FREEWAVE

ZumLink™

Covers Models: Z9-P, Z9-PE, and Z9-PE-GREY

Firmware 1.1.0.1

User & Reference Manual

Part Number: LUM0076AA
Revision: Sep-2018

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.

Warning! Do not remove or insert any of the cables while the unit is powered on unless the area is known to be free of ignition concentrations of flammable gasses or vapors.

Warranty Information

FreeWave Technologies, Inc. warrants the FreeWave® ZumLink Z9-P or Z9-PE or Z9-PE-GREY (Product) that you have purchased against defects in materials and manufacturing for a period of two years from the date of shipment, depending on model number. In the event of a Product failure due to materials or workmanship, FreeWave will, at its discretion, repair or replace the Product. For evaluation of Warranty coverage, return the Product to FreeWave upon receiving a Return Material Authorization (RMA). The replacement product will remain under warranty for 90 days or the remainder of the original product warranty period, whichever is longer.

IN NO EVENT WILL FREEWAVE TECHNOLOGIES, INC., ITS SUPPLIERS, OR ITS LICENSORS BE LIABLE FOR ANY DAMAGES ARISING FROM THE USE OF OR INABILITY TO USE THIS PRODUCT. THIS INCLUDES BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, INABILITY TO ACCESS OR SEND COMMUNICATION OR DATA, PERSONAL INJURY OR DAMAGE, OR OTHER LOSS WHICH MAY ARISE FROM THE USE OF THIS PRODUCT. THE WARRANTY IS EXCLUSIVE AND ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE ARE EXPRESSLY DISCLAIMED.

FreeWave's Warranty does **not apply** in the following circumstances:

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

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.

Warning! The Z9-PE and Z9-PE-GREY are sold as a fully enclosed device, assembled at the FreeWave factory. Opening the device voids the FreeWave warranty.

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Table of Contents

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 moreinfo@freewave.com.

Additional Information

Note: Use the http://support.freewave.com/ website to download the latest documentation for Z9-P / Z9-PE / Z9-PE-GREY.
Registration is required to use this website.

Document Styles

This document uses these styles:

- 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: **xxxxxxxxx**.

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 Z9-P / Z9-PE / Z9-PE-GREY.

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

- Z9-P is a board level 900MHz Ethernet radio.
- Z9-PE and Z9-PE-GREY are enclosed 900MHz Ethernet radios.

The Z9-P / Z9-PE / Z9-PE-GREY 900MHz Series:

- Operates in the unlicensed 900MHz 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 ZumIQ, 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

ZumLink uses Listen Before Talk (LBT) and Carrier Sense Multiple Access (CSMA) where there are no assigned slots. The radios transmit when the channel is clear.

- The Gateway broadcasts packets to all Endpoints within range.
- The Endpoints unicast packets back to the Gateway.
- The Gateway acknowledges the Endpoint 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 in the most demanding RF environments:

1.2.1. 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.

1.2.2. Forward Error Correction

- The fecRate (on page 212) increases the reliability of the data transferred over the air at the cost of some transmission throughput.
  - Improves sensitivity by 3dB to maximize range and 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.

1.2.3. Packet Aggregation

- The aggregateEnabled (on page 210) 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.

1.2.4. Packet Compression

- When the compressionEnabled (on page 211) 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. ZumIQ Application Environment

ZumLink provides the ZumIQ 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 / Z9-PE / Z9-PE-GREY.

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

2. Included & User-supplied Equipment

2.1. Included Equipment

Included Equipment	
Qty	**Description**
1	Z9-P / Z9-PE / Z9-PE-GREY wireless device.
1	Power Cable with flying leads • Z9-P (FreeWave Part Number: ASC2402PT) • Z9-PE (FreeWave Part Number: ASC0003ZL) • Z9-PE-GREY (FreeWave Part Number: ASC0003TH)
1	Quick Start Guide

Note: See the Available Accessories (on page 392).

2.2. User-supplied Equipment

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

> **Note**: **See Approved Antennas (on page 189) for detailed information.
> Approved antennas can be purchased directly from FreeWave.

3. Port Connections and Pinout Assignments

Port Connections

Pinout Assignments

3.1. Z9-P Port Connections

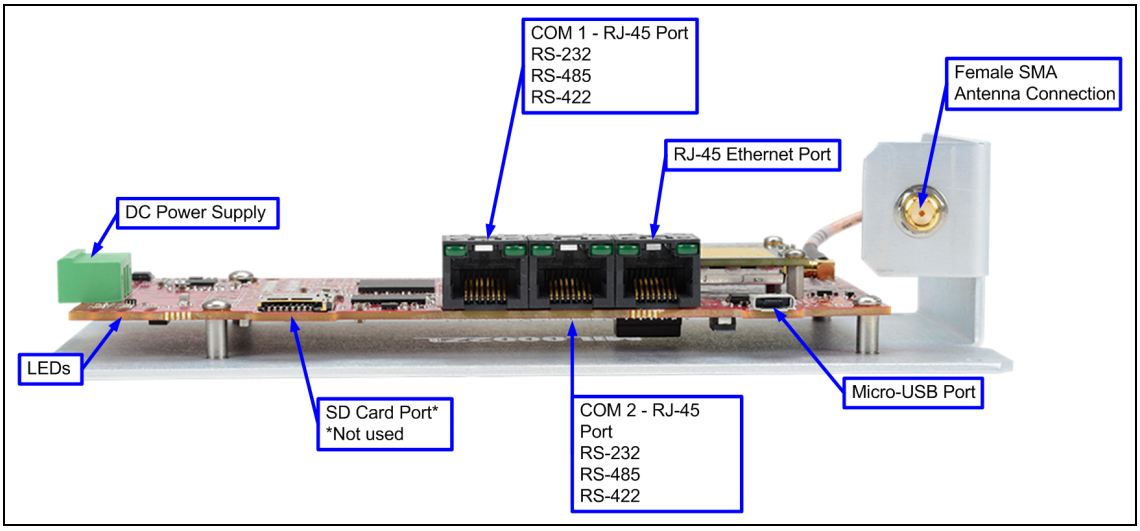


Figure 1: Z9-P Port Connections

3.2. Z9-PE Port Connections

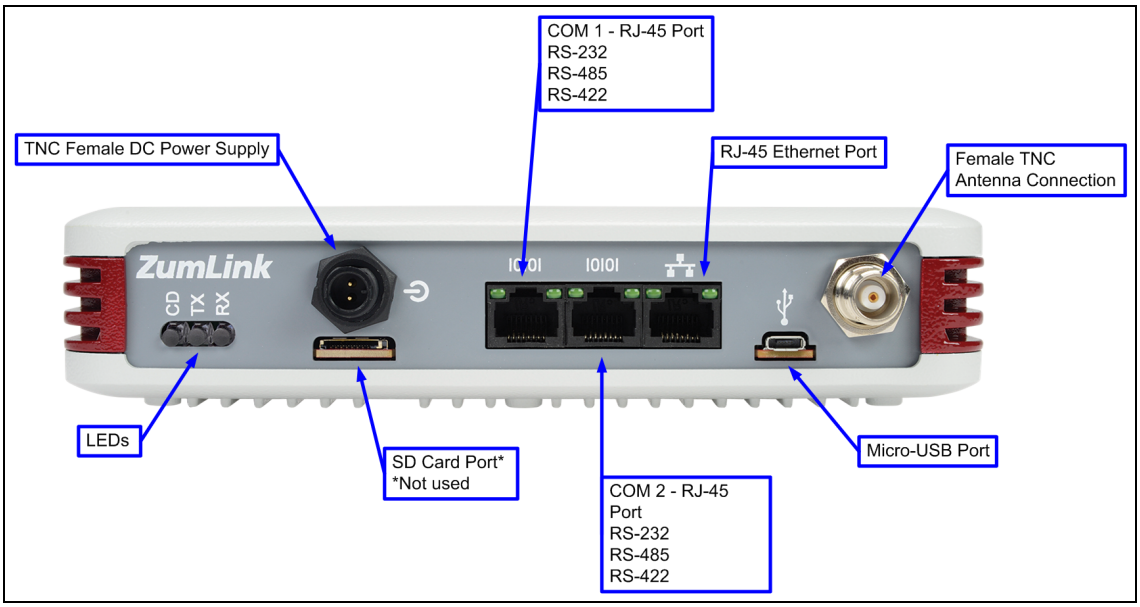


Figure 2: Z9-PE Port Connections

3.3. Z9-PE-GREY Port Connections

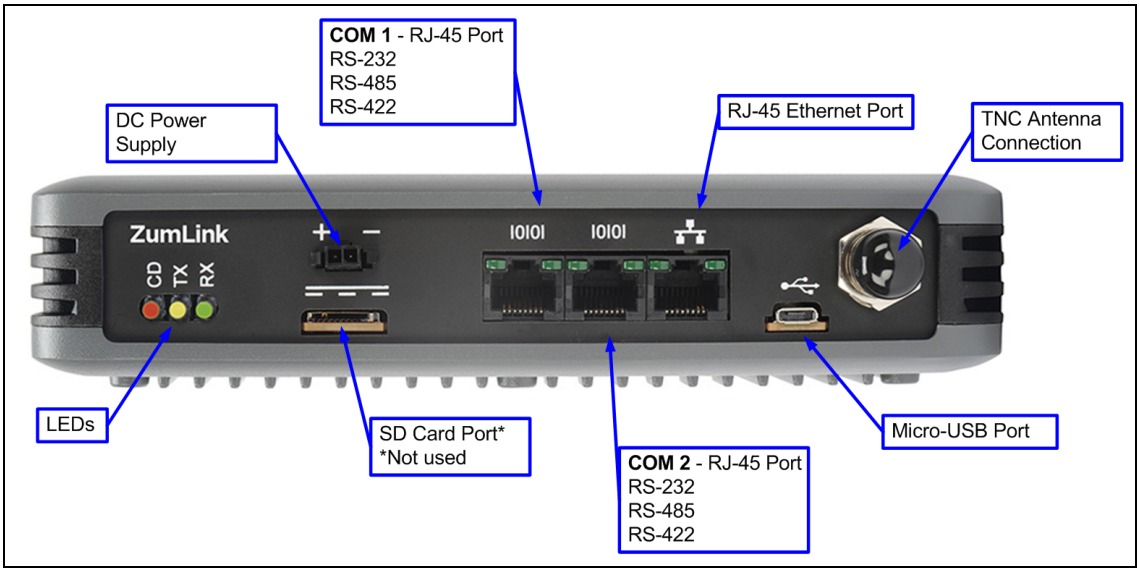


Figure 3: Z9-PE-GREY Port Connections

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 435) for additional information.

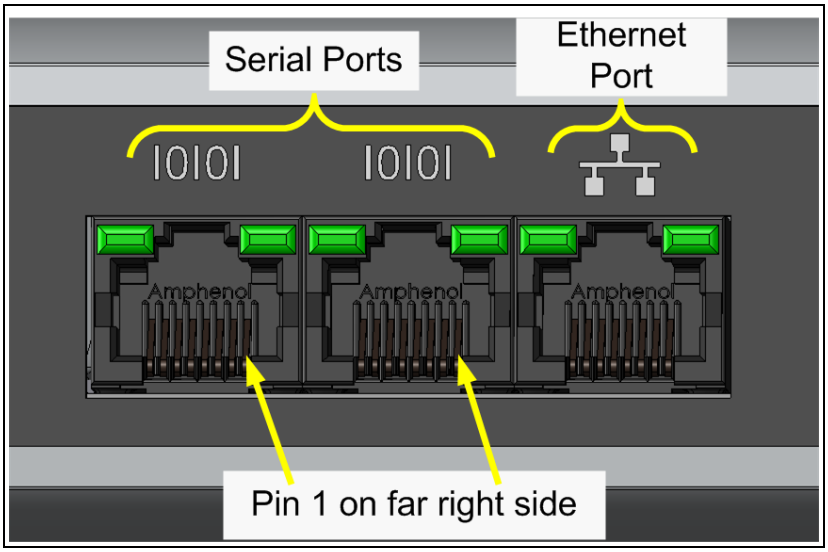


Figure 4: Serial and Ethernet Ports - Z9-P / Z9-PE / Z9-PE-GREY

3.5. Serial Pinout Assignments

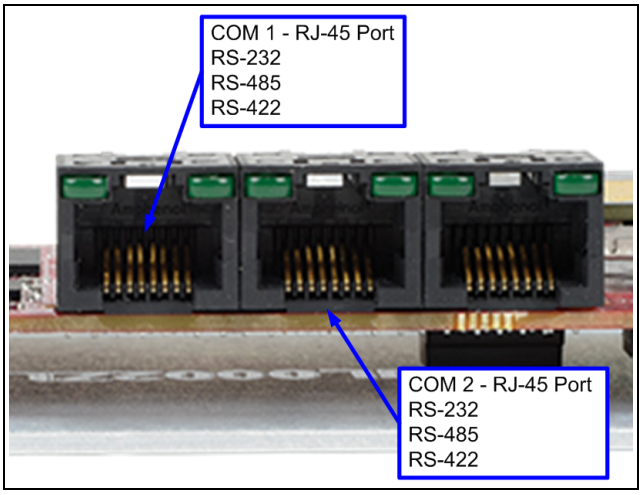


Figure 5: Z9-P Serial Pinout Assignments

(I) - Input (O) - Output (B) - Bidirectional

Z9-P 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)	RX+ (Y+) --- (B)	RX+ (Y+) --- (I)
7	CTS --- (O)	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 191) section 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

4.1. Power Setup

- The Z9-P / Z9-PE / Z9-PE-GREY is approved to operate with an input voltage range of +6 to +30 VDC (+/- 10%) that can supply at least 0.8 Amps.
- See the Technical Specifications (on page 430) for additional information.

