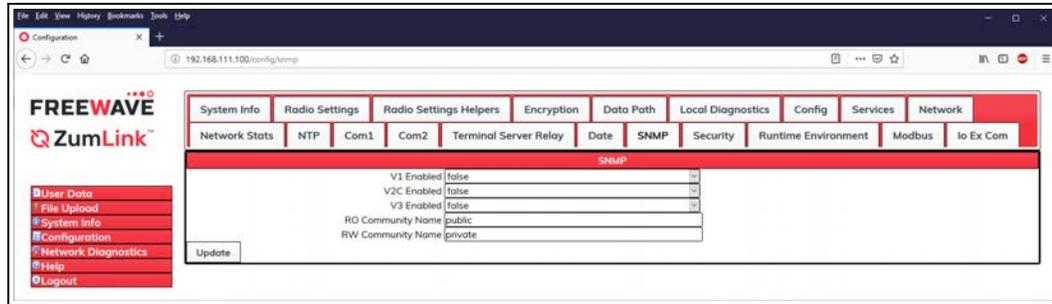


Figure 298: SNMP window

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the SNMP Parameters \(on page 147\)](#).

37.22. System Info window

The **System Info** window provides system level information for the Z9-P or Z9-PE.

Note: See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 299](#)

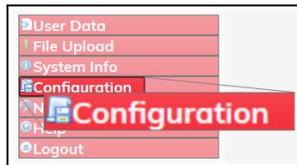


Figure 299: Configuration link

The **Authentication Required** (Login) dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **System Info** tab to access the **System Info** parameters. [Figure 300](#)

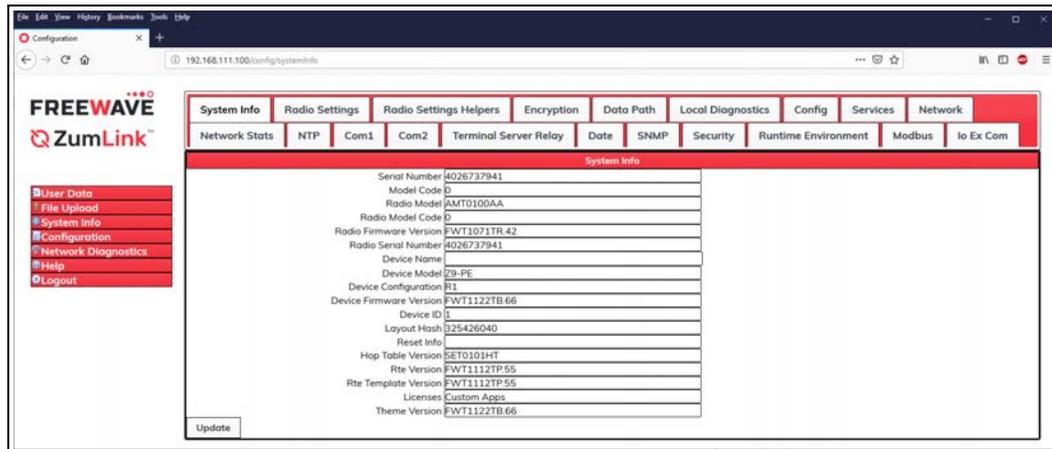


Figure 300: System Info window

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the System Info Parameters](#) (on page 149).

37.23. Terminal Server Relay window

The **Terminal Server Relay** window is used to connect the local Terminal Servers (hence the COM ports) to any remote Terminal Server.

Note: See the [Terminal Server Relay Parameters \(on page 372\)](#) for detailed information about the parameters.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration \(on page 112\)](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **Configuration** link. [Figure 301](#)

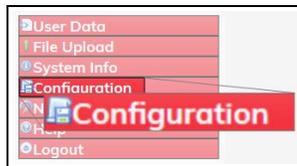


Figure 301: Configuration link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
The **Login** dialog box closes and the **System Info** window opens.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

6. Click the **Terminal Server Relay** tab to access the **Terminal Server Relay** parameters. [Figure 302](#)

Note: See the [Terminal Server Relay Parameters \(on page 372\)](#) for detailed information about the parameters.

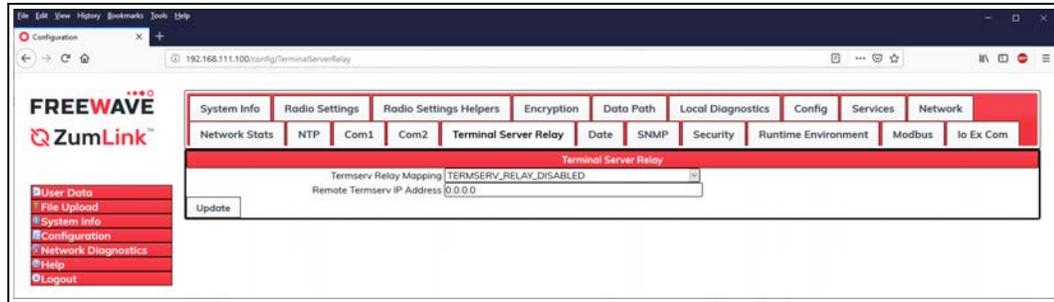


Figure 302: Terminal Server Relay window

7. Optional: On the **Menu** list, click the **Configuration** link to [Change the Terminal Server Relay Parameters \(on page 151\)](#).

37.24. User Data - Drag and Drop window

The **User Data - Drag and Drop** window lists the default files of the Z9-P or Z9-PE.

Access and Window Description

1. Verify the [Setup the Computer IP Address Configuration](#) procedure is completed.
2. Open a web browser.
3. In the URL address bar, enter the IP address of the connected Z9-P or Z9-PE and press <Enter>.

The [Home window \(on page 403\)](#) opens.

Note: If this is the first time the Z9-P or Z9-PE is accessed, enter its default IP address of **192.168.111.100**.
If the IP address was changed, enter that IP Address.
See the [System Info Parameters \(on page 361\)](#) for detailed information about the parameters.

4. On the **Menu** list, click the **User Data - Drag and Drop** link.

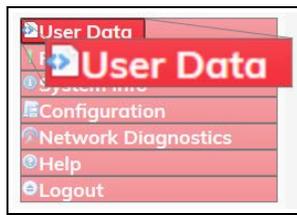


Figure 303: User Data - Drag and Drop Files link

The **Authentication Required (Login)** dialog box opens.

5. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.

Note: If the **User Name** or **Password** were changed, enter the applicable information.

The **Login** dialog box closes and the **User Data** window opens. [Figure 304](#)

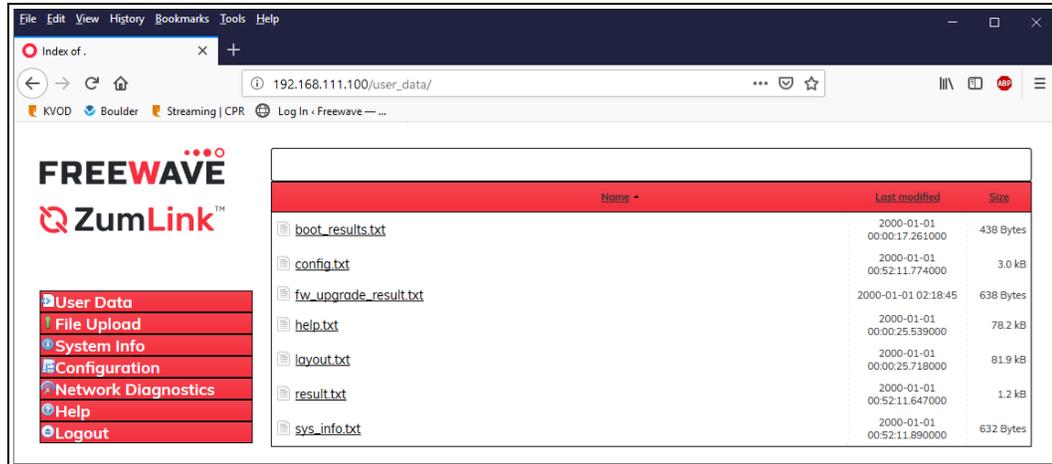


Figure 304: User Data window

Files and Descriptions - Z9-P or Z9-PE

File Name	Description
boot_results.txt	The boot_results.txt file shows the firmware version the device is currently running.
config.txt	The config.txt file contains all of the configuration parameters of the Z9-P or Z9-PE. These parameters determine how the device functions and connects to other devices in the network.
fw_upgrade_result.txt	The fw_upgrade_result.txt file shows the status of the update procedure for the device firmware. Note: This file appears after the ZumLink has been updated to a newer version of firmware.
help.txt	The help.txt file contains online user assistance information using the CLI commands. Example: In a CLI window, enter help=txPower or help txpower to see the help information for the radioSetting.txpower setting.
layout.txt	The layout.txt file is used for management applications to provide the CLI and config.cfg with a format description of the commands.
result.txt	The result.txt is used to verify the acceptance or rejection of each parameter change applied to the config.txt file. Note: This file appears after the config.txt file of the ZumLink has been changed.
sys_info.txt	The sys_info.txt file provides information about the radio including serial number, model number, firmware versions, and device name.

38. Release Notes

These sections describe the additions, changes, and known limitations in each software version for the ZumLink Z9-P or Z9-PE. The most recent version is listed first.



The latest firmware and software versions and the most recent list of known limitations and workarounds are available on support.freewave.com.

- [Version 1.1.2.2 \(on page 446\)](#)
- [Version 1.1.1.2 \(on page 447\)](#)
- [Version 1.1.0.1 \(on page 449\)](#)
- [Version 1.0.7.0 \(on page 453\)](#)
- [Version 1.0.6.0 \(on page 456\)](#)
- [Version 1.0.4.2 \(on page 457\)](#)
- [Version 1.0.4.1 \(on page 458\)](#)
- [Version 1.0.3.2 \(Initial Release\) \(on page 459\)](#)

38.1. Version 1.1.2.2

Release Date: July 2019

Additions and Changes

- The Web Interface has been re-designed for improved usability on the Z9-P or Z9-PE.
- Support has been added for:
 - Supply Voltage
 - **localDiagnostics.SupplyVoltage** is NOT supported on **Z9-P**, **Z9-PE**, **Z9-PC**, or **Z9-PC-SR001** models.
 - 0 (zero) indicates the individual radio does not support **localDiagnostics.SupplyVoltage**.
 - VLAN Management
 - Users can only access the device from the VLAN ID.
 - If the VLAN tag is set on a specific Ethernet port, that port cannot be used to access the Management VLAN ID.

Note: See the [VLAN MGMT \(on page 297\)](#) parameter for additional information.

Corrections have been implemented for:

- The **devuser** login password and the sudo password were out of sync when loading a new **IQ Application Environment** when the default password was changed on the existing **IQ Application Environment**. These passwords are now in sync.
- Files uploaded using the Web Interface cannot be deleted by users.
- After updating the [Rte Template Version \(on page 369\)](#) parameter, a reboot is necessary to update the **sys_info.txt** file.

Known Limitations and Workarounds

- Setting [Time String \(on page 253\)](#) causes the **entire Z9-P or Z9-PE configuration** to revert to saved settings.
 - **Workaround:** Save settings before changing the **date.timeString** parameter.
- Cannot change the **date.timeString** once the time is set using NTP.
- The **UCD-SNMP-MIB-WP201.txt** file is missing definition for **dskIndex**.
- The Ethernet port can become unresponsive after changing networks and the [VLAN Tag \(on page 297\)](#) IDs.
 - **Workaround:** Reboot the Z9-P or Z9-PE for changes to take effect.
- Unable to get input voltage via Modbus.
- When using the Web Interface on a computer with **Windows® 8** or **Windows® 10**, clicking **Cancel** does **not** halt the upload process.
- Files uploaded using the Web Interface drag-n-drop procedure are now write-protected and cannot be deleted.

- When changing and saving the [Radio Settings Parameters \(on page 310\)](#), the CLI interface may momentarily lock.
- If there is enough space to transfer the update firmware but not enough to facilitate the update, the update fails and the Upgrade Failed LEDs do not function.
 - **Workaround:** Users should verify the available free space before uploading an update firmware file.
At least 2x free space is needed on the Z9-P or Z9-PE for the firmware update file.
- Users should wait at least 30 seconds after a factory default command is issued before making configuration changes.
- The fields in the [NTP Parameters \(on page 305\)](#) parameters are **not** validated by the system.
 - **Workaround:** Verify the NTP parameter settings are correct.
- Unable to set the time when the [NTP Reference \(on page 308\)](#) parameter `=NETWORK TIME_SERVER`.
- The highest baud rate supported for RS422 and RS485 is 421 kbps.
- In Firmware v1.1.2.2, when the [Flow Control \(on page 229\)](#) parameter is set to `hardware`, the COM port's flow control does not function.
- The [Signal Level \(on page 262\)](#) parameter reports a maximum of -42 dBm when the [RF Data Rate=RATE_1M](#).

38.2. Version 1.1.1.2

Release Date: December 2018

Additions and Changes

- Improved encryption configuration via the Web Interface.
- At startup, the Z9-P or Z9-PE will synchronize with an NTP server if a server is listed in the [NTP Address \(1 to 5\) \(on page 306\)](#).

Support has been added for:

- ARP Filtering
 - ARP requests of a device have a path to the desired IP addresses and are filtered from non-desired IP addresses.
- VLAN
 - VLAN tagging 802.1q (ports and services)
- Modbus Registers
 - Connect to device via Modbus
 - Modbus TCP
 - Modbus RTU over TCP
 - Modbus RTU using COM1 or COM2 serial ports
 - Supports Reading from FreeWave IO Expansion Modules.
 - Supports requests from external MODBUS RTU serial device using COM1 and COM2.

- Any Modbus TCP, Modbus RTU over TCP, and Modbus RTU request will convert to a serial Modbus RTU request that is sent out the configured serial port to a serial Modbus device.
- Acts as a Modbus TCP to serial Modbus Gateway.
- Allows radio diagnostics and settings to be read via Modbus.
- Updated MIB and SNMP agent:
 - Change from type of Float32TC to INTEGER for these OIDs:
 - `fwtZumLinkSignalLevel .1.3.6.1.4.1.29956.3.2.10.1.0`
 - `fwtZumLinkSignalMargin .1.3.6.1.4.1.29956.3.2.10.2.0`
 - `fwtZumLinkNoiseLevel .1.3.6.1.4.1.29956.3.2.10.40.0`

Corrections have been implemented for:

- MIB and SNMP agent:
 - [Tx Availability \(on page 276\)](#) is ONLY available via MIB, not via SNMP.
 - [Rx Success \(on page 273\)](#) is NOT available via SNMP.
 - [localDiagnostics.TxAvailability](#) returns [localDiagnostics.RxSuccess](#) value via SNMP.
- The Web Interface and CLI windows now show the same value for the [Tx Success \(on page 276\)](#) on the Gateway.
- [Netmask \(on page 293\)](#) value does NOT match the actual value after two value changes.
- [IP Address \(on page 290\)](#) value does NOT match actual value after two value changes
- Options are visible but not active in the [Handler \(on page 230\)](#) parameter.
- Setting [Aggregate Enabled \(on page 243\)](#) on all Endpoints in a network prevents the neighbor table from being populated.
 - The [Network Diagnostics window \(on page 412\)](#) does not appear correctly when `dataPath.aggregateEnabled=true`.
- Brackets {} or back slashes \ in a [Device Name \(on page 364\)](#) breaks the Network Table.
- The setKey **cannot** be entered using the Web Interface.

Beta Features

Web Interface

- Improved encryption configuration.
 - Added Encryption Configuration table.
 - The Encryption key is can now be entered in the Web Interface.

Note: See the [Change the Encryption Parameters \(on page 122\)](#) procedure for detailed information.

- Network Diagnostics menu
 - Added Network Diagram
 - Visual representation of: Radio Network RF, Communication Path, and Link Quality.

- Available views are: Link Margin, RSSI, Tx Rate, Rx Rate, Margin with Neighbors, and RSSI with Neighbors.

Note: See the [Network Diagnostics window \(on page 412\)](#) for additional information.

- Available options are: Download support bundle, clear stats, clear all stats, refresh network diagnostics, save image.

Known Limitations and Workarounds

- Exiting from the CLI may take up to 30 seconds.
- Entering the shortcut text of [ModbusTcp](#) and [ModbusRtuOverTcp](#) results in a DUPLICATE_PARAMETER Error.
 - **Workaround:** The fully-qualified parameter of [modbus.modbusTcp](#) and [modbus.modbusRtuOverTcp](#) must be entered.
- The [encryption.getKey](#) and [encryption.setKey](#) parameters are now deprecated.
- When issuing the [factoryDefaults=set](#) command, after making changes for any of the [Network Parameters \(on page 288\)](#), the user is locked out of the CLI.
 - **Workaround:** Reboot the Z9-P or Z9-PE for changes to take effect.
- VSWR reading may be inconsistent between the **Network Diagram** on the [Network Diagnostics window \(on page 412\)](#) and the information reported in the [Local Diagnostics window \(on page 406\)](#).
- The [File Upload window \(on page 399\)](#) shows a 100% upload when the upload file has not completed on **Windows® 8** and **Windows® 10** computers.
 - **Workaround:** Wait the appropriate amount of time or watch the LEDs to indicate completion of file transfer or use the v1112-Firmware Update - Drag and Drop procedure.
- When setting the parameter [Arp Filter Enabled=true](#), ARP requests and responses are NOT blocked on VLAN interfaces.
- The [Signal Level \(on page 262\)](#) parameter reports a maximum of -42 dBm when the [RF Data Rate=RATE_1M](#).
- When the [Termserv Relay Mapping \(on page 373\)](#) parameter is designated and the [Flow Control \(on page 229\)](#) parameter is set to [Hardware](#), the COM port's flow control does not function.

38.3. Version 1.1.0.1

Release Date: September 2018

Additions and Changes

- Support has been added for:
 - Local Diagnostics:
 - [Noise Level \(on page 266\)](#)
 - [Rx Success \(on page 273\)](#)

- [Tx Availability \(on page 276\)](#)
- [Tx Success \(on page 276\)](#)
- [VSWR \(Signal Level\) \(on page 277\)](#)

Important! VSWR **may not** function on Z9-P or Z9-PE models manufactured prior to September, 2018.
If the Z9-P or Z9-PE always reports a VSWR value of 0 (zero), VSWR is **not** supported.
The VSWR is instantaneous, not averaged.
Each measurement can produce a different value; units that do support VSWR will occasionally report 0 (zero) due to an invalid measurement.

- [MTU \(on page 291\)](#) 1994 byte size with a VLAN tag.
 - Previously supported an MTU 1400 byte size with a VLAN tag.
- Multicast traffic
- Expanded MIB and SNMP agent for Z9-P or Z9-PE:
 - SNMP v2c and v3 write access.
 - Parameters have been added to the MIB and SNMP agent.
- Increase Terminal Server connections from 20 to 128 concurrent TCP connections.
- Default settings were changed to improve field performance:
 - [Compression Enabled \(on page 244\)](#) default is now **True**.
 - [Beacon Burst Count \(on page 311\)](#) default is now **3**.
 - [Radio Hopping Mode \(on page 324\)](#) default is now **Hopping_On**.
 - [RF Data Rate \(on page 332\)](#) default is now **RATE_500K**.
 - [TX Power \(on page 334\)](#) default is now **30**.

Important! A Gateway **MUST BE** configured for the radios to communicate.

- Corrections have been implemented for:
 - Frequency Mask
 - COM ports temporarily stop functioning when passing traffic with certain [Termserv Relay Mapping \(on page 373\)](#) settings enabled.
 - When [RF Data Rate = RATE_4M](#) and [Beacon Burst Count = 1](#):
 - Endpoint-Repeaters may lose synchronization with the Gateway and reset themselves.
 - Updated time out behavior for the COM1 and COM2 terminal servers:
 - The connection remains open if data is being sent or received.
- The [Terminal Server Time Out \(on page 236\)](#) connection remains open if data is sent or received.
- A new LED pattern at startup after an upgrade to v1.1.0.1 indicates an active boot of the Z9-P or Z9-PE.
- During boot, the COM LEDs will cycle indicating startup.

- For optimal throughput, when Repeaters are used and the RF environment is noisy, the [Beacon Burst Count \(on page 311\)](#) is no longer required to be 2 or more.
- When an invalid Gateway is entered, the [Gateway \(on page 289\)](#) is set to a null value.
 - When a Z9-P or Z9-PE with a non-default **network.gateway** value (e.g., 194.2.2.2) is upgraded to v1.1.0.1, it is set to a null value after upgrade.
- **IQ Application Environment** now available
 - This was previously only available as a standard option in the v1.0.6.0 release.

Important! If upgrading to v1.1.0.1 from any previous firmware version, a license key **MUST** BE requested to activate the **IQ Application Environment**.
[Contact FreeWave Technical Support \(on page 14\)](#) for the license key.

- The default value for [NTP Reference \(on page 308\)](#) was changed to NETWORK_TIME_SERVER.
 - This causes the Z9-P or Z9-PE to attempt to contact the default external **time.nist.gov** IP address listed in [NTP Address \(1 to 5\) \(on page 306\)](#).

Beta Features

Important! Beta Features have not been fully tested by FreeWave.
The intent is to expose the feature and receive early feedback from customers.

- Web Interface
 - Added a **Configuration** menu.
 - Added a **Network Diagnostics** menu

Important! A Gateway is required to use the **Network Diagnostics** menu.

- Network Discovery
 - Discover other Endpoints in the network.
 - Show hops and their paths from the Gateway.
 - Show the link quality (RSSI and Margin).
 - Show neighbors.
 - Available options are:
 - Download Support Bundle
 - Clear Status
 - Refresh Network Diagnostics
 - Save Network Diagnostics
- MacTableEntryAgeTimeout
 - The MacTableEntryAgeTimeout is the number of seconds before an inactive entry in the radio MAC Table ages out and expires.
 - This feature:

- Allows the optimization of the time it takes a unit to learn a new path to allow for Repeater redundancy.
- Is used to adjust fail-over times with parallel Repeaters.
- User field sets MacTableEntryAgeTimeout period.
 - The default is 120 seconds, with a Minimum of 30 seconds and a Maximum of 86400 seconds.

Known Limitations and Workarounds

- A downgrade from v1.1.0.1 to v1.0.4.x **requires** an intermediate **downgrade** to v1.0.7.0.

Example: Downgrade v1.1.0.1 to v1.0.7.0, then downgraded to v1.0.4.0.

- v1.0.6.0 / v1.1.0.1 Upgrade or Downgrade
 - When either updating or downgrading, the **IQ Application Environment** template is changed but NOT the active **IQ Application Environment** runtime application environment version.
 - Active applications will continue to run.

FREEWAVE Recommends: Prior to an update or downgrade procedure, save and backup all applications.

- After updating the [Rte Template Version \(on page 369\)](#) parameter, a reboot is necessary to update the **sys_info.txt** file.
 - Performing a [Rte Reset \(on page 339\)](#) to copy in the new FW template erases any existing applications in the original runtime application environment.
 - If the new runtime environment is needed, save all applications prior to performing a [runtimeEnvironment.rteReset](#).
- Changing the [IP Address \(on page 290\)](#) to some value other than 192.x.x.x will prevent all subsequent IP address changes.
 - **Workaround:** Enter a Gateway address and reboot the Z9-P or Z9-PE.
- VSWR **may not** function on Z9-P or Z9-PE models manufactured prior to September, 2018.

If the Z9-P or Z9-PE always reports a VSWR value of 0 (zero), VSWR is **not** supported.

 - VSWR is less accurate at higher power levels (>20 dBm).

Note: The reported VSWR is a value proportional to the VSWR. It is closer to VSWR at lower powers, but at higher power levels, it still increases with reflected power.

- Rebooting a pair of radios simultaneously when one of the Z9-P or Z9-PE has the parameter [Termserv Relay Mapping=Enabled](#), the terminal server relay takes up to 6 minutes to become active.

- To update the [Network Diagnostics window \(on page 412\)](#), refresh the browser to clear the browser cache.
- When upgrading to v1.1.0.1, the **fw_upgrade_result.txt** file **does NOT appear** after the upgrade is completed.
 - If the **fw_upgrade_result.txt** file does appear in the USB drive after an upgrade, it is now write-protected and cannot be deleted.
- Setting [Aggregate Enabled \(on page 243\)](#) on all Endpoints in a network prevents the neighbor table from being populated.
 - The [Network Diagnostics window \(on page 412\)](#) does not appear correctly when **dataPath.aggregateEnabled=true**.
- [Tx Availability \(on page 276\)](#) is ONLY available via MIB, not via SNMP.
- [Rx Success \(on page 273\)](#) is NOT available via SNMP.
- **localDiagnostics.TxAvailability** returns **localDiagnostics.RxSuccess** value via SNMP.
- Options are visible but not active in the [Handler \(on page 230\)](#) parameter.
- The [Signal Level \(on page 262\)](#) parameter reports a maximum of -42 dBm when the [RF Data Rate=RATE_1M](#).
- When the [Termserv Relay Mapping \(on page 373\)](#) parameter is designated and the [Flow Control \(on page 229\)](#) parameter is set to **Hardware**, the COM port's flow control does not function.
- The setKey **cannot** be entered using the Z9-P or Z9-PE Web Interface.

Important! The **encryption.setKey** MUST BE entered in CLI.

38.4. Version 1.0.7.0

Release Date: June 2018

Warning! DO NOT remove power from the Z9-P or Z9-PE during or immediately after the firmware update process!

Wait until the [Home window \(on page 403\)](#) Web Interface is accessible before removing power from the Z9-P or Z9-PE device.



If power is removed prematurely during the update process, the Web Interface pages may not be accessible.

To recover from a failed Web Interface update, use the [Firmware Update - Drag and Drop \(on page 35\)](#) procedure to reinstall the **.pkg** file and **WAIT for the file update process to complete**.

DO NOT start another update or configuration change while an update is in progress.

Upgrade Notes for Z9-P or Z9-PE - v1.0.7.0

Important!: Inside the downloaded **Z9-P-and-Z9-PE-v1070-Firmware.zip** file, there are **TWO .pkg** files.
The **CORRECT .pkg** file to use depends on the **ZumLink** version you are upgrading from.

- When upgrading **from v1.0.4.2 or LATER** firmware, use the file named:
 - **1_Device_Firmware_v1_0_7_0_____when_upgrading_from_v1042_or_later.pkg**.
- When upgrading from a version **EARLIER than v1.0.4.2**, use the file named:
 - **1_Device_Firmware_v1_0_7_0_____when_upgrading_from_a_version_earlier_than_v10402.pkg**.
- For all firmware versions, use the **.fcf** file for the second part of the upgrade.

Additions and Changes

- Hop table frequency masking masks the channels that fall within the range plus or minus one-half ($\frac{1}{2}$) the channel bandwidth.
- Support has been added for:
 - Multiple Repeaters using a maximum of 3 Repeater slots.
 - The Endpoint-Repeater has a radio Repeater slot range from 1-3.
 - A maximum number of 3 Endpoint-Repeaters are supported in an overlapping communication space or RF coverage area.
 - The radio Repeater slot numbers can be reused where there is no RF connectivity or overlap between the reused radio Repeater slots.

FREEWAVE Recommends: Set the **Beacon Burst Count (on page 311)** to **2** or more for optimal throughput when Repeaters are used and the RF environment is noisy.
This increases the number of beacons sent in a beacon interval.

- The **Terminal Server Relay Client** provides radio-to-radio serial communication.
- Hopping data rates from the Gateway to Endpoint and the Endpoint to Gateway are now more symmetric.
- Improved sensitivity, noise filtering, and interference avoidance for 250 and 500 kbps rates. Throughput rates between the Gateway and Endpoint have been rebalanced.

Important!: Data rates 250K and 500K are NOT compatible with previous releases of the ZumLink radio firmware.

- When **network.netmaskFilterEnabled=true**, VLAN tagged packets are filtered out because the radio is not considered on the VLAN and therefore VLAN packets cannot be on the same subnet.
- Multiple FEC-related corrections have been implemented.
- A problem where the Ethernet interface does not work due to pings at boot time has been fixed.

Beta Features

Important! Beta Features have not been fully tested by FreeWave.
The intent is to expose the feature and receive early feedback from customers.

- 1.5 Mbps RF Data Rate
 - Sensitivity -90dBm
- MacTableEntryAgeTimeout
 - The MacTableEntryAgeTimeout is the number of seconds before an inactive entry in the radio MAC Table ages out and expires.
 - This feature:
 - Allows the optimization of the time it takes a unit to learn a new path to allow for Repeater redundancy.
 - Is used to adjust fail-over times with parallel Repeaters.
 - User field sets MacTableEntryAgeTimeout period.
 - The default is 120 seconds, with a Minimum of 30 seconds and a Maximum of 86400 seconds.

Known Limitations and Workarounds



Caution: `config.restore` can give inconstant results if the [Radio Mode \(on page 329\)](#) was changed.

- Significant data is lost between radios when operating in close proximity (3-6 feet) when `radioSettings.rfDataRate=RATE_4M` (See [RF Data Rate \(on page 332\)](#)). (See [RF Data Rate \(on page 332\)](#)).
- **Workarounds:**
 - Reduce power on radios when operating in close proximity.
 - Enable the [LNA Bypass \(on page 319\)](#).
- When using the USB, the CLI may lock up on units with [Termserv Relay Mapping \(on page 373\)](#) enabled.
- **Workarounds:**
 - Re-seat the cable
 - Reconfigure the [Termserv Relay Mapping](#) using either of these procedures:
 - [Drag and Drop Configuration \(on page 54\)](#) or
 - [Web Interface Configuration \(on page 65\)](#)
 - [Drag and Drop Configuration \(on page 54\)](#) or
 - [Web Interface Configuration \(on page 65\)](#)
- COM ports temporarily stop functioning when passing traffic with certain [Terminal Server Relay](#) settings enabled.

- When the [Termserv Relay Mapping](#) parameter is in use, the [Connection Drops \(on page 226\)](#) count should be ignored.
- When operating at [RF Data Rate = RATE_4M](#) and [Beacon Burst Count = 1](#):
 - Endpoint-Repeaters may lose synchronization with the Gateway and reset themselves.
 - TCP traffic can be intermittent when operating multiple Repeaters.
- When operating at [RF Data Rate = RATE_4M](#) and with multiple Repeaters, if a **short Beacon Interval** and a **high Beacon Burst Count** are designated, throughput is very low.
 - **Workaround:** Use either a **longer Beacon Interval** or a **lower Beacon Burst Count**.
- As Repeaters are chained in the network, round trip delay increases.
 - When issuing pings of large packet sizes at the lower data rates, such as 115.2K, and a [Beacon Interval=TWENTY_FIVE_MS](#), the latency can increase causing the pings to fail.
 - **Workaround:** Allow an appropriate delay between pings.