FREEWAVE Recommends: All input power supply wires should be at least **20AWG** 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 radio from electric shock and provide filtered conditioned power with over-voltage protection.

4.2. Installation

Note: The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. Install an FCC-approved antenna.
2. Connect the antenna feed line to the ZumLink.

Warning! Only FCC approved antennas may be used. See Approved Antennas (on page 189).
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.

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

3. Connect the Z9-P / Z9-PE / Z9-PE-GREY to a power supply.

Note: The Z9-P / Z9-PE / Z9-PE-GREY is approved to operate with an input voltage range of +6 to +30 VDC (+/- 10%) that can supply at least 0.8 Amps.

FREEWAVE Recommends: All input power supply wires should be at least **20AWG** 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.

The LED lights blink to show startup.

Note: See LEDs (on page 435) for more information.

4. Connect the USB cable to the computer and the Micro USB end to the Z9-P / Z9-PE / Z9-PE-GREY.

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

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

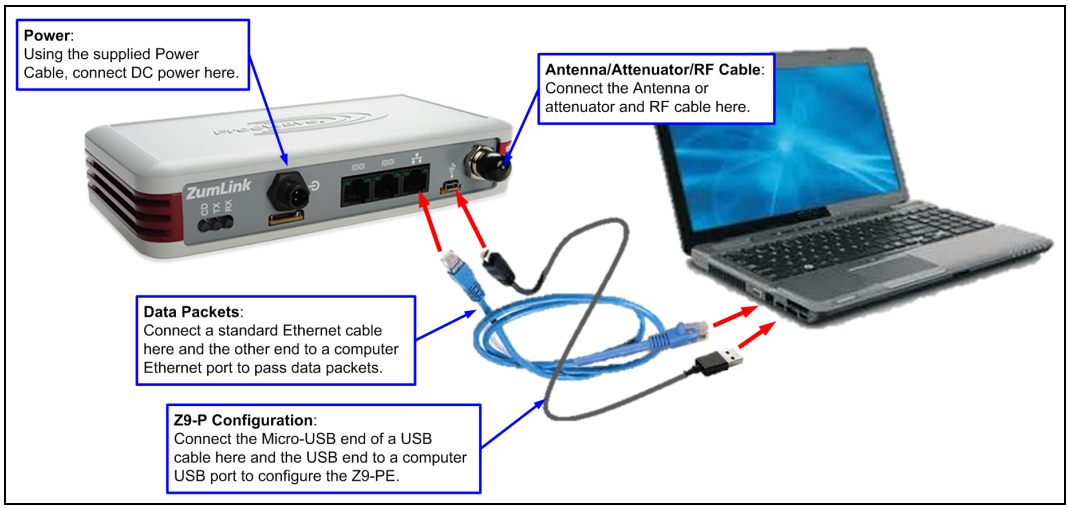


Figure 6: Z9-PE Connected to Laptop

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

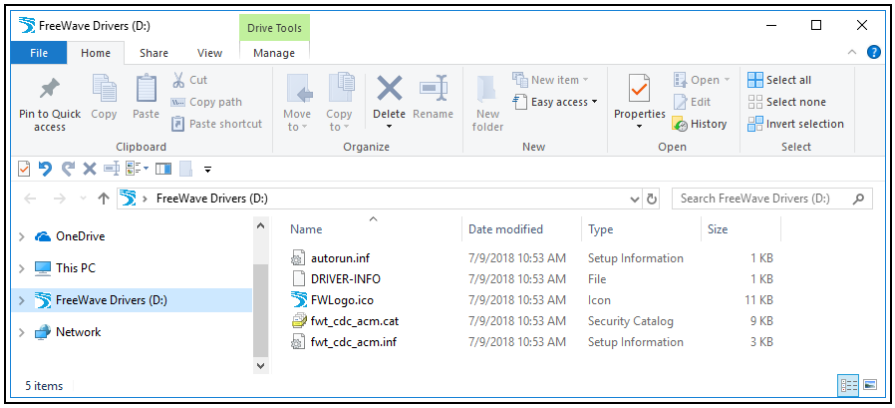


Figure 7: AutoPlay FreeWave Drivers window

Important!: The driver installs automatically.

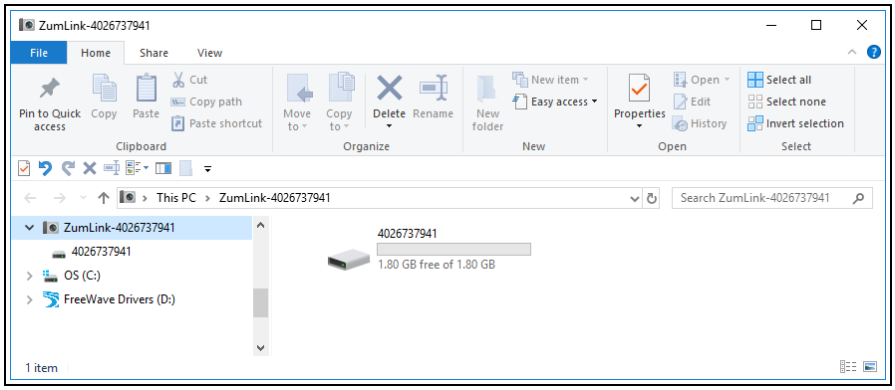


Figure 8: ZumLink window

5. Optional: Use the Ethernet port for data communications.
6. Continue with:
   - Firmware Upgrade (on page 28)
   - Drag and Drop Configuration - ZumLink (on page 53)
   - CLI Configuration (on page 65)
   - Web Interface Configuration (on page 75)

5. Firmware Upgrade

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

These are the basic steps to upgrade the Z9-P / Z9-PE / Z9-PE-GREY firmware:

A. Download the Upgrade File (on page 29)
B. Optional: Download the ZumIQ Application Environment (on page 88)
C. Review the Upgrade Summary - v1.1.01 (on page 32) to know which files are used to upgrade from a previous firmware version.
D. Complete either the:
Firmware Upgrade - Drag and Drop (on page 35) or
Firmware Upgrade - Web Interface (on page 41)

5.1. Download the Upgrade File

Note: The images in this procedure are for Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. Click http://support.freewave.com/.
   The **Login** window opens.

   Important!: Registration is required to use this website.

2. Enter the **User Name** and **Password**.

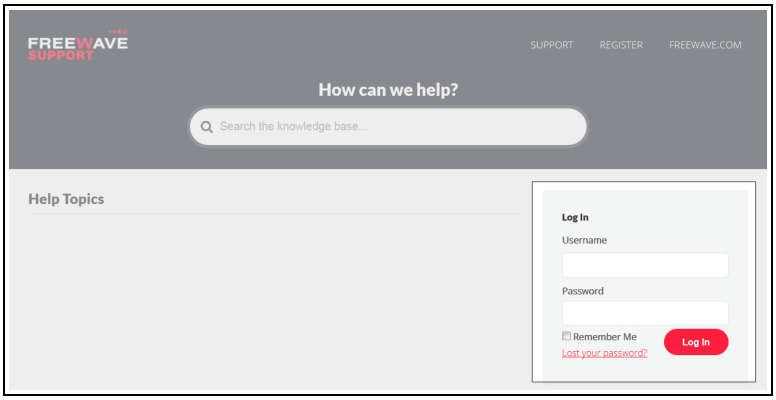


Figure 9: FreeWave Login window

3. Click  .
   A successful Login message briefly appears.
   The **Help Topics** window opens.
4. Click the **Firmware** link. (Figure 10)

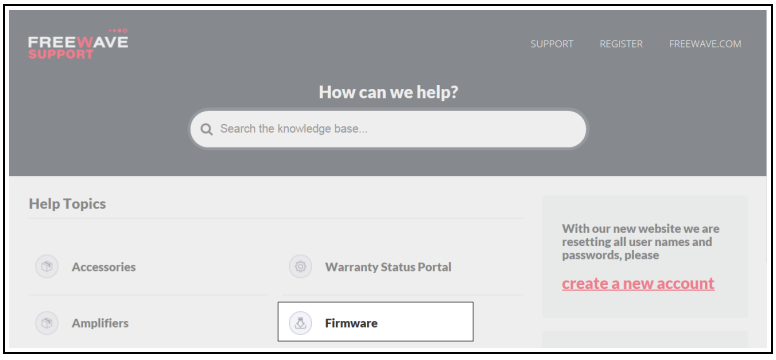


Figure 10: Help Topics window

   The **Firmware** window opens.
5. Click the **ZumLink Firmware** link. (Figure 11)

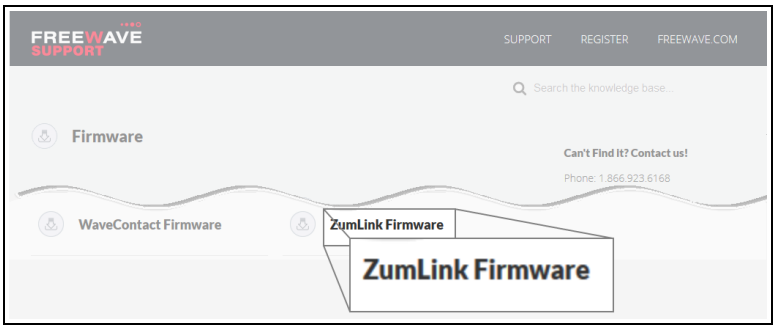


Figure 11: Firmware window

The available firmware/software appears in the window. (Figure 12)

Figure 12: Z9-P / Z9-PE / Z9-PE-GREY Firmware window

6. Click the firmware/software link.
   The **Firmware Upgrade** window opens.
7. Select and click the **Firmware_v1_1_0_1** attachment. (Figure 13)

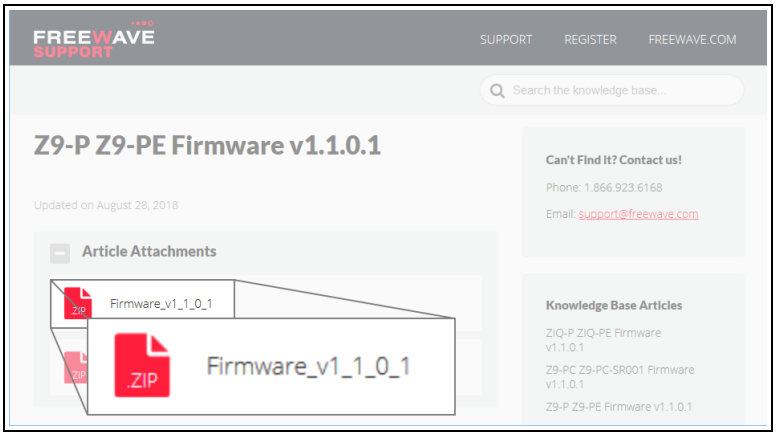


Figure 13: Z9-P / Z9-PE / Z9-PE-GREY Firmware Upgrade window with selected Firmware v1_1_0_1 Attachment

The **Opening** dialog box opens. (Figure 14)

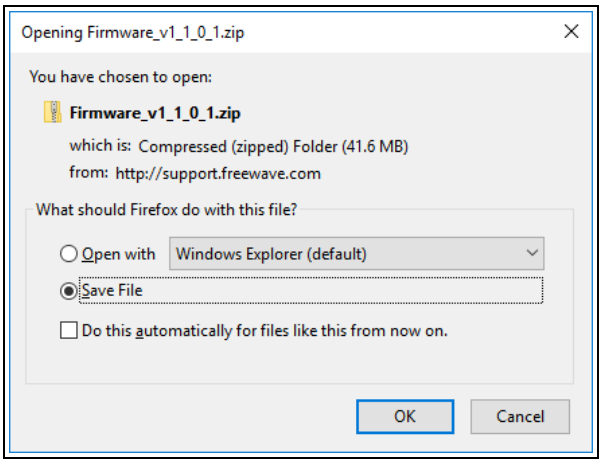


Figure 14: Opening Firmware v1_1_0_1.zip dialog box

8. Click **OK**.
   The **Enter name of file to save to** dialog box opens. (Figure 15)

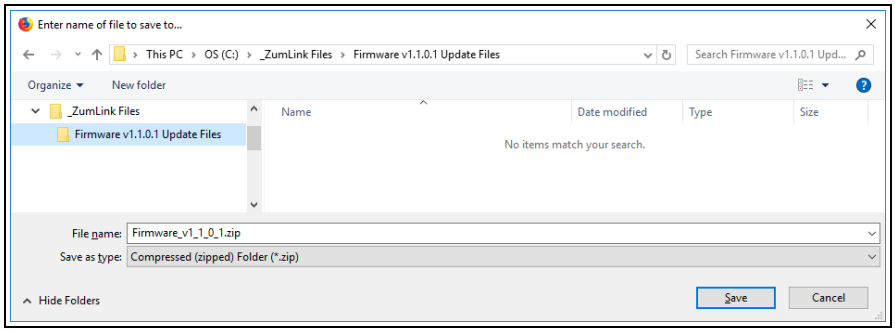


Figure 15: Enter name of file to save to dialog box

9. 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.
10. Either:
    a. Continue with Optional: Download the ZumIQ Application Environment (on page 88) or
    b. Open a Windows® Explorer window and find the location where the **Firmware v1_1_0_1.zip** file was saved.
11. Double-click the **.zip** file.
12. Extract the files from the **.zip** file into the parent location.