FREEWAVE Recommends: Set the [beaconBurstCount=2](#) or more and [beaconInterval=ONE_HUNDRED_MS](#) or more for optimal throughput when extended Repeater networks are used.

- Frequency Mask is not working properly.
- The [Signal Level \(on page 262\)](#) parameter reports a maximum of -42 dBm when the [RF Data Rate=RATE_1M](#).
- ZumIQ application environment is not available.

38.5. Version 1.0.6.0

Release Date: September 2017

Additions and Changes

Important! If a downgrade to v1.0.4.0 is needed, an update to v1.0.7.0 is required first, then the user can install v1.0.4.0.

- **IQ Application Environment** available
 - Provides the capability to develop and host 3rd party Apps for intelligent control and automation of remote sensors and devices.
 - Provides a Debian Linux environment and access to hardware resources for application development and deployment.
 - These official sample applications are available at <https://github.com/FreeWaveTechnologies/ZumIQ>:
 - Mosquitto
 - Node.js
 - Node-RED

- Python 2.7
- Python 3.x

Known Limitations and Workarounds

- The web page is not available for several minutes after the Z9-P or Z9-PE reboots.
- A reboot of the Z9-P or Z9-PE is required:
 - when **Security** page settings are changed.
 - after applying a license file.
- The **Node-RED** website times out on slow networks.
 - **Workaround:** Replace **Node.js v8** with **Node.js v7** using the **install-node7.sh** script available on **GitHub**.
- A downgrade from v1.0.6.0 to v1.0.4.0 **requires** an intermediate **upgrade** to v1.0.7.0.

Example: Upgrade from v1.0.6.0 to v1.0.7.0, then downgrade to v1.0.4.0.

- The **Signal Level (on page 262)** parameter reports a maximum of -42 dBm when the **RF Data Rate=RATE_1M**.

38.6. Version 1.0.4.2

Release Date: June 2017

Additions and Changes

- Allows for the passing of VLAN tagged traffic.
- Packet Aggregation is now working properly.
- Resolved the **otaMaxFragementSize** performance issues when set to 64.
- When **network.netmaskFilterEnabled=true**, VLAN tagged packets are filtered out because the radio is not considered on the VLAN and therefore VLAN packets cannot be on the same subnet.

Known Limitations and Workarounds

- When changing the COM port to **Terminal Server**, the **ZumLink** must be power cycled after making the change.
- The **Signal Level (on page 262)** parameter reports a maximum of -42 dBm when the **RF Data Rate=RATE_1M**.

Notes

- If the password was changed from the default, the password is changed back to **admin** after upgrading the radio firmware.
- Firmware v1.0.4.2 and v1.0.4.1 are over-the-air compatible but are NOT compatible with firmware v1.0.3.2 when the **radioSettings.radioHoppingMode** setting is set to **On** (enabled).

38.7. Version 1.0.4.1

Release Date: May 2017

Additions and Changes

Additions and Changes	
Feature	Description
IP Filtering	Prevents IP addresses NOT within the IP subnet from being transmitted over the air.
Repeater	Allows a single radio to repeat (store and forward) traffic from one radio to another.
Terminal Server Activity Timeout	Provides a settable time that closes the port when no data is received through the socket connection for longer than the timeout period.
Diagnostic Support Bundle	Generates a zip file containing all the configuration and diagnostics information when IP address followed by /support is typed in a web browser.
Radio Settings	Displays parameters that are required for radio mode, frequency hopping, and so forth. <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p>Example: The <code>radioSettings.beaconInterval</code> is not available for radios configured as Endpoints.</p> </div>
Throughput	Increases in user data throughput in most RF data rates for single channel and frequency hopping when operating unidirectional or bidirectional.
RF Rate 250 kbps	Unexpected packet losses when <code>radioSettings.beaconInterval</code> set to 50 msec has been resolved.
Help	Additional details included in the radios help function.
COM port	COM port LEDs are now functional as described in this manual.
USB COM Port	Changed so that each time a ZumLink device is plugged into a Windows based computer a unique port number is NOT enumerated.

Notes

- If the password was changed from the default, the password is changed back to **admin** after upgrading the radio firmware.
- Firmware v1.0.4.1 is NOT over-the-air compatible with firmware v1.0.3.2 when the `radioSettings.radioHoppingMode` setting is set to **On** (enabled) or with FEC enabled.

Known Limitations and Workarounds

- Packet Aggregation is currently not working properly.
- When `otaMaxFragementSize` is set to 64, disruptions and failures occur in a ping test with payload size of 20.
- When changing the COM port to **Terminal Server**, the **ZumLink** must be power cycled after making the change.

- The [Signal Level \(on page 262\)](#) parameter reports a maximum of -42 dBm when the [RF Data Rate=RATE_1M](#).

38.8. Version 1.0.3.2 (Initial Release)

Release Date: October 2016

Known Limitations and Workarounds

- When changing the COM port to **Terminal Server**, the [ZumLink](#) must be power cycled after making the change.
- Unexpected packet losses when the [radioSettings.beaconInterval](#) is set to 50 msec.

39. Available Accessories

These are the Z9-P or Z9-PE accessories available from FreeWave.

- [Z9-P or Z9-PE Accessories \(on page 460\)](#)
- [Z9-P Only Accessories \(on page 461\)](#)
- [Z9-PE Only Accessories \(on page 461\)](#)

39.1. Z9-P or Z9-PE Accessories

Available Accessories - Z9-P or Z9-PE	
Part Number	Description
EAN0900SQ	<ul style="list-style-type: none"> • ¼ Wave Omni-directional 900 MHz Stub Antenna • 0 (zero) dBi gain • Straight, SMA Male RF connector
EAN0900SR	<ul style="list-style-type: none"> • ½ Wave Omni-directional 900 MHz Stub Antenna • 2 dBi gain • Right-angle 360 degree swivel, SMA Male RF connector
EAN0900WC	<ul style="list-style-type: none"> • Open coil Omni-directional 896-940 MHz Antenna • 5.15 dBi gain. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important!: Does NOT include mounting hardware or cable.</p> </div>
EAN0905WC	<ul style="list-style-type: none"> • Closed coil Omni-directional 896-970 MHz Antenna • 5 dBi gain

Available Accessories - Z9-P or Z9-PE	
Part Number	Description
EAN0906YC	<ul style="list-style-type: none"> • 3 Element 890-960 MHz Yagi antenna • 8.65 dBi gain • 24" feedline terminated with N female connector
ECD0324ER	3 foot long RJ-45 to DB-9 cable adapter
ECD0658EB	6.5 foot long shielded Ethernet cable
EMD1280AX	12 VDC @ 800 mA AC-to-DC power supply with Phoenix Contact (# 1776692) <ul style="list-style-type: none"> • Z9-PE (FreeWave Part Number: ASC0003ZL) or the • Z9-PE-GREY (FreeWave Part Number: ASC0003TH)

39.2. Z9-P Only Accessories

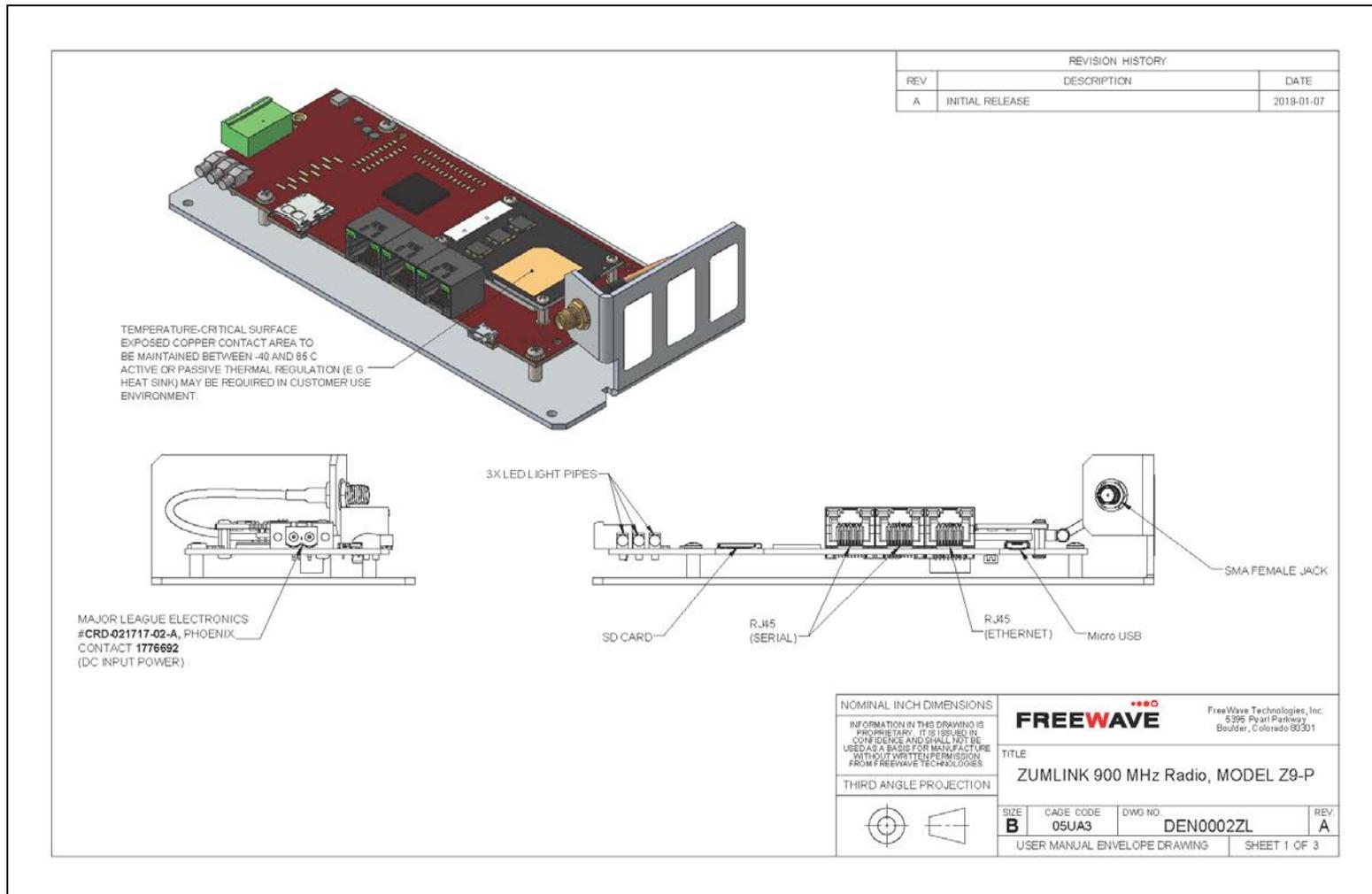
Available Accessories - Z9-PE Only	
Part Number	Description
AOH0001HT	Multi-position DIN rail bracket kit

39.3. Z9-PE Only Accessories

Available Accessories - Z9-PE Only	
Part Number	Description
EMD1280UW	12 VDC @ 800 mA AC-to-DC power supply with DC plug
ASC0002ZL	12 inch power adapter with jack <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: For use with EMD1280UW Power Supply.</p> </div>
AOH4003SP	Reversible DIN rail bracket kit