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

13. Continue with Upgrade Summary - v1.1.01 (on page 32).

5.2. Upgrade Summary - v1.1.01

5.2.1. Downgrade

Contact FreeWave Technical Support (on page 13) for firmware **DOWNGRADE** assistance.

5.2.2. Upgrade

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

The **UPGRADE** options are:

- Upgrade from Firmware v1.0.7.0 (on page 33)
- Upgrade from Firmware v1.0.6.0 (on page 33)
- Upgrade from Firmware v1.0.4.3 (Z9-PC and Z9-PC-SR001) (on page 34)
- Upgrade from Firmware v1.0.4.2 (Z9-P and Z9-PE) (on page 34)

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

- Firmware Upgrade - Drag and Drop (on page 35)
- Firmware Upgrade - Web Interface (on page 41)

5.2.3. Upgrade from Firmware v1.0.7.0

Required Files

1_Device_Firmware_v1_1_0_1.pkg
2_Radio_Firmware_v1_0_7_1.fcf

Optional: ZumIQ Files

3_Optional_ZumIQ_Environment_v1_1_0_0.pkg

Important!: Contact FreeWave Technical Support (on page 13) for the ZumIQ license.

5.2.4. Upgrade from Firmware v1.0.6.0

Required Files

1_Device_Firmware_v1_1_0_1.pkg
2_Radio_Firmware_v1_0_7_1.fcf

Optional: ZumIQ Files

3_Optional_ZumIQ_Environment_v1_1_0_0.pkg

- The ZumIQ license is preserved

Note: ZumIQ can be added anytime in future.

FREEWAVE Recommends: If currently using the v1.0.6.0 developer environment, an upgrade to **3_Optional_ZumIQ_Environment_v1_1_0_0.pkg** is NOT required.

5.2.5. Upgrade from Firmware v1.0.4.3 (Z9-PC and Z9-PC-SR001)

Required Files

1_Device_Firmware_v1_1_0_1.pkg
2_Radio_Firmware_v1_0_7_1.fcf

Optional: ZumIQ Files

3_Optional_ZumIQ_Environment_v1_1_0_0.pkg

> **Note**: ZumIQ can be added anytime in future.
> Contact FreeWave Technical Support (on page 13) for the ZumIQ license.

5.2.6. Upgrade from Firmware v1.0.4.2 (Z9-P and Z9-PE)

Required Files

1_Device_Firmware_v1_1_0_1.pkg
2_Radio_Firmware_v1_0_7_1.fcf

Optional: ZumIQ Files

3_Optional_ZumIQ_Environment_v1_1_0_0.pkg

> **Note**: ZumIQ can be added anytime in future.
> Contact FreeWave Technical Support (on page 13) for the ZumIQ license.

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

- Firmware Upgrade - Drag and Drop (on page 35)
- Firmware Upgrade - Web Interface (on page 41)

5.3. Firmware Upgrade - Drag and Drop

This is the drag-and-drop procedure to upgrade the Z9-P / Z9-PE / Z9-PE-GREY firmware.

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

- Alternatively, use the Firmware Upgrade - Web Interface (on page 41) to upgrade the Z9-P / Z9-PE / Z9-PE-GREY.
- The images in this procedure are for Windows® 10 and/or Firefox®.
  The dialog boxes and windows appear differently on each computer.

FREEWAVE Recommends: Upgrade to v1.1.0.1 to use the enhanced features and updated security of the Z9-P / Z9-PE / Z9-PE-GREY.
Prior to an upgrade or downgrade procedure, save and backup all applications.

Caution: This procedure requires the Windows® Explorer file extension to be visible.
See the Microsoft® topic Show or Hide File Name Extensions to view the extensions.

1. Verify the Download the Upgrade File (on page 29) procedure is complete.
2. Connect the USB cable to the computer and the Micro USB end to the Z9-P / Z9-PE / Z9-PE-GREY Micro-USB port.
   The **FreeWave Drivers** and **ZumLink** windows open.

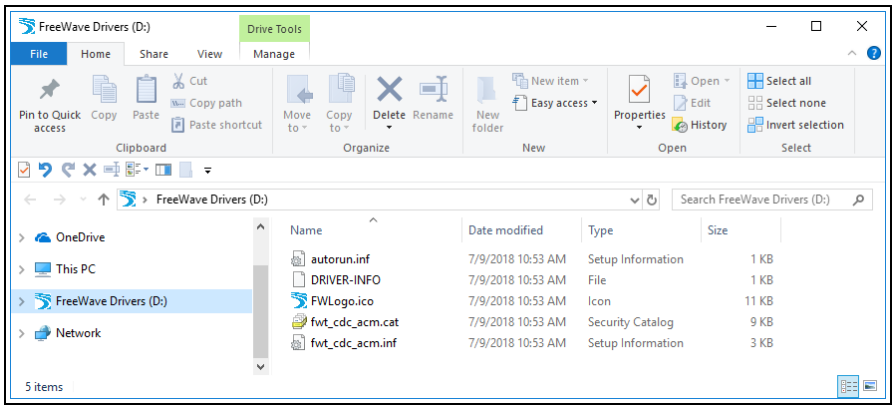


Figure 16: FreeWave Drivers window

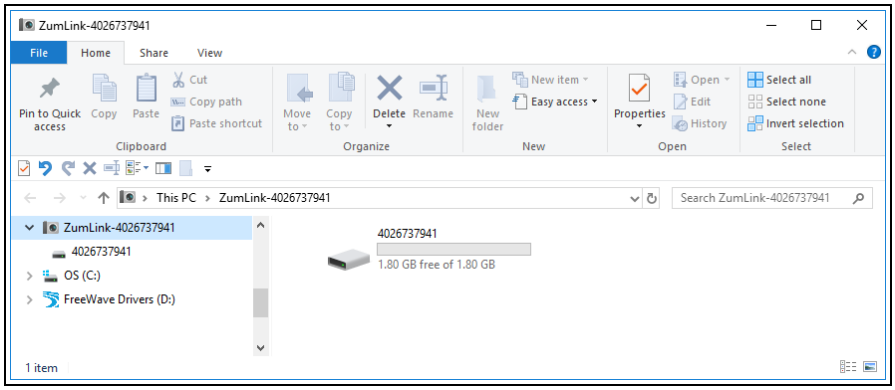


Figure 17: ZumLink window

3. In the **ZumLink** window, double-click the connected Z9-P / Z9-PE / Z9-PE-GREY. The files of the Z9-P / Z9-PE / Z9-PE-GREY appear in the window. (Figure 18)

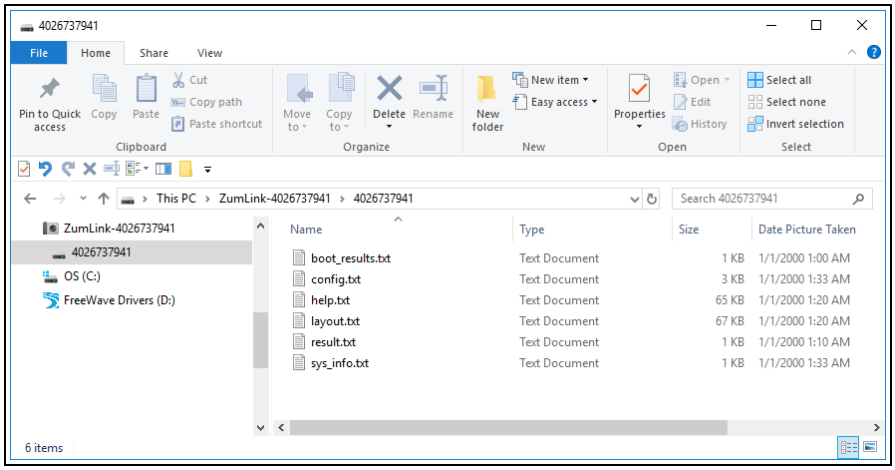


Figure 18: Opened ZumLink window showing the Default Files

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 upgrade process in case the old **config.txt** file needs to be restored.

5. Locate and select the downloaded **1_Device_Firmware_v1_1_0_1.pkg** upgrade file. (Figure 19)

> **Caution**: 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, Windows® 8.1, and Windows® 10.
> Failure to save the file with the correct extension type results in the copied file **NOT** integrating with the Z9-P / Z9-PE / Z9-PE-GREY.

6. If using some versions of Windows® 8, Windows® 8.1, or Windows® 10, change the extension of the **.pkg** file to **.pkg.txt** and select that file.

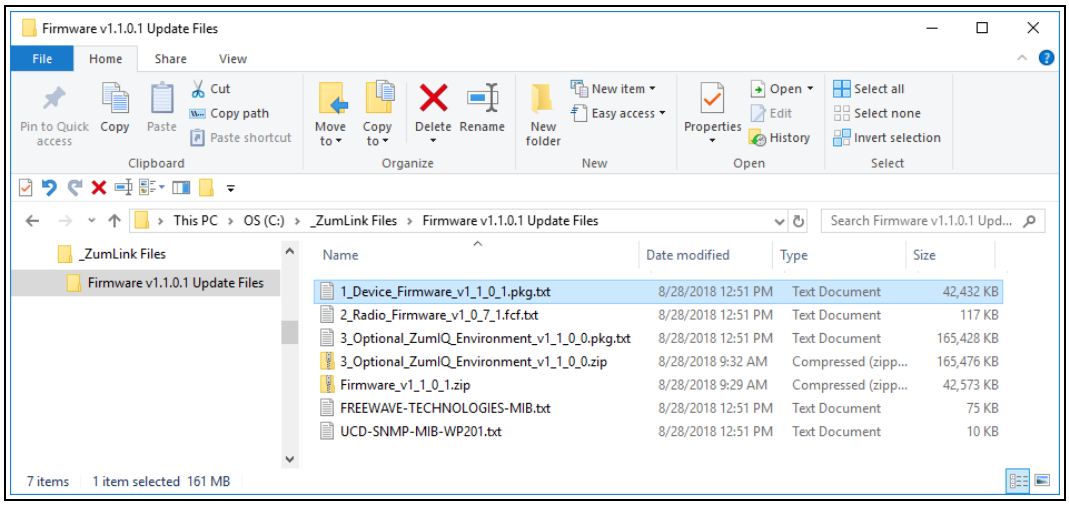


Figure 19: Selected 1_Device_Firmware_v1_1_0_1.pkg.txt File

7. Drag and drop the .pkg or .pkg.txt file on to the **ZumLink** window. (Figure 20)

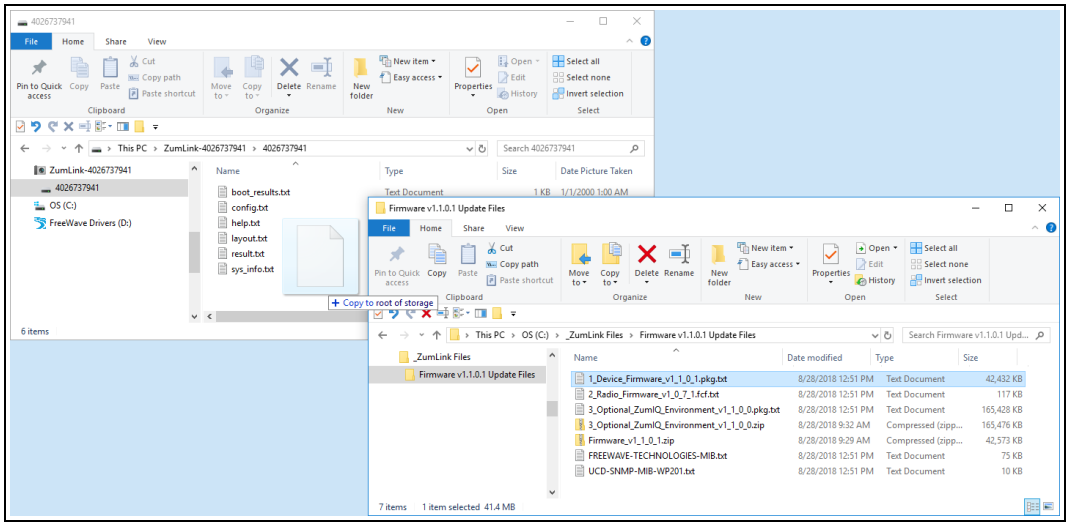


Figure 20: Drag and Drop the .pkg or .pkg.txt file to the ZumLink window

The **ZumLink** window is similar to Figure 21:

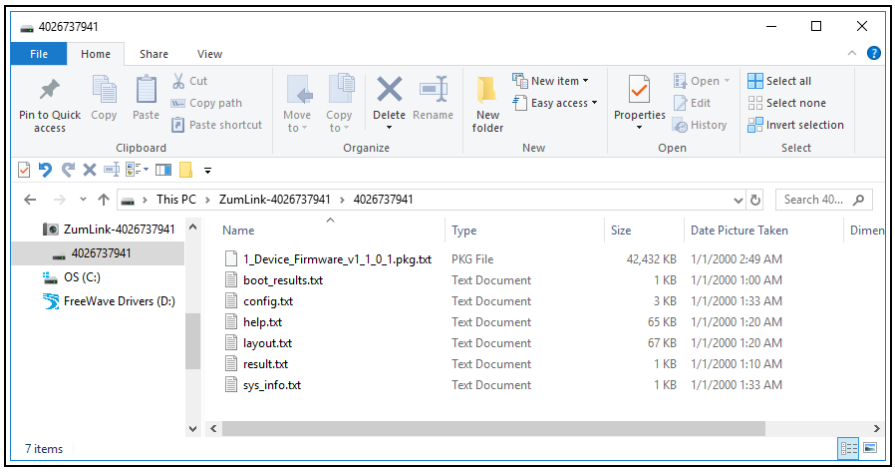


Figure 21: 1_Device_Firmware_v1_1_0_1.pkg.txt File Dropped in the ZumLink window

The .pkg or .pkg.txt file will disappear after approximately 6-10 minutes.