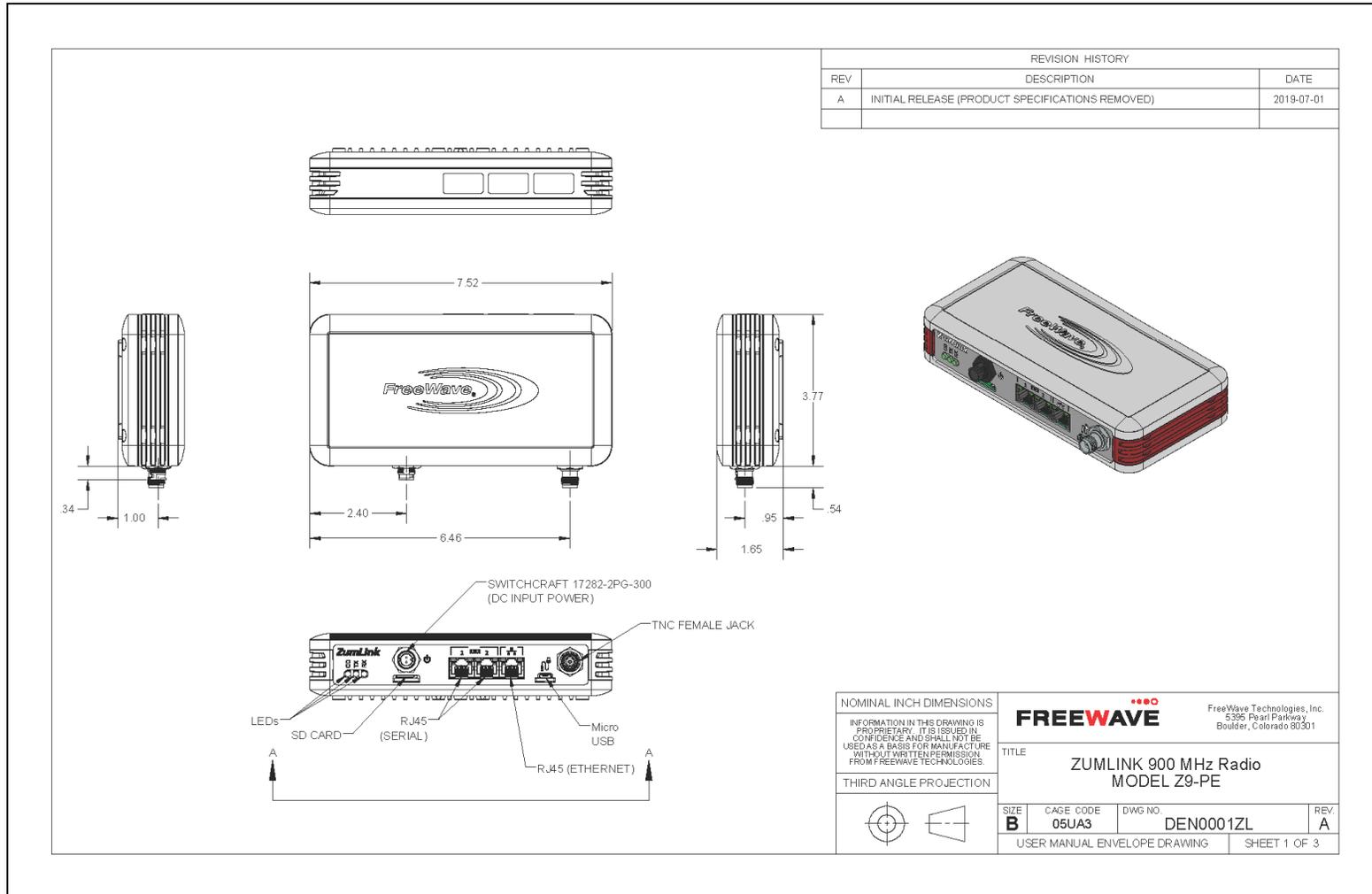
40. Mechanical Drawing - Z9-P

40.1. Z9-P - Top and Sides

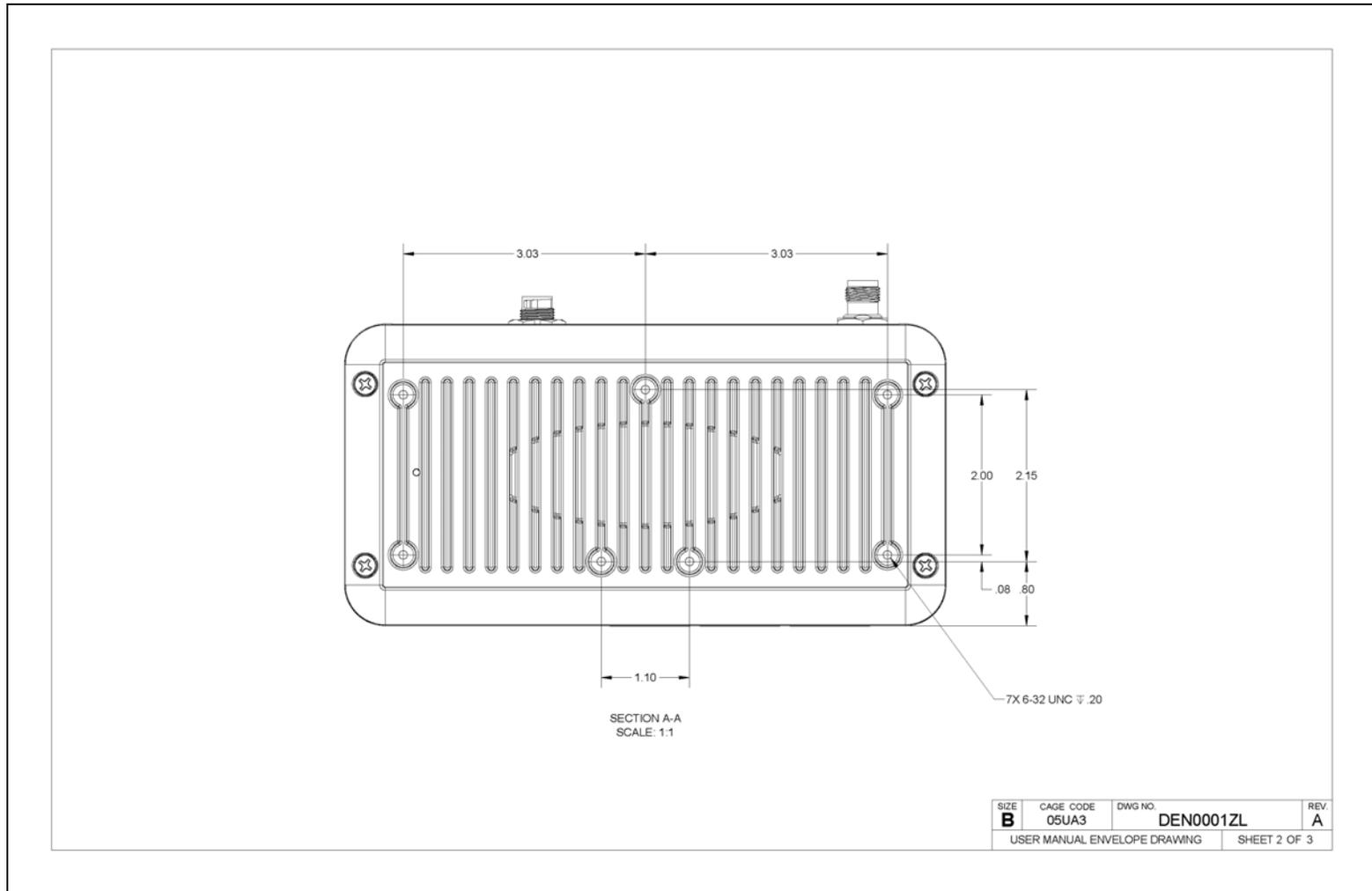


41. Mechanical Drawing - Z9-PE

41.1. Z9-PE - Top and Sides



41.2. Z9-PE - Back



42. Z9-P or Z9-PE Hop Tables

- [Standard Hop Set - 900 MHz Channels \(on page 467\)](#)
- [Australia Hop Set - 900 MHz Channels \(on page 470\)](#)
- [Brazil Hop Set - 900 MHz Channels \(on page 473\)](#)

42.1. Standard Hop Set - 900 MHz Channels

These are the standard channels supported when the [Radio Hopping Mode \(on page 324\)](#) is **Enabled**.

Note: When the **Radio Hopping Mode** is **Disabled**, the frequency can be set manually.

- [RF Data Rate: 115.2 kbps \(on page 467\)](#)
- [RF Data Rate: 250 kbps \(on page 468\)](#)
- [RF Data Rate: 500 kbps \(on page 468\)](#)
- [RF Data Rate: 1 Mbps \(on page 468\)](#)
- [RF Data Rate: 1.5 Mbps \(Beta\) \(on page 469\)](#)
- [RF Data Rate: 4 Mbps \(on page 469\)](#)

42.1.1. RF Data Rate: 115.2 kbps

Channel Size (MHz): 0.2304

Number of Channels: 110

Standard Hop Set - ZumLink 900 MHz Channels									
RF Data Rate: 115.2 kbps									
902.4768		907.0848		911.6928		916.3008		920.9088	925.5168
902.7072		907.3152		911.9232		916.5312		921.1392	925.7472
902.9376		907.5456		912.1536		916.7616		921.3696	925.9776
903.1680		907.7760		912.3840		916.9920		921.6000	926.2080
903.3984		908.0064		912.6144		917.2224		921.8304	926.4384
903.6288		908.2368		912.8448		917.4528		922.0608	926.6688
903.8592		908.4672		913.0752		917.6832		922.2912	926.8992
904.0896		908.6976		913.3056		917.9136		922.5216	927.1296
904.3200		908.9280		913.5360		918.1440		922.7520	927.3600
904.5504		909.1584		913.7664		918.3744		922.9824	927.5904
904.7808		909.3888		913.9968		918.6048		923.2128	
905.0112		909.6192		914.2272		918.8352		923.4432	
905.2416		909.8496		914.4576		919.0656		923.6736	
905.4720		910.0800		914.6880		919.2960		923.9040	
905.7024		910.3104		914.9184		919.5264		924.1344	
905.9328		910.5408		915.1488		919.7568		924.3648	
906.1632		910.7712		915.3792		919.9872		924.5952	
906.3936		911.0016		915.6096		920.2176		924.8256	
906.6240		911.2320		915.8400		920.4480		925.0560	
906.8544		911.4624		916.0704		920.6784		925.2864	

42.1.2. RF Data Rate: 250 kbps**Channel Size (MHz): 0.3456****Number of Channels: 73**

Standard Hop Set - ZumLink 900 MHz Channels									
RF Data Rate: 250 kbps									
902.5344		907.0272		911.5200		916.0128		920.5056	924.9984
902.8800		907.3728		911.8656		916.3584		920.8512	925.3440
903.2256		907.7184		912.2112		916.7040		921.1968	925.6896
903.5712		908.0640		912.5568		917.0496		921.5424	926.0352
903.9168		908.4096		912.9024		917.3952		921.8880	926.3808
904.2624		908.7552		913.2480		917.7408		922.2336	926.7264
904.6080		909.1008		913.5936		918.0864		922.5792	927.0720
904.9536		909.4464		913.9392		918.4320		922.9248	927.4176
905.2992		909.7920		914.2848		918.7776		923.2704	
905.6448		910.1376		914.6304		919.1232		923.6160	
905.9904		910.4832		914.9760		919.4688		923.9616	
906.3360		910.8288		915.3216		919.8144		924.3072	
906.6816		911.1744		915.6672		920.1600		924.6528	

42.1.3. RF Data Rate: 500 kbps**Channel Size (MHz): 0.6912****Number of Channels: 36**

Standard Hop Set - ZumLink 900 MHz Channels									
RF Data Rate: 500 kbps									
902.7072		906.8544		911.0016		915.1488		919.2960	923.4432
903.3984		907.5456		911.6928		915.8400		919.9872	924.1344
904.0896		908.2368		912.3840		916.5312		920.6784	924.8256
904.7808		908.9280		913.0752		917.2224		921.3696	925.5168
905.4720		909.6192		913.7664		917.9136		922.0608	926.2080
906.1632		910.3104		914.4576		918.6048		922.7520	926.8992

42.1.4. RF Data Rate: 1 Mbps**Channel Size (MHz): 1.3824****Number of Channels: 18**

Standard Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1 Mbps	
903.0528	915.4944
904.4352	916.8768

Standard Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1 Mbps	
905.8176	918.2592
907.2000	919.6416
908.5824	921.0240
909.9648	922.4064
911.3472	923.7888
912.7296	925.1712
914.1120	926.5536

42.1.5. RF Data Rate: 1.5 Mbps (Beta)

Channel Size (MHz): 1.3824

Number of Channels: 17

Standard Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1.5 Mbps (Beta)	
903.2562	916.1586
904.8690	917.7714
906.4818	919.3842
908.0946	920.9970
909.7074	922.6098
911.3202	924.2226
912.9330	925.8354
914.5458	

42.1.6. RF Data Rate: 4 Mbps

Channel Size (MHz): 3.2256

Number of Channels: 7

Standard Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 4 Mbps	
904.5504	
907.7760	
911.0016	
914.2272	
917.4528	
920.6784	
923.9040	

42.2. Australia Hop Set - 900 MHz Channels

These are the standard channels supported when the [Radio Hopping Mode \(on page 324\)](#) is **Enabled**.

Note: When the **Radio Hopping Mode** is **Disabled**, the frequency can be set manually.

- RF Data Rate: 115.2 kbps (on page 470)
- RF Data Rate: 250 kbps (on page 470)
- RF Data Rate: 500 kbps (on page 471)
- RF Data Rate: 1 Mbps (on page 471)
- RF Data Rate: 1.5 Mbps (Beta) (on page 472)
- RF Data Rate: 4 Mbps (on page 472)

42.2.1. RF Data Rate: 115.2 kbps

Channel Size (MHz): 0.2304

Number of Channels: 54

Australia Hop Set - ZumLink 900 MHz Channels									
RF Data Rate: 115.2 kbps									
915.3792		917.6832		919.9872		922.2912		924.5952	926.8992
915.6096		917.9136		920.2176		922.5216		924.8256	927.1296
915.8400		918.1440		920.4480		922.7520		925.0560	927.3600
916.0704		918.3744		920.6784		922.9824		925.2864	927.5904
916.3008		918.6048		920.9088		923.2128		925.5168	
916.5312		918.8352		921.1392		923.4432		925.7472	
916.7616		919.0656		921.3696		923.6736		925.9776	
916.9920		919.2960		921.6000		923.9040		926.2080	
917.2224		919.5264		921.8304		924.1344		926.4384	
917.4528		919.7568		922.0608		924.3648		926.6688	

42.2.2. RF Data Rate: 250 kbps

Channel Size (MHz): 0.3456

Number of Channels: 35

Australia Hop Set - ZumLink 900 MHz Channels						
RF Data Rate: 250 kbps						
915.6672		919.1232		922.5792		926.0352
916.0128		919.4688		922.9248		926.3808
916.3584		919.8144		923.2704		926.7264
916.7040		920.1600		923.6160		927.0720

Australia Hop Set - ZumLink 900 MHz Channels						
RF Data Rate: 250 kbps						
917.0496		920.5056		923.9616		927.4176
917.3952		920.8512		924.3072		
917.7408		921.1968		924.6528		
918.0864		921.5424		924.9984		
918.4320		921.8880		925.3440		
918.7776		922.2336		925.6896		

42.2.3. RF Data Rate: 500 kbps

Channel Size (MHz): 0.6912

Number of Channels: 17

Australia Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 500 kbps	
915.8400	922.0608
916.5312	922.7520
917.2224	923.4432
917.9136	924.1344
918.6048	924.8256
919.2960	925.5168
919.9872	926.2080
920.6784	926.8992
921.3696	

42.2.4. RF Data Rate: 1 Mbps

Channel Size (MHz): 1.3824

Number of Channels: 8

Australia Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1 Mbps	
Frequency	
	916.8768
	918.2592
	919.6416
	921.0240
	922.4064
	923.7888
	925.1712
	926.5536

42.2.5. RF Data Rate: 1.5 Mbps (Beta)**Channel Size (MHz): 1.3824****Number of Channels: 7**

Australia Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1.5 Mbps (Beta)	
	916.1586
	917.7714
	919.3842
	920.9970
	922.6098
	924.2226
	925.8354

42.2.6. RF Data Rate: 4 Mbps**Channel Size (MHz): 3.2256****Number of Channels: 3**

Australia Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 4 Mbps	
	917.4528
	920.6784
	923.9040

42.3. Brazil Hop Set - 900 MHz Channels

These are the standard channels supported when the [Radio Hopping Mode \(on page 324\)](#) is **Enabled**.

Note: When the **Radio Hopping Mode** is **Disabled**, the frequency can be set manually.

- [RF Data Rate: 115.2 kbps \(on page 473\)](#)
- [RF Data Rate: 250 kbps \(on page 474\)](#)
- [RF Data Rate: 500 kbps \(on page 474\)](#)
- [RF Data Rate: 1 Mbps \(on page 474\)](#)
- [RF Data Rate: 1.5 Mbps \(Beta\) \(on page 475\)](#)
- [RF Data Rate: 4 Mbps \(on page 475\)](#)

42.3.1. RF Data Rate: 115.2 kbps

Channel Size (MHz): 0.2304

Number of Channels: 75

Brazil Hop Set - ZumLink 900 MHz Channels							
RF Data Rate: 115.2 kbps							
902.4768		905.9328		917.4528		920.9088	924.3648
902.7072		906.1632		917.6832		921.1392	924.5952
902.9376		906.3936		917.9136		921.3696	924.8256
903.1680		906.6240		918.1440		921.6000	925.0560
903.3984		906.8544		918.3744		921.8304	925.2864
903.6288		907.0848		918.6048		922.0608	925.5168
903.8592		915.3792		918.8352		922.2912	925.7472
904.0896		915.6096		919.0656		922.5216	925.9776
904.3200		915.8400		919.2960		922.7520	926.2080
904.5504		916.0704		919.5264		922.9824	926.4384
904.7808		916.3008		919.7568		923.2128	926.6688
905.0112		916.5312		919.9872		923.4432	926.8992
905.2416		916.7616		920.2176		923.6736	927.1296
905.4720		916.9920		920.4480		923.9040	927.3600
905.7024		917.2224		920.6784		924.1344	927.5904

42.3.2. RF Data Rate: 250 kbps**Channel Size (MHz): 0.3456****Number of Channels: 49**

Brazil Hop Set - ZumLink 900 MHz Channels							
RF Data Rate: 250 kbps							
902.5344		905.9904		917.7408		921.1968	924.6528
902.8800		906.3360		918.0864		921.5424	924.9984
903.2256		906.6816		918.4320		921.8880	925.3440
903.5712		907.0272		918.7776		922.2336	925.6896
903.9168		915.6672		919.1232		922.5792	926.0352
904.2624		916.0128		919.4688		922.9248	926.3808
904.6080		916.3584		919.8144		923.2704	926.7264
904.9536		916.7040		920.1600		923.6160	927.0720
905.2992		917.0496		920.5056		923.9616	927.4176
905.6448		917.3952		920.8512		924.3072	