8. **WAIT** a few minutes for the **FreeWave Drivers** and **ZumLink** windows to close. The Z9-P / Z9-PE / Z9-PE-GREY automatically reboots.

Warning! DO NOT remove power from the Z9-P / Z9-PE / Z9-PE-GREY during or immediately after the firmware upgrade process!
Wait until the Home window (on page 351) Web Interface is accessible before removing power from the **ZumLink** device (approximately 6-8 minutes).

If power is removed prematurely during the upgrade process, the Web Interface pages may not be accessible.
Reinstall the .pkg file and **WAIT for the file upgrade process to complete**.

The LEDs (on page 435) indicated the upgrade process.

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

9. In the **ZumLink** window, double-click the connected Z9-P / Z9-PE / Z9-PE-GREY. The files of the Z9-P / Z9-PE / Z9-PE-GREY appear in the window.
10. Locate and select the downloaded 2_Radio_Firmware_v1_0_7_1.fcf upgrade file. (Figure 22)

Caution: 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, Windows® 8.1, and Windows® 10.
Failure to save the file with the correct extension type results in the copied file **NOT** integrating with the Z9-P / Z9-PE / Z9-PE-GREY.

11. If using some versions of Windows® 8, Windows® 8.1, or Windows® 10, change the extension of the **.fcf** file to **.fcf.txt** and select that file.

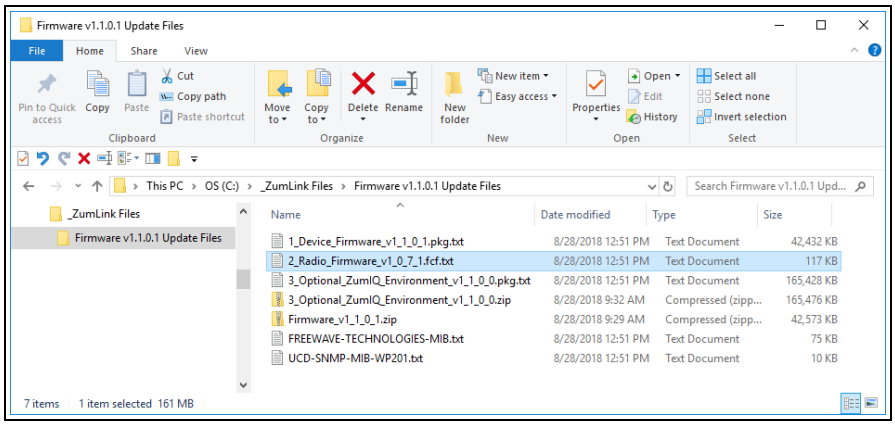


Figure 22: Selected 2_Radio_Firmware_v1_0_7_1.fcf.txt File

12. Drag and drop the **.fcf** or **.fcf.txt** file on to the **ZumLink** window.

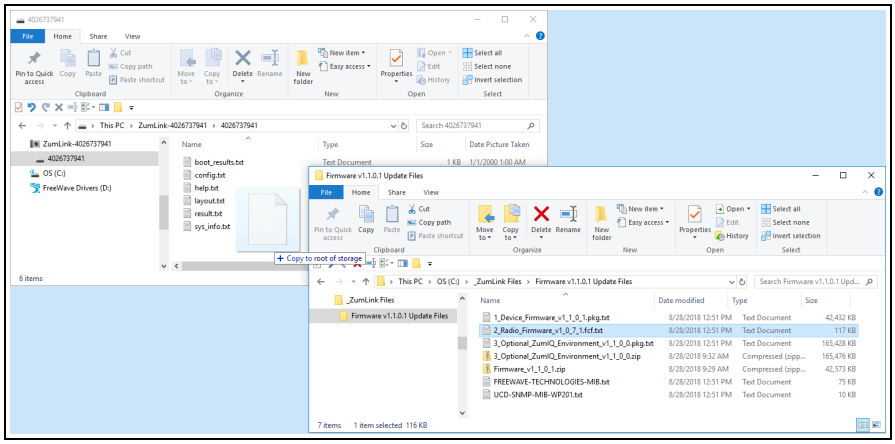


Figure 23: Drag and Drop the .fcf or .fcf.txt file to the ZumLink window

The **.fcf** or **.fcf.txt** file will disappear.

13. Wait for the **.fcf** or **.fcf.txt** file to be applied (≈ 1-2 minutes).

> Tip: The LEDs (on page 435) indicated the upgrade process.

14. Optional: Open the **sys.info.txt** file to verify the upgrade information. (Figure 24)

> **Important!**: The image provides example information only.
> Each Z9-P / Z9-PE / Z9-PE-GREY provides its own unique information.

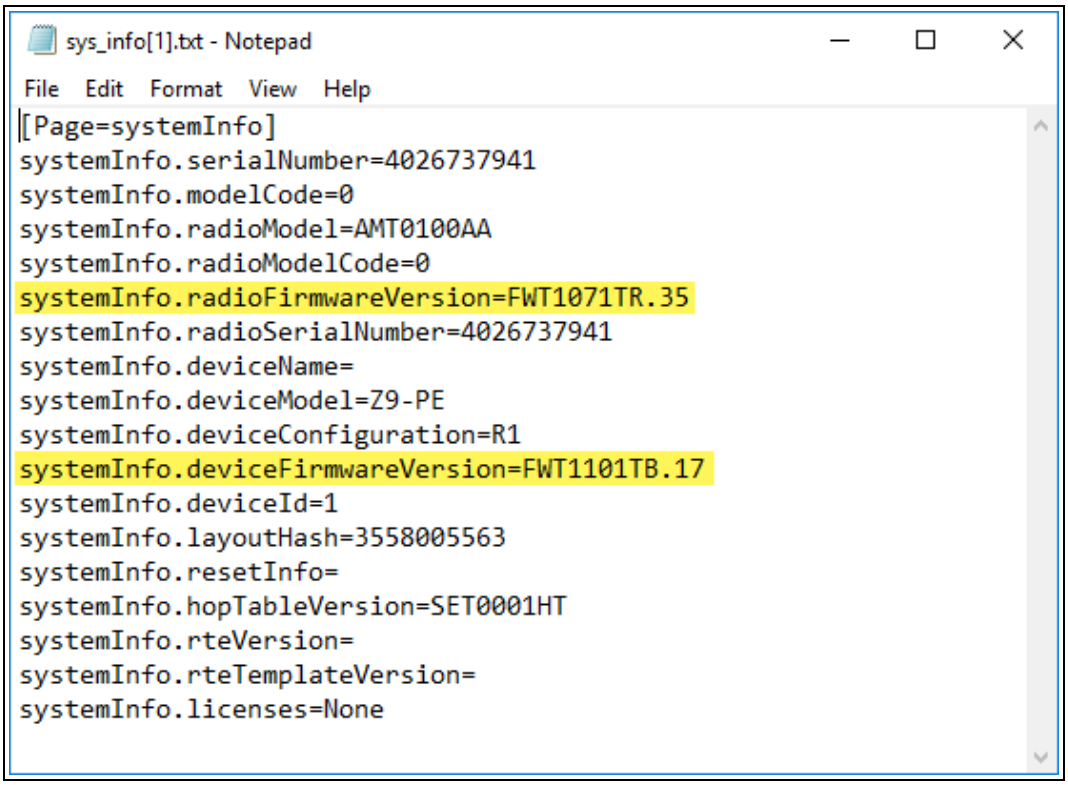


Figure 24: sys.info.txt file with Updated Firmware

Important!: For the v1.1.0.1 upgrade, these parameters should have this information:
systemInfo.radioFirmwareVersion=FWT1071TR.35.
Web Interface - Radio Firmware Version is FWT1071TR.35.
systemInfo.deviceFirmwareVersion=FWT1101TB.17
Web Interface - Device Firmware Version is FWT1101TB.17
If these versions are NOT listed in their respective parameters, repeat the upgrade procedure.

15. Continue with:
    - Optional: Drag and Drop - Installation of ZumIQ Application Environment (on page 90)
    - Drag and Drop Configuration - ZumLink (on page 53)
    - CLI Configuration (on page 65)

5.4. Firmware Upgrade - Web Interface

This procedure uses a web browser window to upgrade the Z9-P / Z9-PE / Z9-PE-GREY firmware.

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

- Alternatively, use the Firmware Upgrade - Drag and Drop (on page 35) to upgrade the Z9-P / Z9-PE / Z9-PE-GREY.
- The images in this procedure are for Windows® 10 and/or Firefox®.
  The dialog boxes and windows appear differently on each computer.

FREEWAVE Recommends: Upgrade to v1.1.0.1 to use the enhanced features and updated security of the Z9-P / Z9-PE / Z9-PE-GREY.
Prior to an upgrade or downgrade procedure, save and backup all applications.

Caution: This procedure requires the Windows® Explorer file extension to be visible.
See the Microsoft® topic Show or Hide File Name Extensions to view the extensions.

The Z9-P / Z9-PE / Z9-PE-GREY upgrade process requires these basic steps:

A. Download the Upgrade File (on page 29)
B. Setup the Computer IP Address Configuration (on page 42)
C. Install the Upgrade File using the Web Interface (on page 46)

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

5.4.1. Setup the Computer IP Address Configuration

Note: The images in this procedure are for Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. On the computer, click the Windows® **Start** button and select **Control Panel**.
2. View the **Control Panel** window by **Category** and click **Network and Sharing Center**. (Figure 25)

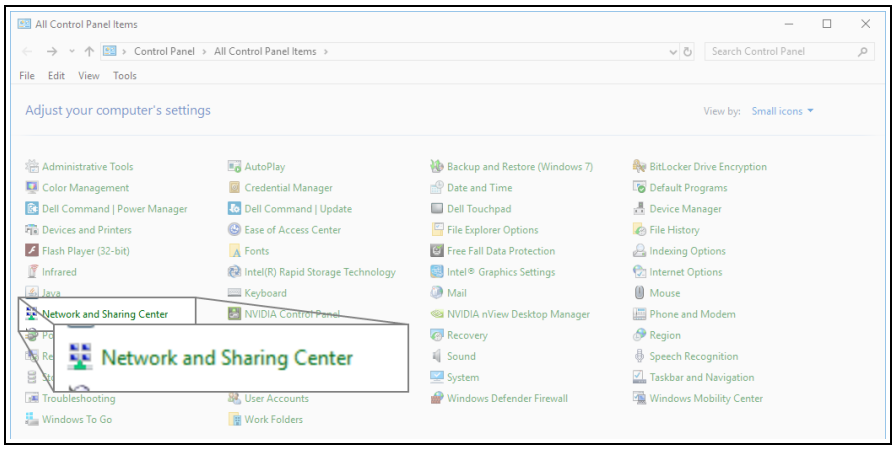


Figure 25: Control Panel > Network and Sharing Center

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

3. Click the **Change Adapter Settings** link. (Figure 26)

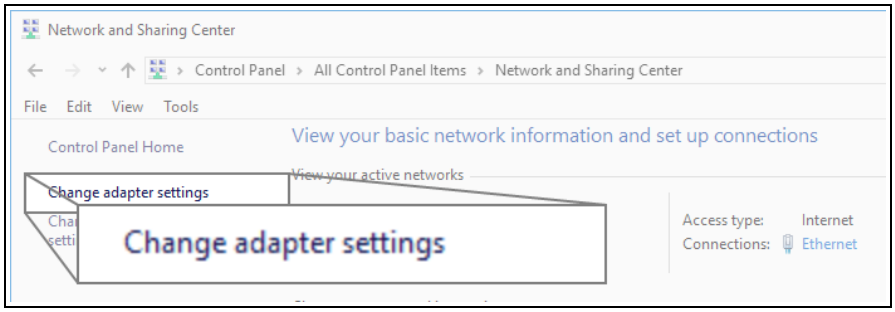


Figure 26: Change Adapter Settings Link

The **Network Connections** window opens. (Figure 27)

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

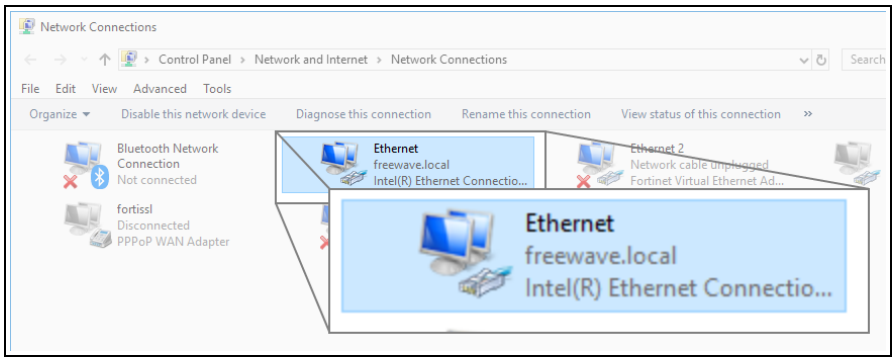


Figure 27: Network Connections window

The **Ethernet Status** dialog box opens. (Figure 28)

5. Click the **Properties** button.

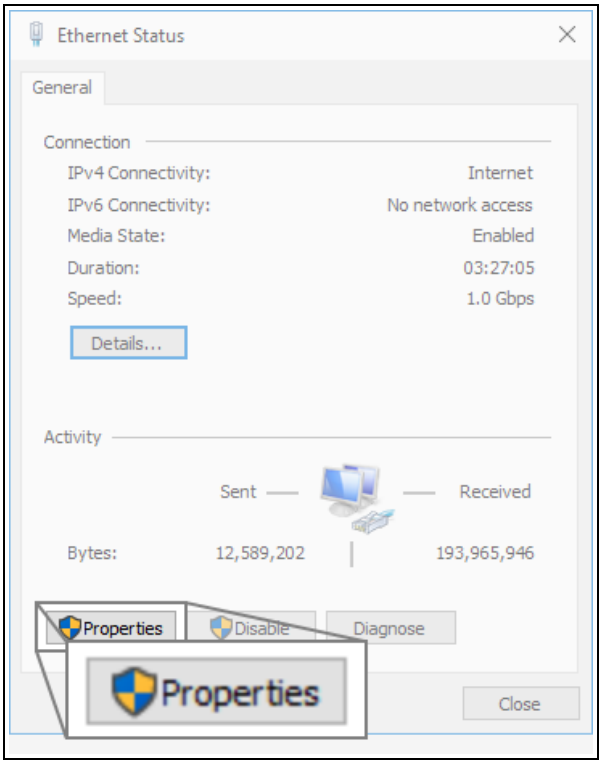


Figure 28: Ethernet Status dialog box

The **Ethernet Properties** dialog box opens.

6. Select the **Internet Protocol Version 4 (TCP/IPv4)** option. (Figure 29)
7. Click the **Properties** button.

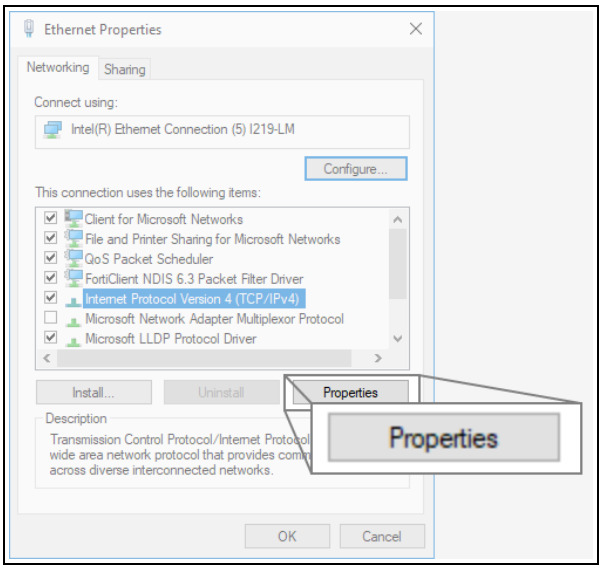


Figure 29: Ethernet Properties dialog box

The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens. (Figure 30)

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

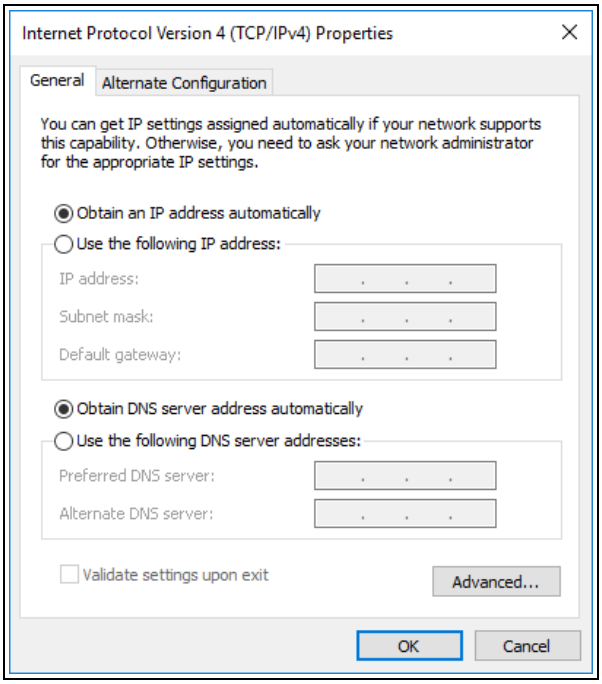


Figure 30: Default Example of Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

9. Select the **Use the following IP address** option button.

10. 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 / Z9-PE / Z9-PE-GREY or all other units in the network. (Figure 31)

> **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 / Z9-PE / Z9-PE-GREY IP Address is **192.168.111.100**.
> The default subnet mask is **255.255.255.0**.

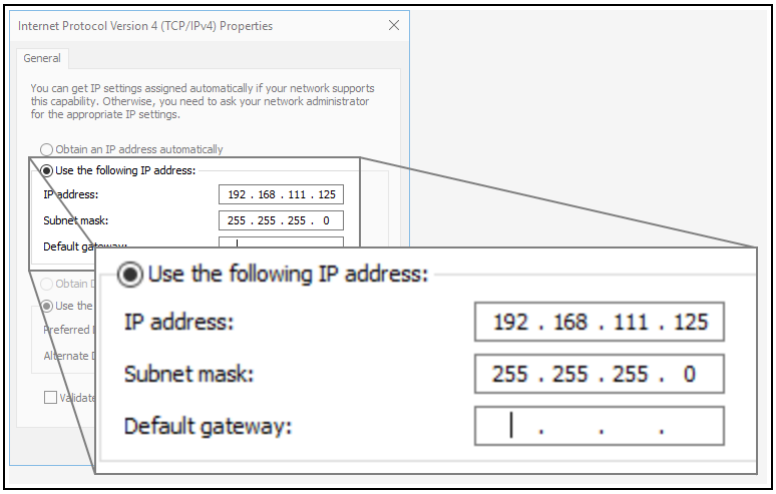


Figure 31: Changed Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

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

11. Click **OK** to save the changes and close the dialog box.
12. Click **Close** twice to close the **Local Area Connection Properties** and **Local Area Connection Status** dialog boxes.
13. Continue with Install the Upgrade File using the Web Interface (on page 46).

5.4.2. Install the Upgrade File using the Web Interface

Note: The images in this procedure are for Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. Verify the Download the Upgrade File (on page 29) procedure is complete.
2. Using a CAT5e / CAT6 Ethernet cable, connect the Z9-P / Z9-PE / Z9-PE-GREY 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 attached Z9-P / Z9-PE / Z9-PE-GREY.

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

5. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
6. On the Menu bar, click the **File Upload** link. (Figure 32)

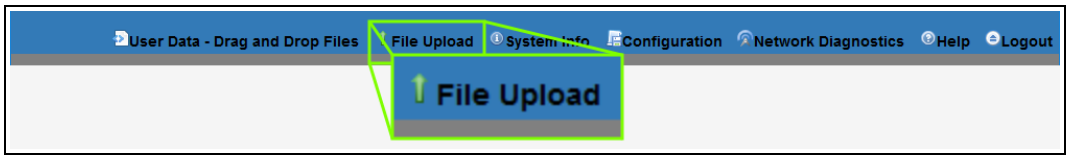


Figure 32: File Upload link

   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.

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

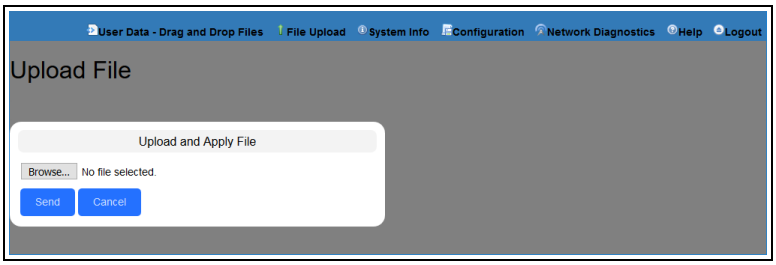


Figure 33: File Upload window

8. Click the **Browse** button.
   The **File Upload** dialog box opens.
9. Locate and select the downloaded **1_Device_Firmware_v1_1_0_1.pkg** upgrade file. (Figure 34)

Caution: 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, Windows® 8.1, and Windows® 10.
Failure to save the file with the correct extension type results in the copied file **NOT** integrating with the Z9-P / Z9-PE / Z9-PE-GREY.

10. If using some versions of Windows® 8, Windows® 8.1, or Windows® 10, change the extension of the .pkg file to .pkg.txt and select that file.

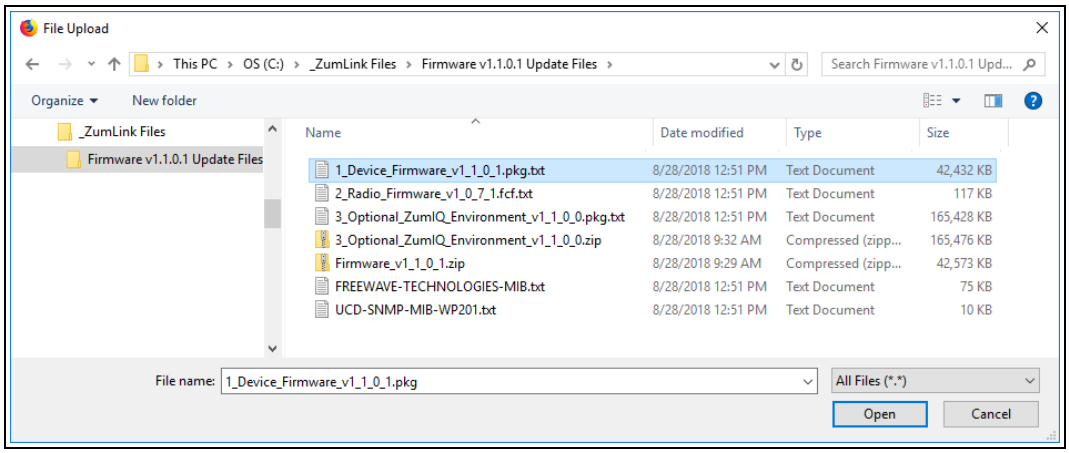


Figure 34: File Upload dialog box with Selected 1_Device_Firmware_v1_1_0_1.pkg.txt File

11. Click **Open**.
The dialog box closes and the **File Upload** window returns showing the selected file. (Figure 35)

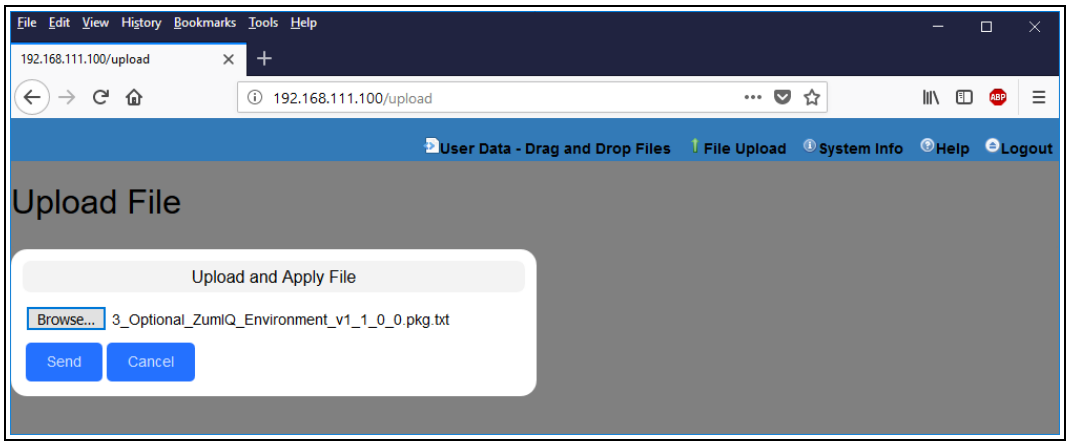


Figure 35: File Upload window with Selected 1_Device_Firmware_v1_1_0_1.pkg.txt File

12. Click **Send**.
The **File Upload** window changes to show the completed upload percentage to the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 36)

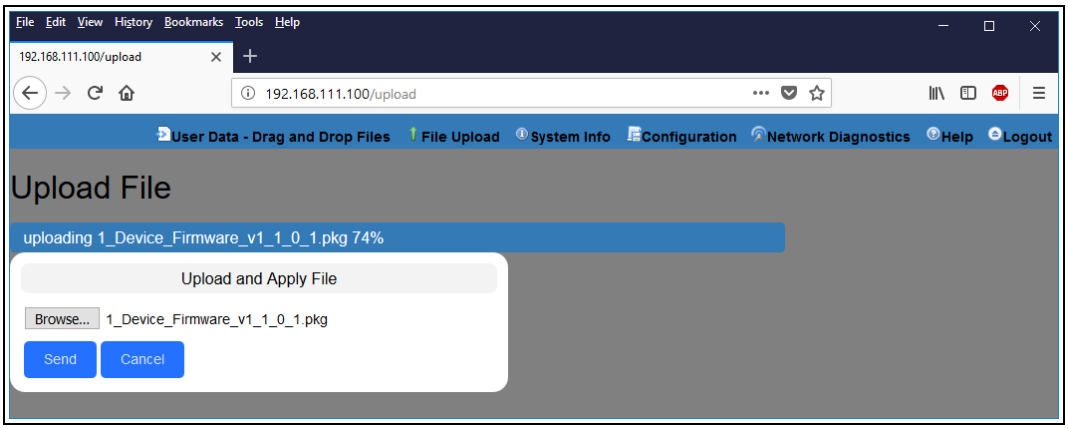


Figure 36: File Upload window Showing Uploading Percentage

13. Wait for the .pkg or .pkg.txt file to be applied (≈ 6-10 minutes).

Warning! DO NOT remove power from the Z9-P / Z9-PE / Z9-PE-GREY during or immediately after the firmware upgrade process!
Wait until the Home window (on page 351) Web Interface is accessible before removing power from the **ZumLink** device (approximately 6-8 minutes).