42.3.3. RF Data Rate: 500 kbps**Channel Size (MHz): 0.6912****Number of Channels: 24**

Brazil Hop Set - ZumLink 900 MHz Channels			
RF Data Rate: 500 kbps			
902.7072		916.5312	922.0608
903.3984		917.2224	922.7520
904.0896		917.9136	923.4432
904.7808		918.6048	924.1344
905.4720		919.2960	924.8256
906.1632		919.9872	925.5168
906.8544		920.6784	926.2080
915.8400		921.3696	926.8992

42.3.4. RF Data Rate: 1 Mbps**Channel Size (MHz): 1.3824****Number of Channels: 11**

Brazil Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1 Mbps	
903.0528	921.0240
904.4352	922.4064
905.8176	923.7888

Brazil Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 1 Mbps	
916.8768	925.1712
918.2592	926.5536
919.6416	

42.3.5. RF Data Rate: 1.5 Mbps (Beta)

Channel Size (MHz): 1.3824

Number of Channels: 10

Standard Hop Set - ZumLink900 MHz Channels	
RF Data Rate: 1.5 Mbps (Beta)	
903.2562	919.3842
904.8690	920.9970
906.4818	922.6098
916.1586	924.2226
917.7714	925.8354

42.3.6. RF Data Rate: 4 Mbps

Channel Size (MHz): 3.2256

Number of Channels: 4

Brazil Hop Set - ZumLink 900 MHz Channels	
RF Data Rate: 4 Mbps	
904.5504	
917.4528	
920.6784	
923.9040	

43. Z9-P or Z9-PE MIB

These are the supported item groups in the Z9-P or Z9-PE MIB file:

- [CPU Usage \(on page 477\)](#)
- [Disk Usage \(on page 477\)](#)
- [Memory Usage \(on page 479\)](#)
- [FreeWave Technologies - MIB-FWT1122TB.66](#)
- [SNMP Write Access \(on page 491\)](#)

43.1. CPU Usage

ZumLink MIB - CPU Usage					
Objective Type	Syntax	MAX Access	Status	Description	::=
ssCpuUser	Integer32	Read-only	Deprecated	The percentage of CPU time spent processing user-level code, calculated over the last minute.	{ systemStats 9 }
ssCpuSystem	Integer32	Read-only	Deprecated	The percentage of CPU time spent processing system-level code, calculated over the last minute.	{ systemStats 10 }
ssCpuIdle	Integer32	Read-only	Deprecated	The percentage of processor time spent idle, calculated over the last minute.	{ systemStats 11 }
ssCpuNice	Integer32	Read-only	Deprecated	The percentage of processor time spent nice, calculated over the last minute.	{ systemStats 12 }

43.2. Disk Usage

ZumLink MIB - Disk Usage					
Objective Type	Syntax	MAX Access	Status	Description	::=
dskTable	Sequence of DskEntry	Not Accessible	Current	Disk watching information. Partitions to be watched are configured by the snmpd.conf file of the agent.	{ ucdavis 9 }

ZumLink MIB - Disk Usage					
Objective Type	Syntax	MAX Access	Status	Description	::=
dskEntry	DskEntry	Not Accessible	Current	An entry containing a disk and its statistics. Index = { dskIndex } <pre>DskEntry ::= SEQUENCE { dskPath DisplayString, dskDevice DisplayString, dskTotal Integer32, dskAvail Integer32, dskUsed Integer32, dskPercent Integer32, dskPercentNode Integer32 }</pre>	{ dskTable 1 }
dskPath	DisplayString	Read-only	Current	Path where the disk is mounted.	{ dskEntry 2 }
dskDevice	DisplayString	Read-only	Current	Path of the device for the partition.	{ dskEntry 3 }
dskTotal	Integer32	Read-only	Current	Total size of the disk / partition (kBytes).	{ dskEntry 6 }
dskAvail	Integer32	Read-only	Current	Available space on the disk.	{ dskEntry 7 }
dskUsed	Integer32	Read-only	Current	Used space on the disk.	{ dskEntry 8 }
dskPercent	Integer32	Read-only	Current	Percentage of space used on disk.	{ dskEntry 9 }
dskPercentNode	Integer32	Read-only	Current	Percentage of nodes used on disk.	{ dskEntry 10 }

43.3. Memory Usage

ZumLink MIB - Memory Usage						
Objective Type	Syntax	Units	MAX Access	Status	Description	::=
memTotalSwap	Integer32	kB	Read-only	Current	The total amount of swap space configured for this host.	{ memory 3 }
memAvailSwap	Integer32	kB	Read-only	Current	The amount of swap space currently unused or available.	{ memory 4 }
memTotalReal	Integer32	kB	Read-only	Current	The total amount of real / physical memory installed on the host.	{ memory 5 }
memAvailReal	Integer32	kB	Read-only	Current	The amount of real / physical memory currently unused or available.	{ memory 7 }
memShared	Integer32	kB	Read-only	Current	The total amount of real or virtual memory currently allocated for use as shared memory. This object will not be implemented on hosts where the underlying operating system does not explicitly identify memory as specifically reserved for this purpose.	{ memory 13 }
memBuffer	Integer32	kB	Read-only	Current	The total amount of real or virtual memory currently allocated for use as memory buffers. This object will not be implemented on hosts where the underlying operating system does not explicitly identify memory as specifically reserved for this purpose.	{ memory 14 }
memCached	Integer32	kB	Read-only	Current	The total amount of real or virtual memory currently allocated for use as cached memory. This object will not be implemented on hosts where the underlying operating system does not explicitly identify memory as specifically reserved for this purpose.	{ memory 15 }

ZumLink MIB - Memory Usage						
Objective Type	Syntax	Units	MAX Access	Status	Description	::=
memUsedReal	Integer32	kB	Read-only	Current	The amount of real / physical memory currently used or available.	{ memory 18 }
memSpeed	Integer32	Hz	Read-only	Current	The Speed of real / physical memory.	{ memory 19 }

43.4. FreeWave Technologies - MIB

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkSerialNumber	Serial Number	Read-only	Unsigned32
fwZumLinkModelCode	Model Code	Read-only	Unsigned32
fwZumLinkRadioModel	Radio model	Read-only	DisplayString
fwZumLinkRadioModelCode	Radio Model Code	Read-only	Unsigned32
fwZumLinkRadioFirmwareVersion	Radio Firmware Version	Read-only	DisplayString
fwZumLinkRadioSerialNumber	Radio Serial Number	Read-only	DisplayString
fwZumLinkDeviceName	Device Name	Read-only	DisplayString
fwZumLinkDeviceModel	Device Model	Read-only	DisplayString
fwZumLinkDeviceConfiguration	Device Configuration	Read-only	DisplayString
fwZumLinkDeviceFirmwareVersion	Device Firmware Version	Read-only	DisplayString
fwZumLinkDeviceId	Device Identifier	Read-only	Unsigned32
fwZumLinkLayoutHash	Unique Layout Identifier	Read-only	Unsigned32
fwZumLinkResetInfo	Reset Information	Read-only	DisplayString
fwZumLinkHopTableVersion	Radio Hop Table Version	Read-only	DisplayString
fwZumLinkRteVersion	Runtime Environment Version	Read-only	DisplayString
fwZumLinkRteTemplateVersion	Runtime Template Environment Version	Read-only	DisplayString
fwZumLinkLicenses	License Information	Read-only	DisplayString
fwZumLinkThemeVersion	Theme Version	Read-only	DisplayString

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkRadioMode	Radio Operational Mode	Read-Write	ZUMLINK_RADIO_MODE_THOR
fwZumLinkRfDataRate	RF Link Data Rate	Read-Write	ZUMLINK_RF_DATA_RATES
fwZumLinkRadioMaxRepeaters	Max Repeater slots in the Network	Read-Write	Unsigned32
fwZumLinkRadioRepeaterSlot	Repeater Slot	Read-Write	Unsigned32
fwZumLinkTxPower	Transmit Power	Read-Write	ZUMLINK_RADIO_TX_POWER
fwZumLinkNetworkId	Network Identifier	Read-Write	Unsigned32
fwZumLinkNodeId	Node ID	Read-Write	Unsigned32
fwZumLinkFrequencyKey	Frequency Key	Read-Write	ZUMLINK_FREQUENCYKEYS
fwZumLinkRadioFrequency	Operating Center Frequency in MHz	Read-Write	Float32TC
fwZumLinkRadioHoppingMode	Radio Hopping Mode	Read-Write	ZUMLINK_RADIO_HOPPING_MODE
fwZumLinkBeaconInterval	Beacon Interval	Read-Write	ZUMLINK_BEACON_INTERVALS
fwZumLinkBeaconBurstCount	The number of beacons to send per beacon time.	Read-Write	Unsigned32
fwZumLinkLnaBypass	LNA Bypass	Read-Write	ZUMLINK_LNA_BYPASS
fwZumLinkMaxLinkDistanceInMiles	The max link distance in miles	Read-Write	Unsigned32
fwZumLinkFrequencyMasks	Frequency Masks	Read-Write	DisplayString
fwZumLinkFrequencyMasksErrors	Frequency Masks Error	Read-only	DisplayString
fwZumLinkEncryptionMode	Encryption mode	Read-Write	ZUMLINK_ENCRYPTION_MODE
fwZumLinkActiveKey	The active selected key.	Read-Write	ZUMLINK_ENCRYPTION_KEYS
fwZumLinkSetKeySelect	Selection of the next encryption key to be modified.	Read-Write	ZUMLINK_ENCRYPTION_KEYS
fwZumLinkSetKeyValue	Set the value of the selected key.	Read-Write	DisplayString

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwtZumLinkCompressionEnabled	If compression is enabled out going packets will be sent compressed if the compressed packet is smaller.	Read-Write	TruthValue
fwtZumLinkOtaMaxFragmentSize	OTA Max Fragment Size	Read-Write	Unsigned32
fwtZumLinkFecRate	Sets the FEC (Forward Error Correction) rate.	Read-Write	ZUMLINK_FEC_RATES
fwtZumLinkAggregateEnabled	Enables the aggregation of smaller packets to enhance throughput.	Read-Write	TruthValue
fwtZumLinkRouteMinSignalMarginThresh	The radio route minimum signal level threshold in dB.	Read-Write	INTEGER
fwtZumLinkMacTableEntryAgeTimeout	The number of seconds before an inactive entry in the MAC Table ages out and becomes expired.	Read-Write	INTEGER
fwtZumLinkSignalLevel	Signal Level	Read-only	INTEGER
fwtZumLinkSignalMargin	Signal Margin	Read-only	INTEGER
fwtZumLinkTimestamp	Diagnostics Time Stamp	Read-only	Unsigned32
fwtZumLinkRadioTx	Radio Tx Data Packets	Read-only	Unsigned32
fwtZumLinkRadioRx	Radio Rx Data Packets	Read-only	Unsigned32
fwtZumLinkRadioReliableTx		Read-only	Unsigned32
fwtZumLinkRadioReliableRx		Read-only	Unsigned32
fwtZumLinkRadioRexmit		Read-only	Unsigned32
fwtZumLinkRadioAckTx		Read-only	Unsigned32
fwtZumLinkRadioNoAckTx		Read-only	Unsigned32
fwtZumLinkRadioTimedOut		Read-only	Unsigned32
fwtZumLinkRadioBadAckRx	Radio Bad ACK Received	Read-only	Unsigned32
fwtZumLinkRadioTooLong		Read-only	Unsigned32
fwtZumLinkRadioTooShort		Read-only	Unsigned32
fwtZumLinkRadioBadSync	Radio Bad Synchronization	Read-only	Unsigned32
fwtZumLinkRadioBadCRC	Radio Bad CRC on RX packets.	Read-only	Unsigned32

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkRadioContentionDrop	Radio Contention Drop	Read-only	Unsigned32
fwZumLinkRadioSendingDrop		Read-only	Unsigned32
fwZumLinkRadioLLTx	Radio Low Level Transmit	Read-only	Unsigned32
fwZumLinkRadioLLRx	Radio Low Level Receive	Read-only	Unsigned32
fwZumLinkCntSTX		Read-only	Unsigned32
fwZumLinkCntETX		Read-only	Unsigned32
fwZumLinkCntBadSync		Read-only	Unsigned32
fwZumLinkCntBadBCC		Read-only	Unsigned32
fwZumLinkInterfaceDataTx		Read-only	Unsigned32
fwZumLinkInterfaceDataRx		Read-only	Unsigned32
fwZumLinkInterfaceBytesTx		Read-only	Unsigned32
fwZumLinkInterfaceBytesRx		Read-only	Unsigned32
fwZumLinkResetsDetected		Read-only	Unsigned32
fwZumLinkResetsSent		Read-only	Unsigned32
fwZumLinkResetStats	Reset Statistics	Read-Write	ZUMLINK_NOW_OPTION
fwZumLinkMonitoredNode	Monitor Node	Read-Write	Unsigned32
fwZumLinkChannelDiagsTable	Show Channel Diagnostics	Not Accessible	
fwZumLinkChannelDiagsEntry	A row containing diagnostics for a channel.	Not Accessible	
fwZumLinkChannelDiagsIdx	Index to a set of diagnostics for a channel	Not Accessible	Unsigned32
fwZumLinkChannelDiagsFreq	Channel Diagnostics Frequency	Read-only	Float32TC
fwZumLinkChannelDiagsRSSI	Channel Diagnostics RSSI	Read-only	INTEGER
fwZumLinkChannelDiagsMargin	Channel Diagnostics Margin	Read-only	INTEGER
fwZumLinkChannelDiagsNodeID	Channel Diagnostics Node ID	Read-only	Unsigned32
fwZumLinkNodeDiagsTable	Show Monitored Node Diagnostics	Not Accessible	
fwZumLinkNodeDiagsEntry	A row containing diagnostics for a node.	Not Accessible	
fwZumLinkNodeDiagsNodeID	Node Diagnostics Node ID	Read-only	Unsigned32

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkNodeDiagsFreq	Node Diagnostics Frequency	Read-only	Float32TC
fwZumLinkNodeDiagsRSSI	Node Diagnostics RSSI	Read-only	INTEGER
fwZumLinkNodeDiagsMargin	Node Diagnostics Margin	Read-only	INTEGER
fwZumLinkMacTableClear	Clear the MAC to nodeld mapping table and force routes to be relearned.	Read-Write	ZUMLINK_NOW_OPTION
fwZumLinkNoiseLevel	Noise Level	Read-only	INTEGER
fwZumLinkVSWR	VSWR	Read-only	Unsigned32
fwZumLinkTxSuccess	Transmit Success Percentage	Read-only	Unsigned32
fwZumLinkTxAvailability	Transmit Availability Percentage	Read-only	Unsigned32
fwZumLinkRxSuccess	Receive Success Percentage	Read-only	Unsigned32
fwZumLinkSupplyVoltage	Supply Voltage	Read-only	INTEGER
fwZumLinkReset		Read-Write	ZUMLINK_RESET_OPTIONS
fwZumLinkFactoryDefaults		Read-Write	ZUMLINK_FDR_OPTIONS
fwZumLinkSave		Read-Write	ZUMLINK_NOW_OPTION
fwZumLinkTimeOutCli	The number of seconds of idle before CLI connection will be closed.	Read-Write	Unsigned32
fwZumLinkMac_address		Read-only	MacAddress
fwZumLinkIp_address	IP address of unit.	Read-Write	IpAddress
fwZumLinkNetmask	Netmask of unit.	Read-Write	IpAddress
fwZumLinkGateway	Gateway of unit.	Read-Write	IpAddress
fwZumLinkStpEnabled	Spanning tree protocol is enabled or disabled.	Read-Write	TruthValue
fwZumLinkTxqueuelen	Sets the Ethernet transmit packet queue length.	Read-Write	Unsigned32
fwZumLinkMtu	Sets the MTU frame size for the unit.	Read-Write	Unsigned32
fwZumLinkNetmaskFilterEnabled	Enable or disable bridge firewall.	Read-Write	TruthValue

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkNameserver_address1	DNS for name-to-address resolution.	Read-Write	IpAddress
fwZumLinkNameserver_address2	DNS for name-to-address resolution.	Read-Write	IpAddress
fwZumLinkArpFilterEnabled	Enable or disable ARP filtering in bridge firewall.	Read-Write	TruthValue
fwZumLinkVlanMgmt	Management VLAN ID for the device	Read-Write	Unsigned32
fwZumLinkVlanTag	VLAN Tag ID for the Ethernet port	Read-Write	Unsigned32
fwZumLinkRx_bytes	Number bytes of Ethernet packets received from the radio network.	Read-only	Unsigned32
fwZumLinkRx_packets	Number of Ethernet packets received from the radio network.	Read-only	Unsigned32
fwZumLinkRx_dropped	Number of Ethernet packets received from the radio network that were dropped at the Ethernet interface.	Read-only	Unsigned32
fwZumLinkRx_errors	Number of Ethernet packets received from the radio network that were had Ethernet errors.	Read-only	Unsigned32
fwZumLinkTx_bytes	Number bytes of Ethernet packets received from the Ethernet port and sent over the radio network.	Read-only	Unsigned32
fwZumLinkTx_packets	Number Ethernet packets received from the Ethernet port and sent over the radio network.	Read-only	Unsigned32
fwZumLinkTx_dropped	Number Ethernet packets received from the Ethernet port but dropped because the txqueue was full.	Read-only	Unsigned32
fwZumLinkTx_errors	Number Ethernet packets received from the Ethernet port that were in error.	Read-only	Unsigned32
fwZumLinkNtpReference	Clock reference for NTP.	Read-Write	ZUMLINK_NTP_REFERENCE
fwZumLinkNtpRestart	Cause the NTP system to restart.	Read-Write	ZUMLINK_NOW_OPTION
fwZumLinkNtpDate	Set the local time from other NTP servers on the network.	Read-Write	ZUMLINK_NOW_OPTION

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwtZumLinkNtp_address1	Server to be used for syncing time. Use 0.0.0.0 to skip this server.	Read-Write	DisplayString
fwtZumLinkNtp_address2	Server to be used for syncing time. Use 0.0.0.0 to skip this server.	Read-Write	DisplayString
fwtZumLinkNtp_address3	Server to be used for syncing time. Use 0.0.0.0 to skip this server.	Read-Write	DisplayString
fwtZumLinkNtp_address4	Server to be used for syncing time. Use 0.0.0.0 to skip this server.	Read-Write	DisplayString
fwtZumLinkNtp_address5	Server to be used for syncing time. Use 0.0.0.0 to skip this server.	Read-Write	DisplayString
fwtZumLinkCom1Mode	Com port mode	Read-Write	ZUMLINK_UART_MODE
fwtZumLinkCom1Handler	Protocol of the com port	Read-Write	ZUMLINK_UART_HANDLER
fwtZumLinkCom1Baudrate	Com port baud rate	Read-Write	ZUMLINK_UART_BAUDRATES
fwtZumLinkCom1Databits	Com port data bits	Read-Write	ZUMLINK_UART_DATABITS
fwtZumLinkCom1Parity	Com port parity	Read-Write	ZUMLINK_UART_PARITY
fwtZumLinkCom1Stopbits	Com port number of stop bits	Read-Write	ZUMLINK_UART_STOPBITS
fwtZumLinkCom1Duplex	Com port is full or half duplex	Read-Write	ZUMLINK_UART_DUPLEX
fwtZumLinkCom1FlowControl	Com port hardware flow control is not supported.	Read-Write	ZUMLINK_UART_FLOWCONTROL_OFF
fwtZumLinkCom1DelayBeforeSendMs	Com port will delay sending in Ms to allow the other side to switch from tx to rx mode.	Read-Write	Unsigned32
fwtZumLinkCom1BreakBeforeSendUs	Com port will send a break signal for at least the number of microseconds specified before sending the data.	Read-Write	Unsigned32
fwtZumLinkCom1TerminalServerPort	The TCP port number to use when handler is set to TerminalServer.	Read-Write	Unsigned32

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkCom1TerminalServerTimeOut	Terminal Server TimeOut	Read-Write	Unsigned32
fwZumLinkCom1TxBytes	The total bytes sent out of the Com port.	Read-only	Unsigned32
fwZumLinkCom1RxBytes	The total bytes received from the Com port.	Read-only	Unsigned32
fwZumLinkCom1ConnectionDrops	The number of terminal server connections dropped due to inactivity.	Read-only	Unsigned32
fwZumLinkCom2Mode	Com port mode	Read-Write	ZUMLINK_UART_MODE
fwZumLinkCom2Handler	Protocol of the com port	Read-Write	ZUMLINK_UART_HANDLER
fwZumLinkCom2Baudrate	Com port baud rate	Read-Write	ZUMLINK_UART_BAUDRATES
fwZumLinkCom2Databits	Com port data bits	Read-Write	ZUMLINK_UART_DATABITS
fwZumLinkCom2Parity	Com port parity	Read-Write	ZUMLINK_UART_PARITY
fwZumLinkCom2Stopbits	Com port number of stop bits	Read-Write	ZUMLINK_UART_STOPBITS
fwZumLinkCom2Duplex	Com port is full or half duplex	Read-Write	ZUMLINK_UART_DUPLEX
fwZumLinkCom2FlowControl	Com port hardware flow control is on or off	Read-Write	ZUMLINK_UART_FLOWCONTROL
fwZumLinkCom2DelayBeforeSendMs	Com port will delay sending in Ms to allow the other side to switch from tx to rx mode.	Read-Write	Unsigned32
fwZumLinkCom2BreakBeforeSendUs	Com port will send a break signal for at least the number of microseconds specified before sending the data.	Read-Write	Unsigned32
fwZumLinkCom2TerminalServerPort	The TCP port number to use when handler is set to TerminalServer.	Read-Write	Unsigned32
fwZumLinkCom2TerminalServerTimeOut	Terminal Server Time Out	Read-Write	Unsigned32
fwZumLinkCom2TxBytes	The total bytes sent out of the Com port.	Read-only	Unsigned32
fwZumLinkCom2RxBytes	The total bytes received from the Com port.	Read-only	Unsigned32

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwtZumLinkCom2ConnectionDrops	The number of terminal server connections dropped due to inactivity.	Read-only	Unsigned32
fwtZumLinkTermServ_relay_mapping	Options for streaming between serial device servers.	Read-Write	ZUMLINK_TERMSEV_RELAY_MAPPING
fwtZumLinkRemote_termserv_ip_address	IP address of remote terminal server.	Read-Write	IpAddress
fwtZumLinkUpTime	The number of seconds since the unit restarted.	Read-only	Unsigned32
fwtZumLinkUpTimeString	The number days, hours:minutes:seconds since the unit restarted.	Read-only	DisplayString
fwtZumLinkDcAppUptime	The number of seconds since the main app restarted.	Read-only	DisplayString
fwtZumLinkDcAppStartTime	The timestamp of when the main app restarted.	Read-only	DisplayString
fwtZumLinkTimeString	The current time.	Read-Write	DisplayString
fwtZumLinkFileTransferStatus	File Transfer Status	Read-only	DisplayString
fwtZumLinkEnablePtpInterface	Enable PTP interface	Read-Write	TruthValue
fwtZumLinkEnableEthernetLogin	Enable SSH logins	Read-Write	TruthValue
fwtZumLinkNeighborTableNumNeighbors	Number of Neighbors	Read-only	Unsigned32
fwtZumLinkNeighborTableNodeID	Device Node ID	Read-only	Unsigned32
fwtZumLinkNeighborTableNodeType	Node Type	Read-only	Unsigned32
fwtZumLinkNeighborTableIpAddress	Neighbor IP Address	Read-only	IpAddress
fwtZumLinkNeighborTableMacAddress	Neighbor MAC Address	Read-only	MacAddress
fwtZumLinkNeighborTableDeviceName	Device Name	Read-only	DisplayString
fwtZumLinkNeighborTableFWVersion	Device Node ID	Read-only	DisplayString
fwtZumLinkNeighborTableCounter	Neighbor Table Counter	Read-only	Unsigned32
fwtZumLinkNeighborTable	This table gives detailed status information for each neighbor of this node.	Not Accessible	

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwtZumLinkNeighborEntry	A row containing status information for a specific neighbor.	Not Accessible	
fwtZumLinkNeighborNodeid	Neighbor Node ID	Read-only	Unsigned32
fwtZumLinkNeighborIpAddress	Neighbor IP Address	Read-only	IpAddress
fwtZumLinkNeighborMacAddress	Neighbor MAC Address	Read-only	MacAddress
fwtZumLinkNeighborNodeType	Neighbor Node Type	Read-only	Unsigned32
fwtZumLinkNeighborRSSI	Neighbor RSSI	Read-only	INTEGER
fwtZumLinkNeighborLinkMargin	Neighbor Link Margin	Read-only	INTEGER
fwtZumLinkNeighborCounter	Neighbor Table Counter	Read-only	Unsigned32
fwtZumLinkNeighborTimestamp	Time When Node Info Received	Read-only	Unsigned32
fwtZumLinkNetworkTableDiscoveryState	Start or Stop Network Discovery	Read-Write	INTEGER
fwtZumLinkNetworkTableDiscoveryStatus	Get Discover Network Status	Read-only	DisplayString
fwtZumLinkNetworkTableNumNodes	Number of nodes in network	Read-only	Unsigned32
fwtZumLinkNetworkTableTimeStamp	Timestamp for when network table was last updated	Read-only	Unsigned32
fwtZumLinkNetworkTable	This table gives detailed status information for each neighbor of this node.	Not Accessible	
fwtZumLinkNetworkEntry	A row containing status information for a specific node.	Not Accessible	
fwtZumLinkNetworkNodeid	Device ID	Read-only	Unsigned32
fwtZumLinkNetworkNodeType	Node Type / Role	Read-only	Unsigned32
fwtZumLinkNetworkIpAddress	IP Address	Read-only	IpAddress
fwtZumLinkNetworkMacAddress	MAC Address	Read-only	MacAddress
fwtZumLinkNetworkDeviceName	Device Name	Read-only	DisplayString
fwtZumLinkNetworkFwVersion	Firmware Version	Read-only	DisplayString
fwtZumLinkNetworkHopCount	number of hops from node id	Read-only	Unsigned32
fwtZumLinkNetworkNeighborTable	Neighbor Nodes	Not Accessible	

FreeWave Technologies - MIB			
Object	Description	Access	Syntax
fwZumLinkNetworkNeighborEntry	A row containing status information for a specific neighbor node.	Not Accessible	
fwZumLinkNetworkNeighborNodeId	Neighbor Node ID	Read-only	Unsigned32
fwZumLinkNetworkNeighborRSSI	RSSI From Neighbor Node	Read-only	INTEGER
fwZumLinkNetworkPathTable	List of nodes in path from current node where info is gathered to current node	Not Accessible	
fwZumLinkNetworkPathEntry	A row containing status information for a node in the path.	Not Accessible	
fwZumLinkNetworkPathIdx	Index to a node in the path	Not Accessible	Unsigned32
fwZumLinkNetworkPathNodeid	Node In Path From Current Node	Read-only	Unsigned32
fwZumLinkNetworkPathRSSITable	RSSI values between all the nodes along the path	Not Accessible	
fwZumLinkNetworkPathRSSIEntry	A row containing RSSI for a node along the path.	Not Accessible	
fwZumLinkNetworkPathRssiIdx	Index to a pair of source and destination nodes along the path	Not Accessible	Unsigned32
fwZumLinkNetworkPathRssiSrc	Source Node	Read-only	Unsigned32
fwZumLinkNetworkPathRssiDst	Destination Node	Read-only	Unsigned32
fwZumLinkNetworkPathRssiSrcDstRSSI	Source Destination RSSI	Read-only	INTEGER
fwZumLinkNetworkPathRssiDstSrcRSSI	Source Destination RSSI	Read-only	INTEGER

43.5. SNMP Write Access

1. Verify [V2C Enabled \(on page 351\)](#) is enabled.
2. Make a note of the [RW Community Name \(on page 348\)](#).

Note: The default is private if it was not changed.

```
>snmp
[Page=snmp]
v1Enabled=false
v2cEnabled=true
v3Enabled=false
roCommunityName=public
rwCommunityName=private
snmpUser
RESULT:0:OK
```

3. Perform the Read/Write using the [snmp.rwCommunityName](#) identified in Step 2.

Example

```
~$ snmpset -mFREEWAVE-TECHNOLOGIES-MIB -Pu -v2c -c private 192.168.2.10
fwtZumLinkRadioMode.0 i gateway
FREEWAVE-TECHNOLOGIES-MIB::fwtZumLinkRadioMode.0 = INTEGER: gateway(0)
~$ snmpget -mFREEWAVE-TECHNOLOGIES-MIB -Pu -v2c -c private 192.168.2.10
fwtZumLinkRadioMode.0
FREEWAVE-TECHNOLOGIES-MIB::fwtZumLinkRadioMode.0 = INTEGER: gateway(0)
~$ snmpset -mFREEWAVE-TECHNOLOGIES-MIB -Pu -v2c -c private 192.168.2.10
fwtZumLinkRadioMode.0 i endpoint
FREEWAVE-TECHNOLOGIES-MIB::fwtZumLinkRadioMode.0 = INTEGER: endpoint(1)
~$ snmpget -mFREEWAVE-TECHNOLOGIES-MIB -Pu -v2c -c private 192.168.2.10
fwtZumLinkRadioMode.0
```

```
FREEWAVE-TECHNOLOGIES-MIB::fwtZumLinkRadioMode.0 = INTEGER: endpoint(1)
```

4. After adjusting the settings, issue the `save` command.

Note: This is the same workflow as the CLI.

```
~$ snmpset -mFREEWAVE-TECHNOLOGIES-MIB -Pu -v2c -c private 192.168.2.10  
fwtZumLinkSave.0 i now  
FREEWAVE-TECHNOLOGIES-MIB::fwtZumLinkSave.0 = INTEGER: now(1)
```



Best practice for **snmp.v2cEnabled** is to change the **snmp.rwCommunityName** for a production network.

Appendix A: Technical Specifications

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

- [Computing Resources \(on page 494\)](#)
- [Data Transmission \(on page 494\)](#)
- [General Information \(on page 495\)](#)
- [Interfaces \(on page 496\)](#)
- [Management \(on page 496\)](#)
- [Networking \(on page 497\)](#)
- [Power Requirements \(on page 497\)](#)
- [Receiver \(on page 497\)](#)
- [Transmitter \(on page 498\)](#)

Computing Resources

Note: Access to the **Computing Resources** for the Z9-P or Z9-PE requires licensing. For information, contact FreeWave Sales at www.freewave.com/how-to-buy.