If power is removed prematurely during the upgrade process, the Web Interface pages may not be accessible.
Reinstall the .pkg file and **WAIT for the file upgrade process to complete**.

The **File Upload** window refreshes and shows the completed and uploaded file applied to the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 37)

The LEDs (on page 435) indicated the upgrade process.

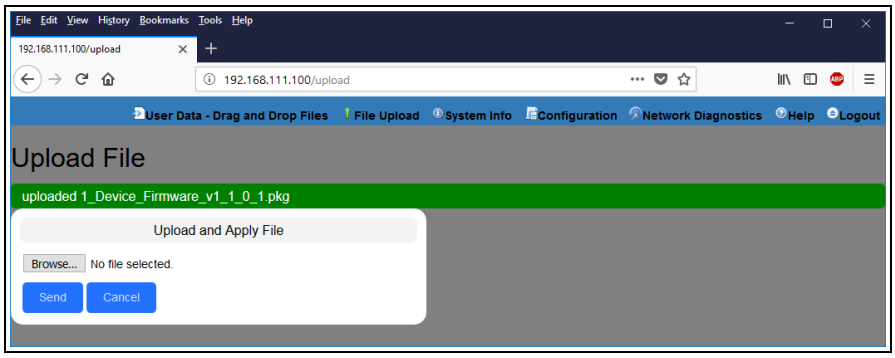


Figure 37: File Upload window Showing Completed Upload of the Selected File

14. Click the **Browse** button.
    The **File Upload** dialog box opens.
15. Locate and select the downloaded **2_Radio_Firmware_v1_0_7_1.fcf** upgrade file. (Figure 38)
16. Optional: If using some versions of Windows® 8, Windows® 8.1, or Windows® 10, change the extension of the **.fcf** file to **.fcf.txt** and select that file.

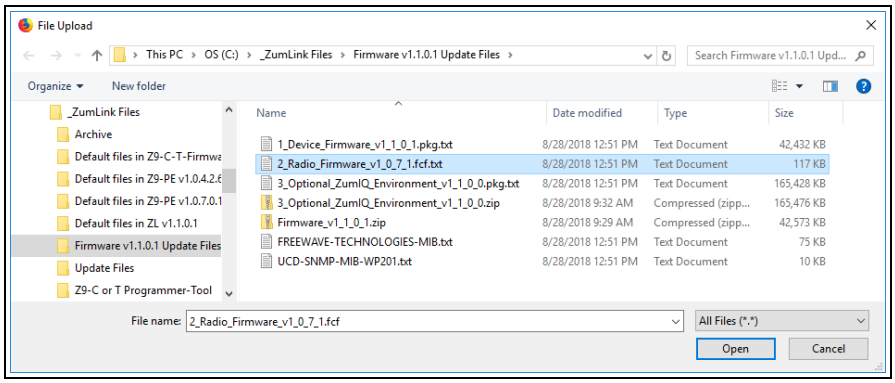


Figure 38: File Upload dialog box with Selected .fcf File

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

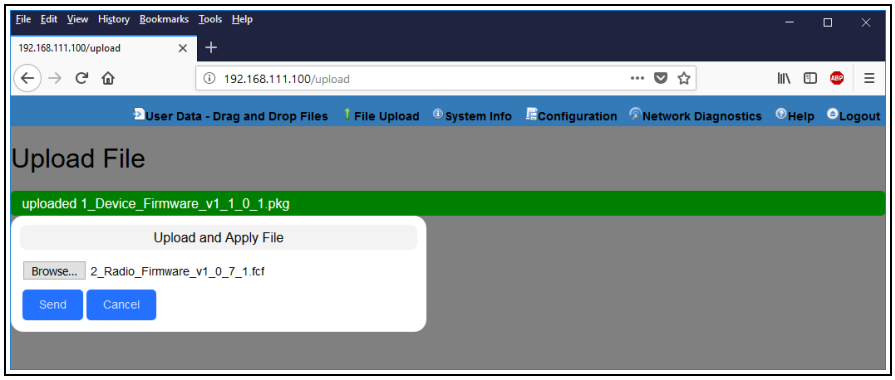


Figure 39: File Upload window with Selected .fcf File

18. Click **Send**.
    The **File Upload** window changes to show the completed upload percentage to the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 40)

> **Note**: The **.fcf** file uploads very quickly (≈ 1-2 minutes).

> The LEDs (on page 435) indicated the upgrade process.

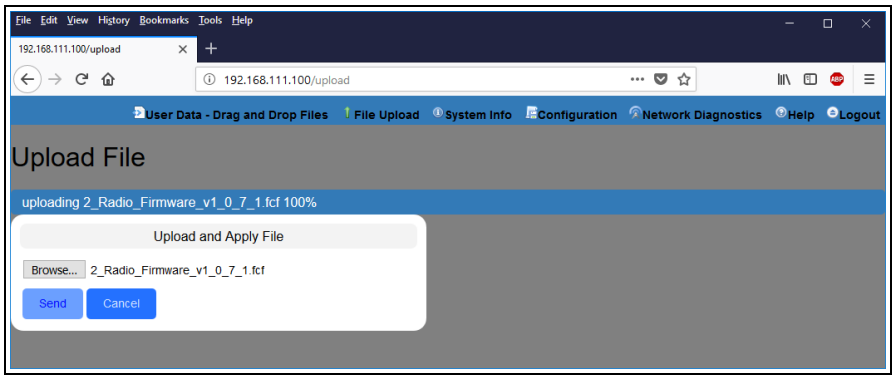


Figure 40: File Upload window Showing Uploading Percentage

The **File Upload** window refreshes and shows the completed and uploaded file applied to the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 41)

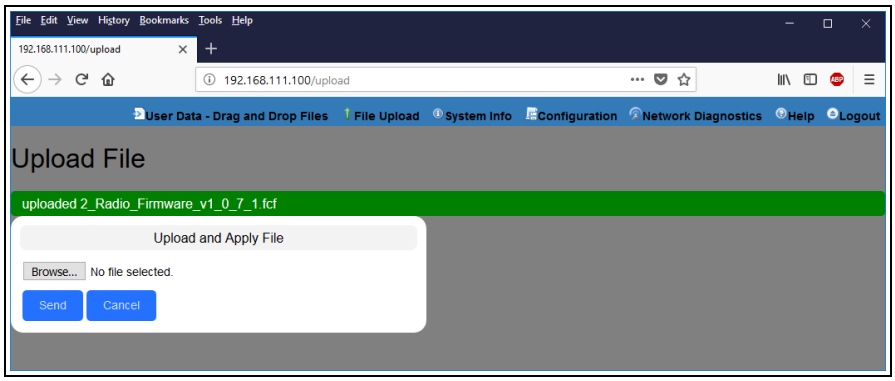


Figure 41: File Upload window Showing Completed Upload of the Selected File

19. Click the **System Info** link. (Figure 42)

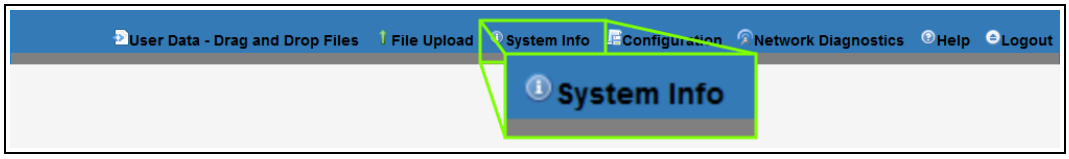


Figure 42: System Info link

The System Info window opens showing the updated firmware on the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 43)

> **Important!**: The image provides example information only.
> Each Z9-P / Z9-PE / Z9-PE-GREY provides its own unique information.

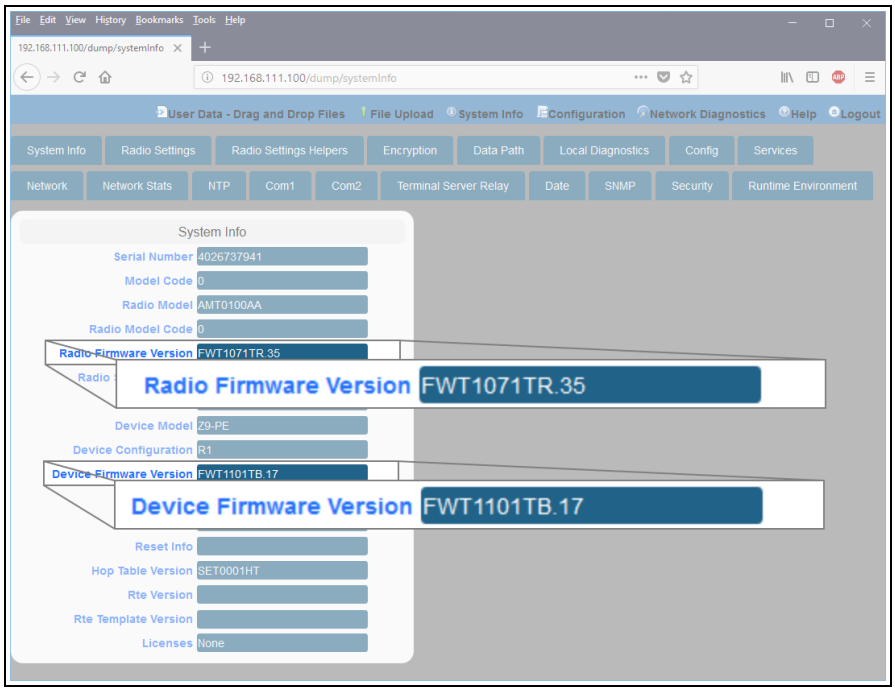


Figure 43: System Info window

Important!: For the v1.1.0.1 upgrade, these parameters should have this information:
systemInfo.radioFirmwareVersion=FWT1071TR.35.
Web Interface - Radio Firmware Version is FWT1071TR.35.
systemInfo.deviceFirmwareVersion=FWT1101TB.17
Web Interface - Device Firmware Version is FWT1101TB.17
If these versions are NOT listed in their respective parameters, repeat the upgrade procedure.

20. Continue with:
    - Optional: Web Interface - Installation of ZumIQ Application Environment (on page 93)
    - Web Interface Configuration - Z9-P / Z9-PE / Z9-PE-GREY (on page 81)

6. Configuration

6.1. Drag and Drop Configuration - ZumLink

Caution: This procedure requires the Windows® Explorer file extension to be visible. See the Microsoft® topic Show or Hide 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 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

Procedure

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

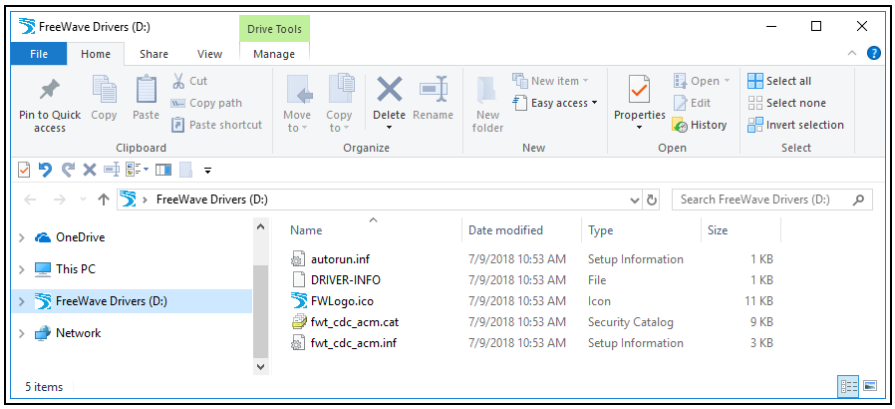


Figure 44: AutoPlay FreeWave Drivers window

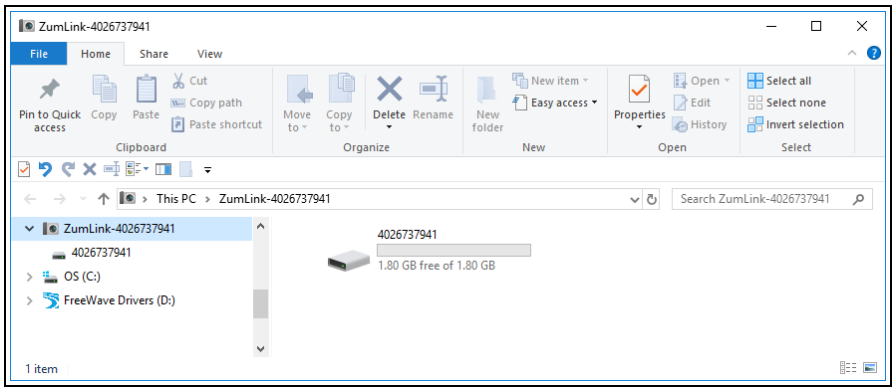


Figure 45: ZumLink window

2. In the **ZumLink** window (Figure 45), double-click the connected Z9-P / Z9-PE / Z9-PE-GREY.
   The files of the Z9-P / Z9-PE / Z9-PE-GREY appear in the window.

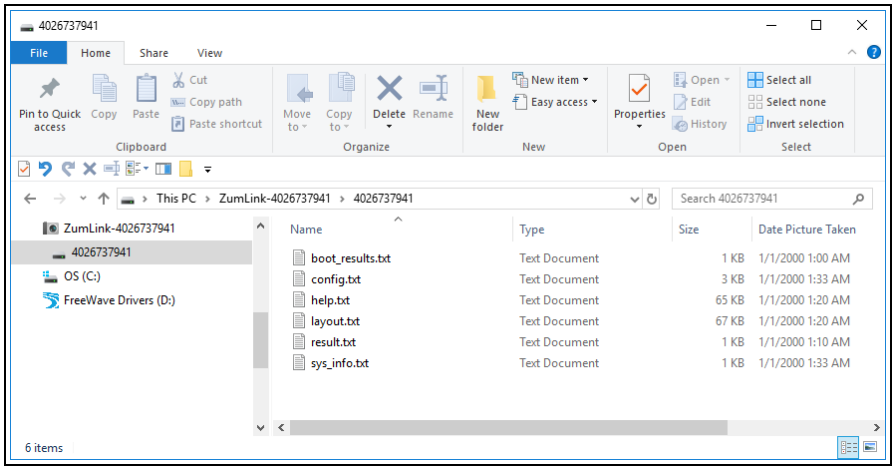


Figure 46: Opened ZumLink window showing the Default Files

3. Select the **config.txt** file and copy it to the clipboard (press <Ctrl+C>).
4. Leave the **ZumLink** window open - it is used later in the procedures.
5. Open a Windows® 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.

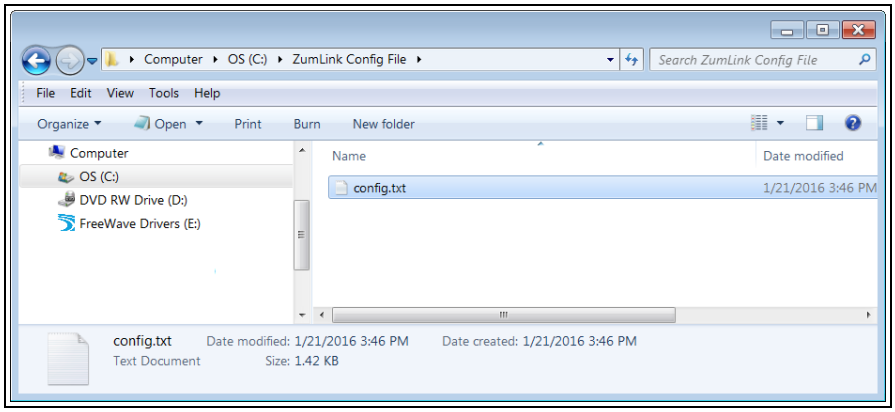


Figure 47: Copied config.txt file in the designated configuration folder.

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**.

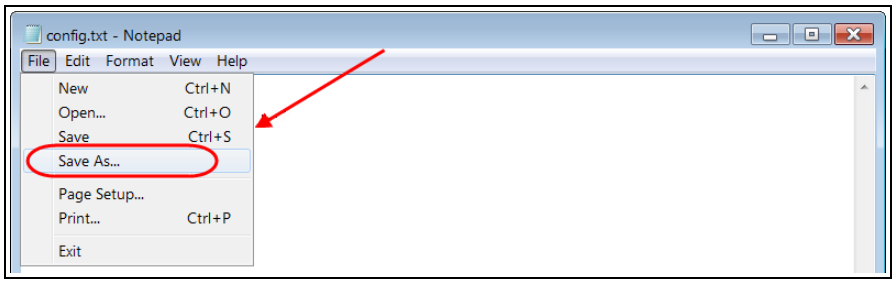


Figure 48: Notepad® window - File > Save As menu.

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.

> **Caution**: 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**.

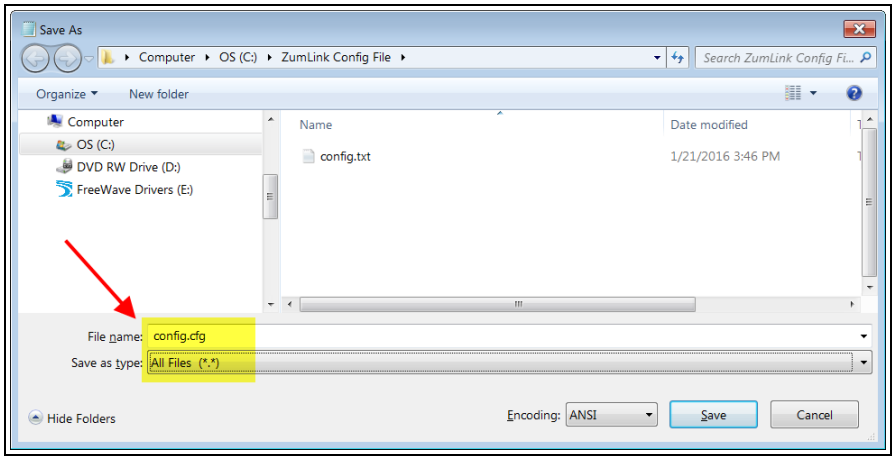


Figure 49: Save As dialog box with All Files (*.*) selected.

13. Click 

.
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 systemInfo Parameters (on page 312) 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 radioSettings Parameters (on page 262) 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 radioSettings Parameters (on page 262).

> **Example**: For illustration, the **radioSettings.radioMode** was changed from **Endpoint** to **Gateway**.

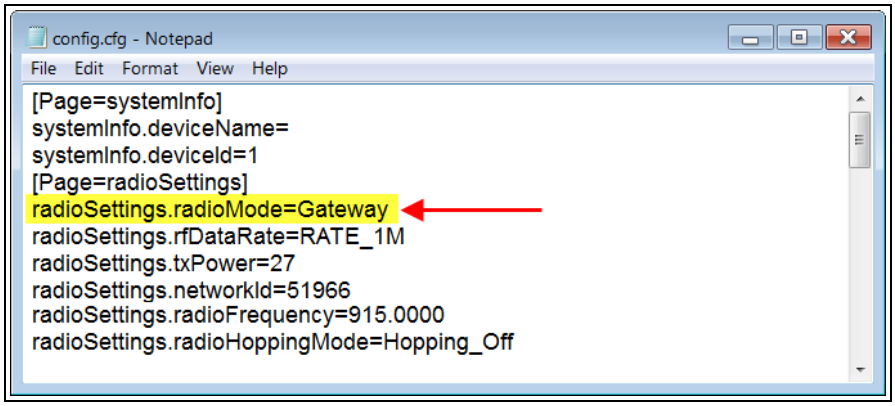


Figure 50: Notepad® with the .cfg file open.

15. Press <Ctrl+S> or, on the **File** menu, click **Save** to save the updated file.
16. Close the text editor.
17. Locate and open the **ZumLink** window so it is side-by-side with the changed configuration file window.
18. Open the Windows® Explorer designated folder for changed configuration files.
19. Select the changed .cfg or .cfg.txt file.

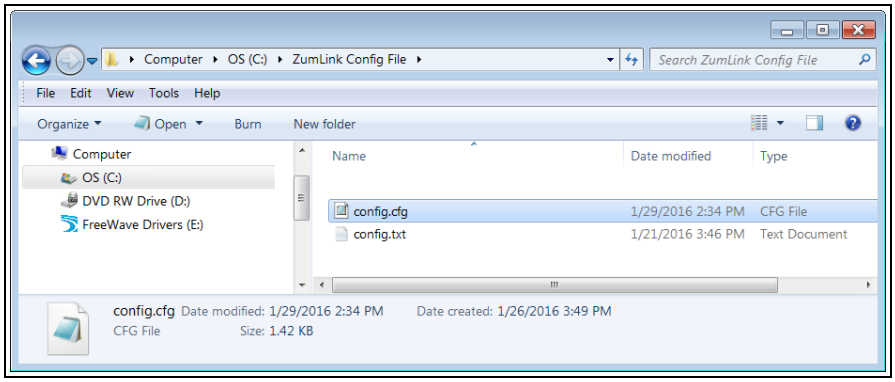


Figure 51: Select the changed .cfg or .cfg.txt file.

20. Drag and drop the .cfg or .cfg.txt file to the **ZumLink** window.

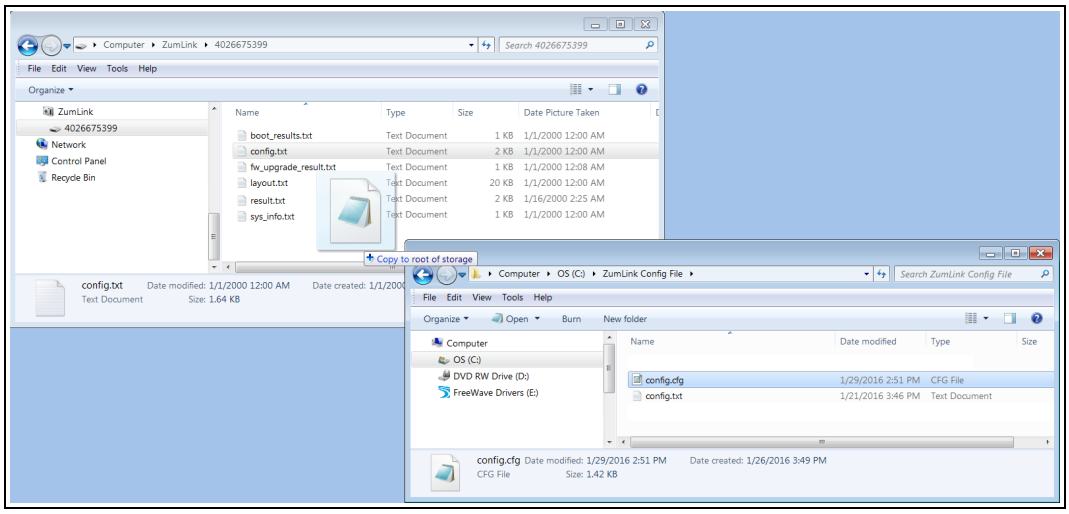


Figure 52: Drag and drop the .cfg or .cfg.txt file to the ZumLink window.

21. 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 / Z9-PE / Z9-PE-GREY 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.

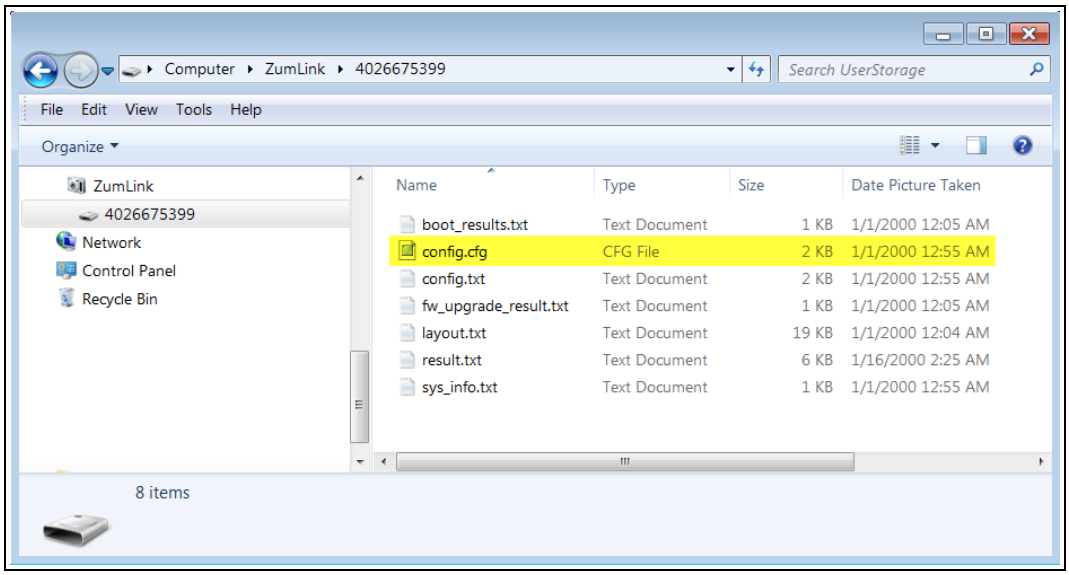


Figure 53: Changed .cfg file copied to the ZumLink window.

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

22. Double-click the **result.txt** file to verify there are **No errors Detected** with the identified changes in the file.

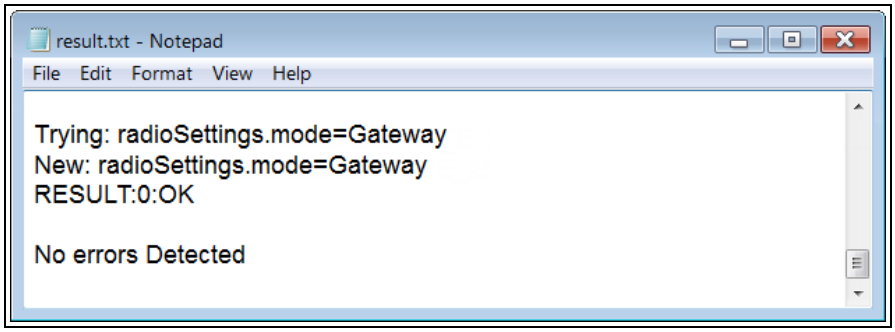


Figure 54: Opened result.txt file.