Computing Resources	
Specification	Description
CPU	ARM Cortex-A8 1 GHz
RAM	512 MB
Storage	1 GB
OS	Debian-based Linux

Data Transmission

Data Transmission	
Specification	Description
Type	Frequency Hopping Spread Spectrum
Modulation	<ul style="list-style-type: none"> 2 level GFSK 4- and 8-ary FSK
Link Throughput	<ul style="list-style-type: none"> Maximum of 1.6 Mbps 4 Mbps with Compression
Error Detection	<ul style="list-style-type: none"> ARQ CRC Retransmit on error Forward Error Correction (FEC)
Hopping Rates	400, 200, 100, 50, 25 ms
Hopping Channels	<ul style="list-style-type: none"> Maximum of 110 channels RF Data Rate (on page 332) dependent See: <ul style="list-style-type: none"> Australia Hop Set - 900 MHz Channels (on page 470) Brazil Hop Set - 900 MHz Channels (on page 473)
Hopping Patterns	<ul style="list-style-type: none"> Maximum of 16 patterns RF Data Rate (on page 332) dependent
Protocol	Adaptive Spectrum Learning (ASL)
User Interface Rate	<ul style="list-style-type: none"> Ethernet Rate: 10/100 Mbps Serial Rate: up to 250 kbps
Data Encryption	128-and 256-bit AES CCM

Data Transmission	
Specification	Description
Advanced Features	<ul style="list-style-type: none"> • Packet Aggregation • Packet Compression

General Information

General Information	
Specification	Description
Operating Temperature	<ul style="list-style-type: none"> • Z9-P <ul style="list-style-type: none"> • -40°C to +85°C • -40°F to +185°F <div style="border: 1px solid orange; padding: 5px; margin: 10px 0;">  <p>Caution: This is the Z9-P temperature as defined for the exposed copper heat sink surface of the ZumLink radio PCB shown in the Z9-P-Exposed Copper Heat Sink (on page 498), Figure 305. See Mechanical Drawing - Z9-P (on page 462).</p> </div> <ul style="list-style-type: none"> • Z9-PE <ul style="list-style-type: none"> • -40°C to +75°C • -40°F to +167°F <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Note: This is the Z9-PE temperature as defined for the local ambient air in contact with the product enclosure and assumes no solar radiation.</p> </div>
Humidity	0 to 95% non-condensing
Dimensions	<ul style="list-style-type: none"> • Z9-P: <ul style="list-style-type: none"> • 177.29 L x 83.06 W x 40.89 H (mm) • 7.0 L x 3.3 W x 1.6 H (in) • Z9-PE: <ul style="list-style-type: none"> • 191.00 L x 109.47 W x 41.91 H (mm) • 7.52 L x 4.31 W x 1.65 H (in)
Weight	<ul style="list-style-type: none"> • Z9-P: 172.37 g (0.38 lbs) • Z9-PE: 750 g (1.7 lbs)
Reliability	MTBF 206,186
Safety	Class I, Division 2, Groups A-D

General Information	
Specification	Description
UL	<p>Z9-P:  US</p> <p>Z9-PE: </p>

Interfaces

Interfaces	
Specification	Description
Data Connectors	<ul style="list-style-type: none"> Three RJ-45s <ul style="list-style-type: none"> 1 Ethernet 2 Serial
USB Connector	Micro USB
RF Connector	<ul style="list-style-type: none"> Z9-P: SMA Z9-PE: TNC
Power Connectors	<ul style="list-style-type: none"> Z9-P: Phoenix Contact (# 1776692) Z9-PE: Switchcraft (#17282-2PG-300)

Management

Management	
Specification	Description
Management	<ul style="list-style-type: none"> Enterprise MIB HTTP MIB-II Modbus SNMPv1/v2c/v3 SSH

Networking

Networking	
Specification	Description
Serial	<ul style="list-style-type: none"> • Modbus RTU • Modbus/TCP • TCP client • TCP server
Traffic Filtering	<ul style="list-style-type: none"> • ARP filter • Netmask filter
VLAN	802.1Q

Power Requirements

Operating State	Description
Operating Voltage	+6 to +30 VDC
Idle Current	118 mA @ 12 VDC
Receive Current	146 mA @ 12 VDC
Transmit Current	358 mA @ 12 VDC

Receiver

Receiver			
Specification	Description		
IF Selectivity	> 40 dB		
System Gain	135 dB		
Sensitivity	RF Data Rate	Without FEC	With FEC
	115.2 kbps	-105 dBm	-108 dBm
	250 kbps	-102 dBm	-105 dBm
	500 kbps	-99 dBm	-102 dBm
	1 Mbps	-95 dBm	-98 dBm
	1.5 Mbps (Beta)	-90 dBm	-93 dBm
	4 Mbps	-83 dBm	-86 dBm

Transmitter

Transmitter	
Specification	Description
Frequency Range	<ul style="list-style-type: none"> 902 to 928 MHz Australia: 915 to 928 MHz Thailand: Z9-P-THA, Z9-PE-THA & Z9-PE-DEVKIT-THA: 920 to 925 MHz
Frequency Stability	15ppm
Output Power	<ul style="list-style-type: none"> 10mW to 1W User selectable
Output Impedance	50 ohms
Range	97 km (60 miles), clear line of sight
Channel Spacing	<ul style="list-style-type: none"> 230.4 kHz 345.6 kHz 691.2 kHz 1382.4 kHz 1612.8 (Beta) kHz 3225.6 kHz
RF Data Rate	<ul style="list-style-type: none"> 115.2 kbps 250 kbps 500 kbps 1 Mbps 1.5 Mbps (Beta) 4 Mbps

Z9-P-Exposed Copper Heat Sink

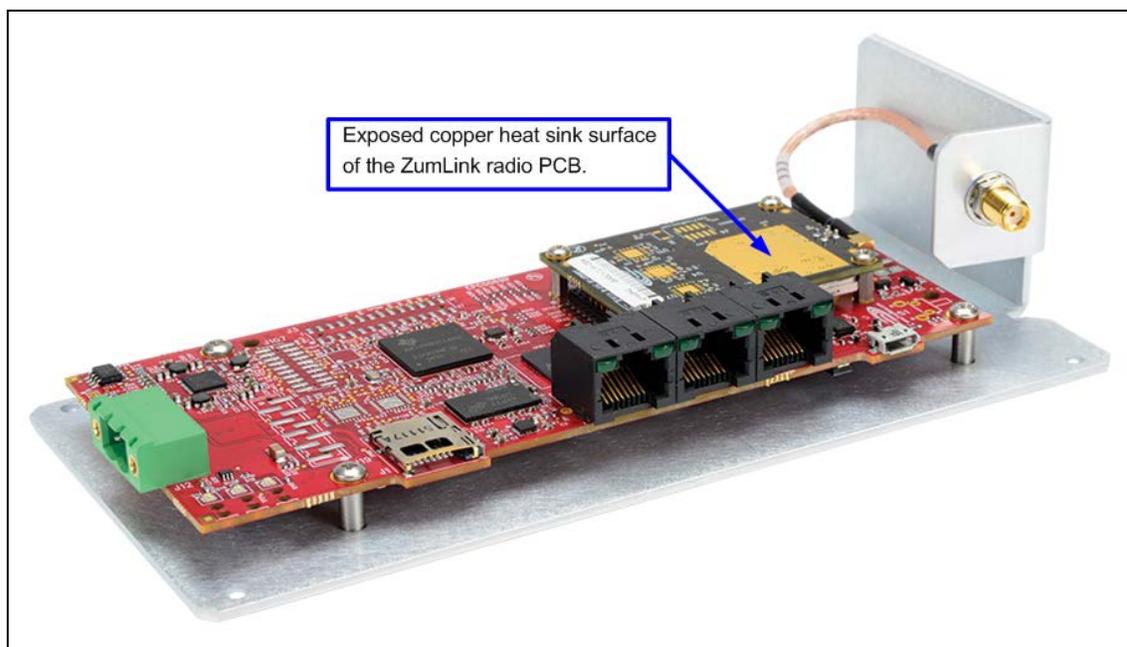


Figure 305: Exposed Copper Heat Sink Surface of the Z9-P Radio PCB

Appendix B: OTA Interoperability

Firmware		Model # / Firmware Compatibility						OTA / Firmware Compatibility					
Device FW	Radio FW	Models Supported						RF Data Rate					
		Z9-PE2	Z9-P2	Z9-PE	Z9-P	Z9-PC	Z9-PC-SR001	115.2kbps	250kbps	500kbps	1Mbps	1.5Mbps (Beta)	4Mbps
1.1.2.2	1.0.7.1	x	x	x	x	x	x	x	XX	XX	x	x	x
1.1.1.2	1.0.7.1	NA	NA	x	x	x	x	x	XX	XX	x	x	x
1.1.0.1	1.0.7.1	NA	NA	x	x	x	x	x	XX	XX	x	x	x
1.0.7.0	1.0.7.0	NA	NA	x	x	x	x	x	XX	XX	x	x	x
1.0.6.0	1.0.4.0	NA	NA	x	x	NA	NA	x	x	x	x	NA	x
1.0.4.3	1.0.4.0	NA	NA	NA	NA	x	x	x	x	x	x	NA	x
1.0.4.2	1.0.4.0	NA	NA	x	x	NA	NA	x	x	x	x	NA	x

Note: XX Enhanced 250kbps & 500kbps RF Data Rates

Appendix C: Firmware & Feature Interoperability

Firmware & Feature Interoperability							
Device Firmware Version	v1.1.2.2	v1.1.1.2	v1.1.0.1	v1.0.7.0	v1.0.6.0	v1..0.4.3	v1.0.4.2
Radio Firmware Version	v1.0.7.1	v1.0.7.1	v1.0.7.1	v1.0.7.0	v1.0.4.0	v1.0.4.0	v1.0.4.0
Feature							
Input Voltage	Z9-P2 Z9-PE2	N/A	N/A	N/A	N/A	N/A	N/A
ZumIQ	Z9-P Z9-PE Z9-PC Z9-PC-SR001 Z9-P2 Z9-PE2	Z9-P Z9-PE Z9-PC Z9-PC-SR001	Z9-P Z9-PE Z9-PC Z9-PC-SR001	N/A	Z9-P Z9-PE	N/A	N/A
VLAN Management	X	N/A	N/A	N/A	N/A	N/A	N/A
ARP Filtering	X	X	N/A	N/A	N/A	N/A	N/A
VLAN (tagging and un-tagging)	X	X	N/A	N/A	N/A	N/A	N/A
Encryption Key Radio Web Interface Configuration	X	X	N/A	N/A	N/A	N/A	N/A
Network Diagnostics Diagram	X	X	N/A	N/A	N/A	N/A	N/A
Modbus	X	X	N/A	N/A	N/A	N/A	N/A
VSWR	X	X	X	N/A	N/A	N/A	N/A
Expanded Local Diagnostics Noise level, RX success, TX availability, TX success	X	X	X	N/A	N/A	N/A	N/A

Firmware & Feature Interoperability							
Device Firmware Version	v1.1.2.2	v1.1.1.2	v1.1.0.1	v1.0.7.0	v1.0.6.0	v1..0.4.3	v1.0.4.2
Radio Firmware Version	v1.0.7.1	v1.0.7.1	v1.0.7.1	v1.0.7.0	v1.0.4.0	v1.0.4.0	v1.0.4.0
Feature							
Expanded MIB Query & configure most statistics and settings	X	X	X	N/A	N/A	N/A	N/A
Network Diagnostics Radio Web Interface	X	X	X	N/A	N/A	N/A	N/A
Enhanced 250 & 500 kbps data rates Improved sensitivity, noise filtering, interference	X	X	X	X	N/A	N/A	N/A
1.5 Mbps RF Data Rate (Beta)	X	X	X	X	N/A	N/A	N/A
MacTable Entry-Age Timeout (Beta)	X	X	X	X	N/A	N/A	N/A
Terminal Server Connections	128 concurrent TCP	128 concurrent TCP	128 concurrent TCP	20 concurrent TCP	N/A	N/A	N/A
Repeaters	Multiple Repeaters	Multiple Repeaters	Multiple Repeaters	Multiple Repeaters	Single Repeater	Single Repeater	Single Repeater

Appendix D: LEDs

These are the LEDs for the Z9-P or Z9-PE.

Note: See [Z9-P Port Connections \(on page 22\)](#) or [Z9-PE Port Connections \(on page 22\)](#) for additional information.

Normal Operation

LEDs - Normal Operation				
CD	TX	RX	Condition	Notes
Solid Red (Bright) 			Not Linked	While operating with Frequency Hopping enabled, this LED indicates the radio has NOT received the beacon within the last 60 seconds.
Solid Green 			Radio linked	The radio is linked with a margin of 20dB or greater above sensitivity or noise level, whichever is highest.
Solid Green  or Alternate Solid Green  / Solid Red (Bright) 		Solid Green 	Receiving Data	The radio is actively receiving data over the wireless RF link.

LEDs - Normal Operation				
CD	TX	RX	Condition	Notes
Solid Green  or Alternate Solid Green  / Solid Red (Bright) 	Solid Green 		Transmitting Data	The radio is actively transmitting data over the wireless RF link.
Alternate Solid Green  / Solid Red (Bright) 		Solid Green 	Receiving Data	<ul style="list-style-type: none"> • There are 4 blink rates for levels 15dB, 10dB, 5dB, and 0dB above sensitivity or noise level, whichever is highest. • The blink rates are faster as the levels increase from the sensitivity / noise point. • The RSSI level is based on the last packet received. • The pattern continues for 60 seconds after the last received packet before turning back to Red if the link has dropped.
Solid Amber (Yellow) 	Blinking Red 	Blinking Red 	Upgrading firmware or changing the configuration.	TX and RX blink in unison at a slow rate.
Blinking Green  5 Times	Off	Off	Upgrade or update succeeded.	
Blinking Red  5 Times	Off	Off	Upgrade or update failed.	

COM LEDs

Note: During boot, the COM LEDs will cycle indicating startup.

LEDs - COM		
LED	LED Color	Description
COM1 Left	Blinking Green 	Transmitting data on COM1.
COM1 Right	Blinking Green 	Receiving data on COM1.
COM2 Left	Blinking Green 	Transmitting data on COM2.
COM2 Right	Blinking Green 	Receiving data on COM2.

Ethernet LEDs

LEDs - Ethernet		
LED	LED Color	Description
Ethernet Left	Solid Green 	<ul style="list-style-type: none"> Shows Power. LED is lit while power is applied to the Ethernet module.
Ethernet Right	Solid Green 	Shows Ethernet link but no activity.
Ethernet Right	Blinking Green 	<ul style="list-style-type: none"> Shows Activity. LED will blink / flicker while sending and receiving data on the Ethernet port.

Appendix E: Z9-P or Z9-PE Files and Descriptions

When the **Windows® File Explorer** window of the Z9-P or Z9-PE is opened, there are default files that appear.

This is a list of those files and descriptions of their purpose.

Note: If the Z9-P or Z9-PE has been updated or rebooted, other files may appear.

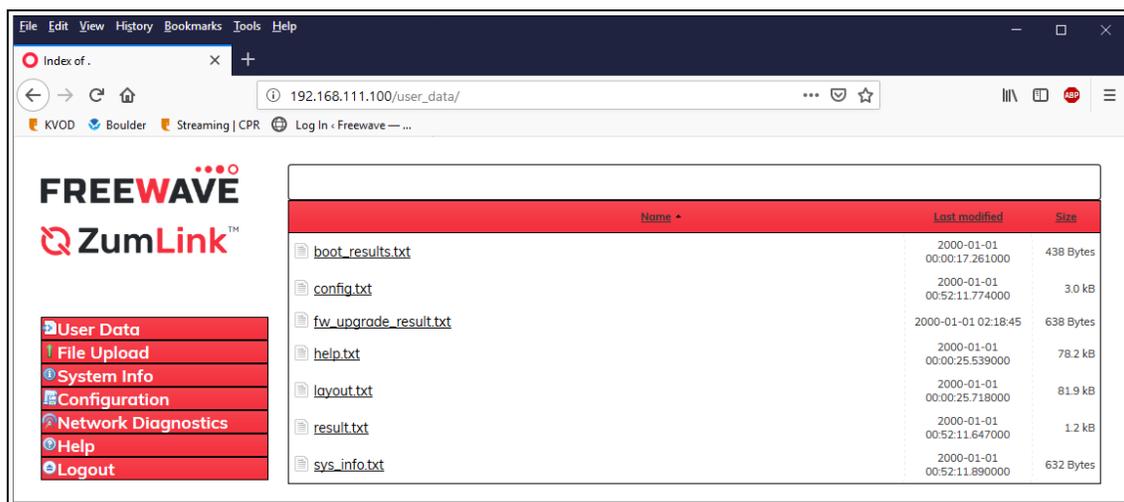


Figure 306: Z9-P or Z9-PE Files shown in Windows® File Explorer

Files and Descriptions - Z9-P or Z9-PE	
File Name	Description
boot_results.txt	The boot_results.txt file shows the firmware version the device is currently running.
config.txt	The config.txt file contains all of the configuration parameters of the Z9-P or Z9-PE. These parameters determine how the device functions and connects to other devices in the network.
fw_upgrade_result.txt	The fw_upgrade_result.txt file shows the status of the update procedure for the device firmware. Note: This file appears after the ZumLink has been updated to a newer version of firmware.
help.txt	The help.txt file contains online user assistance information using the CLI commands. Example: In a CLI window, enter help=txPower or help txpower to see the help information for the radioSetting.txpower setting.
layout.txt	The layout.txt file is used for management applications to provide the CLI and config.cfg with a format description of the commands.
result.txt	The result.txt is used to verify the acceptance or rejection of each parameter change applied to the config.txt file. Note: This file appears after the config.txt file of the ZumLink has been changed.
sys_info.txt	The sys_info.txt file provides information about the radio including serial number, model number, firmware versions, and device name.

Appendix F: Z9-P or Z9-PE Modbus Register Map

This table provides a register map for the Modbus Input / Output devices.

Note: The **Register Names** that can be polled using Modbus correspond to the pages of the CLI.

Important!: By design, unused registers return 0 (zero).

Z9-P or Z9-PE Modbus Register Map

Register Name	Type	Protocol Address	Number Registers	Modbus FC	Address
radioSettings.radioMode	uint32_t	31001	2	4	1000
radioSettings.rfDataRate	uint32_t	31003	2	4	1002
radioSettings.radioMaxRepeaters	uint32_t	31005	2	4	1004
radioSettings.radioRepeaterSlot	uint32_t	31007	2	4	1006
radioSettings.txPower	uint32_t	31009	2	4	1008
radioSettings.networkId	uint16_t	31011	1	4	1010
radioSettings.nodeld	uint16_t	31012	1	4	1011
radioSettings.frequencyKey	uint32_t	31013	2	4	1012
radioSettings.radioFrequency	float	31015	2	4	1014
radioSettings.radioHoppingMode	uint32_t	31017	2	4	1016
radioSettings.beaconInterval	uint32_t	31019	2	4	1018

Z9-P or Z9-PE Modbus Register Map					
Register Name	Type	Protocol Address	Number Registers	Modbus FC	Address
radioSettings.beaconBurstCount	uint32_t	31021	2	4	1020
radioSettings.InaBypass	uint32_t	31023	2	4	1022
radioSettings.maxLinkDistanceInMiles	uint32_t	31025	2	4	1024
localDiagnostics.signalLevel	int	32001	2	4	2000
localDiagnostics.signalMargin	int	32003	2	4	2002
localDiagnostics.NoiseLevel	int	32005	2	4	2004
localDiagnostics.VSWR	uint32_t	32007	2	4	2006
localDiagnostics.TxSuccess	uint32_t	32009	2	4	2008
localDiagnostics.TxAvailability	uint32_t	32011	2	4	2010
localDiagnostics.RxSuccess	uint32_t	32013	2	4	2012
localDiagnostics.timestamp	uint32_t	32015	2	4	2014
localDiagnostics.RadioTx	uint32_t	32017	2	4	2016
localDiagnostics.RadioRx	uint32_t	32019	2	4	2018
localDiagnostics.RadioReliableTx	uint32_t	32021	2	4	2020
localDiagnostics.RadioReliableRx	uint32_t	32023	2	4	2022
localDiagnostics.RadioRexmit	uint32_t	32025	2	4	2024
localDiagnostics.RadioAckTx	uint32_t	32027	2	4	2026
localDiagnostics.RadioNoAckTx	uint32_t	32029	2	4	2028
localDiagnostics.RadioTimedOut	uint32_t	32031	2	4	2030
localDiagnostics.RadioBadAckRx	uint32_t	32033	2	4	2032
localDiagnostics.RadioTooLong	uint32_t	32035	2	4	2034
localDiagnostics.RadioTooShort	uint32_t	32037	2	4	2036
localDiagnostics.RadioBadSync	uint32_t	32039	2	4	2038
localDiagnostics.RadioBadCRC	uint32_t	32041	2	4	2040
localDiagnostics.RadioContentionDrop	uint32_t	32043	2	4	2042
localDiagnostics.RadioSendingDrop	uint32_t	32045	2	4	2044
localDiagnostics.RadioLLTx	uint32_t	32047	2	4	2046
localDiagnostics.RadioLLRx	uint32_t	32049	2	4	2048
localDiagnostics.cntSTX	uint32_t	32051	2	4	2050
localDiagnostics.cntETX	uint32_t	32053	2	4	2052
localDiagnostics.cntBadSync	uint32_t	32055	2	4	2054
localDiagnostics.cntBadBCC	uint32_t	32057	2	4	2056

Z9-P or Z9-PE Modbus Register Map					
Register Name	Type	Protocol Address	Number Registers	Modbus FC	Address
localDiagnostics.interfaceDataTx	uint32_t	32059	2	4	2058
localDiagnostics.interfaceDataRx	uint32_t	32061	2	4	2060
localDiagnostics.interfaceBytesTx	uint32_t	32063	2	4	2062
localDiagnostics.interfaceBytesRx	uint32_t	32065	2	4	2064
localDiagnostics.resetsDetected	uint32_t	32067	2	4	2066
localDiagnostics.resetsSent	uint32_t	32069	2	4	2068
networkStats.rx_bytes	uint32_t	32071	2	4	2070
networkStats.rx_packets	uint32_t	32073	2	4	2072
networkStats.rx_dropped	uint32_t	32075	2	4	2074
networkStats.rx_errors	uint32_t	32077	2	4	2076
networkStats.tx_bytes	uint32_t	32079	2	4	2078
networkStats.tx_packets	uint32_t	32081	2	4	2080
networkStats.tx_dropped	uint32_t	32083	2	4	2082
networkStats.tx_errors	uint32_t	32085	2	4	2084
Com1.TxBytes	uint32_t	32087	2	4	2086
Com1.RxBytes	uint32_t	32089	2	4	2088
Com2.TxBytes	uint32_t	32091	2	4	2090
Com2.RxBytes	uint32_t	32093	2	4	2092
date.upTime	uint32_t	32095	2	4	2094
date.time	uint32_t	32097	2	4	2096
rfStats.UpPackets	uint32_t	32099	2	4	2098
rfStats.UpBytes	uint32_t	32101	2	4	2100
rfStats.UpErrors	uint32_t	32103	2	4	2102
rfStats.UpRate	double	32105	4	4	2104
rfStats.UpRateAvg	double	32107	4	4	2106
rfStats.UpRateAvg2	double	32109	4	4	2108
rfStats.DownPackets	uint32_t	32111	2	4	2110
rfStats.DownBytes	uint32_t	32113	2	4	2112
rfStats.DownErrors	uint32_t	32115	2	4	2114
rfStats.DownRate	double	32117	4	4	2116
rfStats.DownRateAvg	double	32119	4	4	2118
rfStats.DownRateAvg2	double	32121	4	4	2120

Appendix G: FreeWave Legal Information

Export Notification

FreeWave Technologies, Inc. products may be subject to control by the Export Administration Regulations (EAR) and/or the International Traffic in Arms Regulations (ITAR). Export, re-export, or transfer of these products without required authorization from the U.S. Department of Commerce, Bureau of Industry and Security, or the U.S. Department of State, Directorate of Defense Trade Controls, as applicable, is prohibited. Any party exporting, re-exporting, or transferring FreeWave products is responsible for obtaining all necessary U.S. government authorizations required to ensure compliance with these and other applicable U.S. laws. Consult with your legal counsel for further guidance.

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Warning! DO NOT OPEN THE ZumLink Z9-P or Z9-PE WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT.

GNU License Notification

Some of the software in the firmware is licensed under the GNU General Public License and other Open Source and Free Software licenses. Contact FreeWave to obtain the corresponding source on CD.

FCC Notifications**FCC Supplier's Declaration of Conformity**

FreeWave Technologies, Inc.

5395 Pearl Parkway, Boulder, CO 80301

Phone Number: 303.381.9200

Website: www.freewave.com

declare under our sole responsibility that the product Models: Z9-P or Z9-PE complies with Part 15 of 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: KNYPMT0101AB.

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 Part 15 Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the User-Reference Manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

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: KNYPMT0101AB.**"

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 22.94 cm between the radiator and your body.

FCC Notification of Power Warning

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

The antennas used **MUST** provide a separation distance of at least 22.94 cm from all persons and **MUST NOT** be co-located or operate in conjunction with any other antenna or transmitter.

Argentina CNC**Identificación CNC**

- **Z9-P / Z9-PE:** Contiene CNC ID: C-21612

Brazil**ADENDO AO MANUAL****Z9-PE; Z9-P; Z9-PC; Z9-PC-SR001; Z9-P2; Z9-PE2****Atendimento à Regulamentação Anatel**

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

Este produto está homologado pela ANATEL, de acordo com os procedimentos regulamentados pela Resolução 242/2000, e atende aos requisitos técnicos aplicados.

Para maiores informações, consulte o site da ANATEL www.anatel.gov.br

**03838-18-02478****ISED 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. CAN ICES-3 (A)/NMB-3(A)

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. CAN ICES-3 (A)/NMB-3(A)

ISED Host Installation and Label

The content of this documentation covers FreeWave Technologies, Inc. models sold under IC: 2329B-PMT0101AB.

When any FreeWave Technologies, Inc. module is placed inside a Host, a label must be placed on the outside of the Host. The label must include the text "**Contains IC: 2329B-PMT0101AB**".

ISED Radiation Exposure Statement

This system has been evaluated for RF Exposure per RSS-102 and is in compliance with the limits specified by Health Canada Safety Code 6. The system must be installed at a minimum separation distance from the antenna to a general bystander of 7.9 inches (20cm) to maintain compliance with the General Population limits.

L'exposition aux radiofréquences de ce système a été évaluée selon la norme RSS-102 et est jugée conforme aux limites établies par le Code de sécurité 6 de Santé Canada. Le système doit être installé à une distance minimale de 7.9 pouces (20cm) séparant l'antenne d'une personne présente en conformité avec les limites permises d'exposition du grand public.

Professional Installation

All models sold under the listed IC ID must be professionally installed.

Mexico IFETEL

Z9-P Número IFETEL: RCPFRZ917-1310-A4.

Z9-PE Número IFETEL: RCPFRZ917-1310.

La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

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Thailand

“เครื่องโทรคมนาคมและอุปกรณ์นี้มีความสอดคล้องตามมาตรฐานหรือข้อกำหนดทางเทคนิคของกสทช”

This telecommunication equipment conforms to the standard or technical requirements of NBTC.

“เครื่องวิทยุคมนาคมนี้มีระดับการแผ่คลื่นแม่เหล็กไฟฟ้าสอดคล้องตามมาตรฐานความปลอดภัยต่อสุขภาพของมนุษย์จากการใช้เครื่องวิทยุคมนาคมที่คณะกรรมการกิจการโทรคมนาคมแห่งชาติประกาศกำหนด”

(This radio communication equipment has the electromagnetic field strength in compliance with the Safety Standard for the Use of Radio communication Equipment on Human Health announced by the National Telecommunications Commission.)

UL Power Source

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

- single power source or
- a limited power source (LPS) in accordance with:
 - UL 60950-1
 - IEC/EN 60950-1
 - CAN/CSA C22.2 No. 60950-1-07.
- Input voltage for the Z9-P or Z9-PE is +6 to +30 VDC.

Z9-PE Only

When installed in a Restricted Access Location, Max ambient of +75C operating temperature is declared.

When installed in a non-Restricted Access Location, Max ambient of +69C operating temperature is declared.



Caution, Hot Surface

Note: This applies to equipment located in the Restricted Access Location where surface temperatures may reach +75C.

UL and Safety Notification

Z9-P is a Recognized component under UL File Numbers: e484141 and e327789.



Z9-PE is a Listed component under UL File Numbers: e484141 and e327789.



E484141

Power Source

- Z9-P or Z9-PE IS intended to be operated from a Limited Power Source (LPS) or Class 2 power source in accordance with IEC/EN/UL 60950-1 and CAN/CSA C22.2 No. 60950-1-07.
- The Z9-P or Z9-PE IS approved to operate with an input voltage range of +6 to +30 VDC.

Standards and Editions

- HazLoc Standards
 - ANSI / ISA-12.12.01-2015
 - CAN / CSA C22.2 No. 213-15
 - Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations
- Ordinary Location Standards
 - UL 60950, 2nd Edition
 - CAN / CSA-C22.2 No. 60950, 2nd Edition
 - IEC 60950, 2nd Edition
 - EN 60950, 2nd Edition
- Essential Health and Safety Requirements related to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to Directive 2014/34/EU of the European Parliament and the Council. Compliance with:
 - EN 60079-0:2012 + A11:2013
 - EN 60079-15:2010
 - **DEMKO 16 ATEX 1705X** Rev 1
 -  II 3 G Ex nA IIC T5/T6 Gc

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.
- The T6 Tcode is allowed when used in a maximum rated ambient temperature of 60°C.
- The T5 Tcode is allowed when used in a maximum rated ambient temperature of 75°C.

Installation Instructions

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D OR non-hazardous locations only.



Warning! EXPLOSION HAZARD – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS DEBRANCHER A MOINS QUE L'ALIMENTATION N'AIT ETE COUPEE OU QUE L'ENDROIT SOIT CONNE POUR ETRE NON DANGEREUX.

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- This equipment is intended to be mounted within a suitable enclosure that is only accessible with the use of a tool.
 - An SD memory card shall not be used.

FREEWÄVE 