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

23. As appropriate, repeat the Drag and Drop procedure to correct any errors.
24. Optional: Double-click the **config.txt** file to view and verify the new Z9-P / Z9-PE / Z9-PE-GREY configuration.
25. Optional: Complete the Change the Passwords (on page 157) procedure.

6.2. Drag and Drop Configuration - ZumIQ

Caution: This procedure requires the Windows® Explorer file extension to be visible. See the Microsoft® topic Show or Hide 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 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

Procedure

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

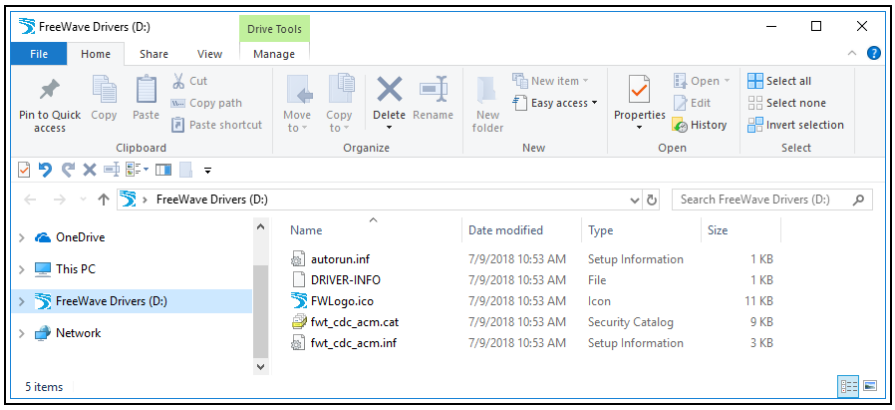


Figure 55: AutoPlay FreeWave Drivers window

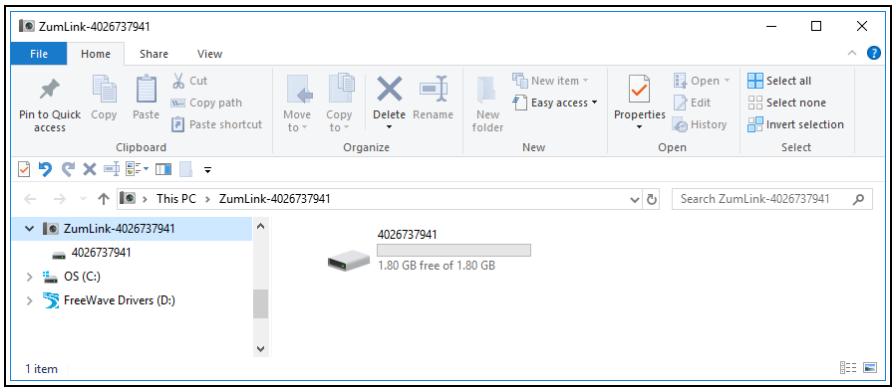


Figure 56: ZumLink window

2. In the **ZumLink** window (Figure 56), double-click the connected Z9-P / Z9-PE / Z9-PE-GREY.
   The files of the Z9-P / Z9-PE / Z9-PE-GREY appear in the window.

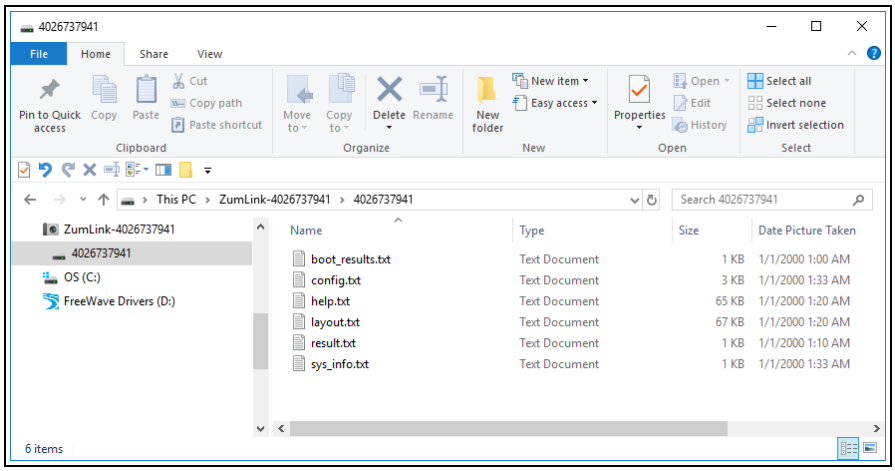


Figure 57: Opened ZumLink window showing the Default Files

3. Select the **config.txt** file and copy it to the clipboard (press <Ctrl+C>).
4. Leave the **ZumLink** window open - it is used later in the procedures.
5. Open a Windows® 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.

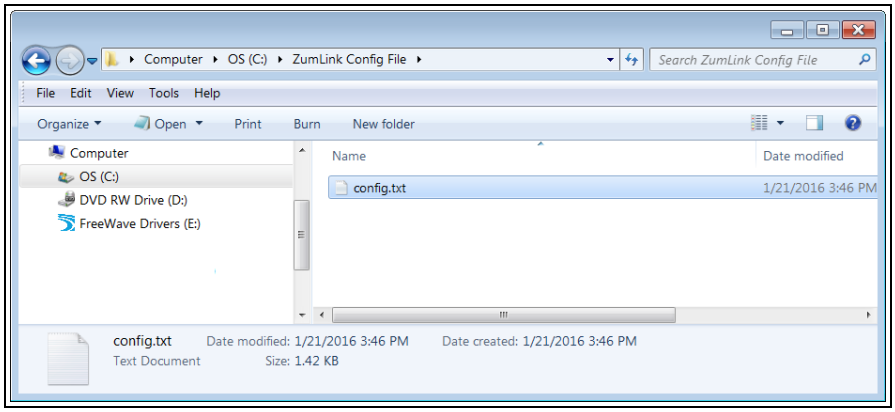


Figure 58: Copied config.txt file in the designated configuration folder.

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**.

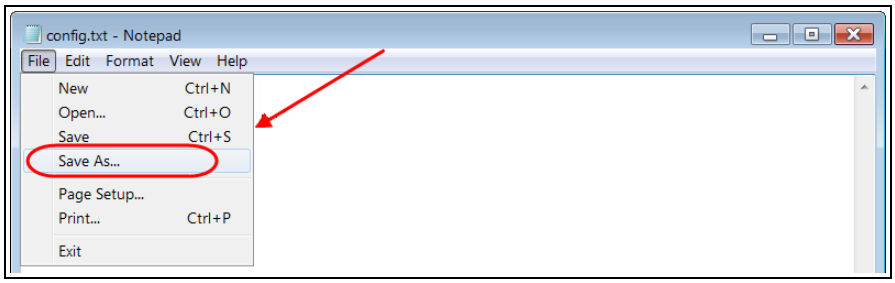


Figure 59: Notepad® window - File > Save As menu.

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.

> **Caution**: 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**.

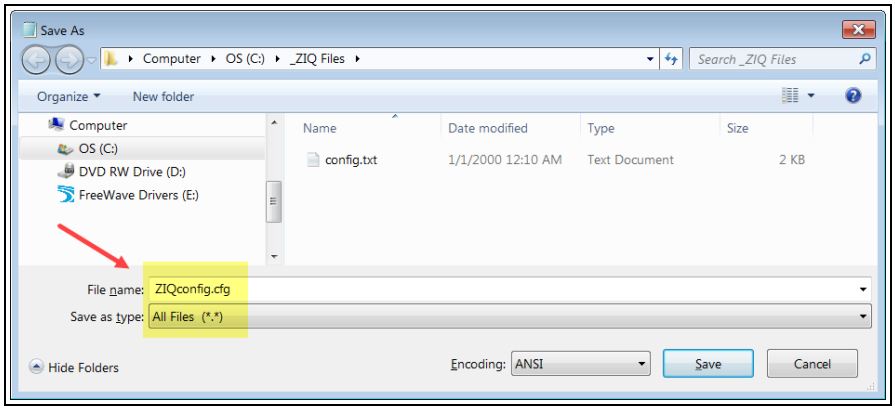


Figure 60: Save As dialog box with All Files (*.*) selected.

13. Click 

.
The dialog box closes and the text editor returns with the new **.cfg** or **.cfg.txt** file open.
14. As applicable, change these **Network** settings to meet the network architecture:
    - [Page=network]
        - network.ip_address=nnn.nnn.nnn.nnn
        - network.netmask=nnn.nnn.nnn.nnn
        - network.gateway=nnn.nnn.nnn.nnn

Note: See the network Parameters (on page 245) for detailed information about the parameters.

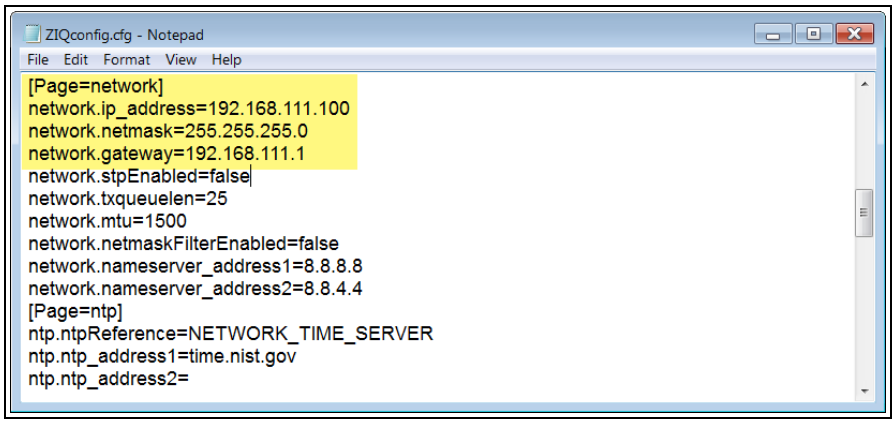


Figure 61: ZIQconfig.cfg Network Page

15. Press <Ctrl+S> or, on the **File** menu, click **Save** to save the updated file.
16. Close the text editor.
17. Locate and open the **ZumLink** window so it is side-by-side with the changed configuration file window.
18. Open the Windows® Explorer designated folder for changed configuration files.
19. Select the changed **.cfg** or **.cfg.txt** file.

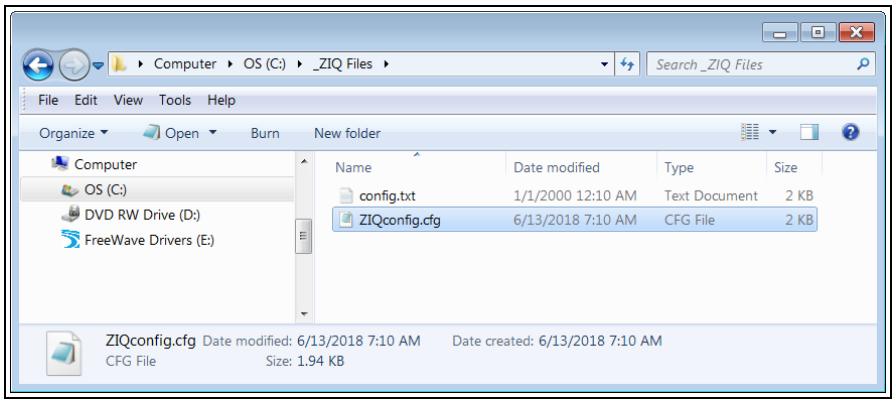


Figure 62: Select the changed .cfg or .cfg.txt file.

20. Drag and drop the **.cfg** or **.cfg.txt** file to the **ZumLink** window.

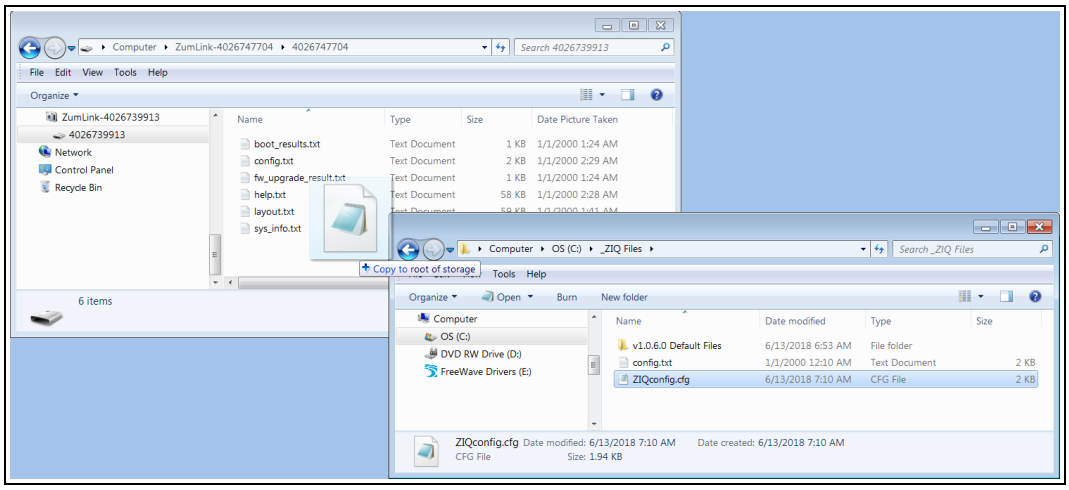


Figure 63: Drag and drop the .cfg or .cfg.txt file to the ZumLink window.

21. 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 / Z9-PE / Z9-PE-GREY 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.

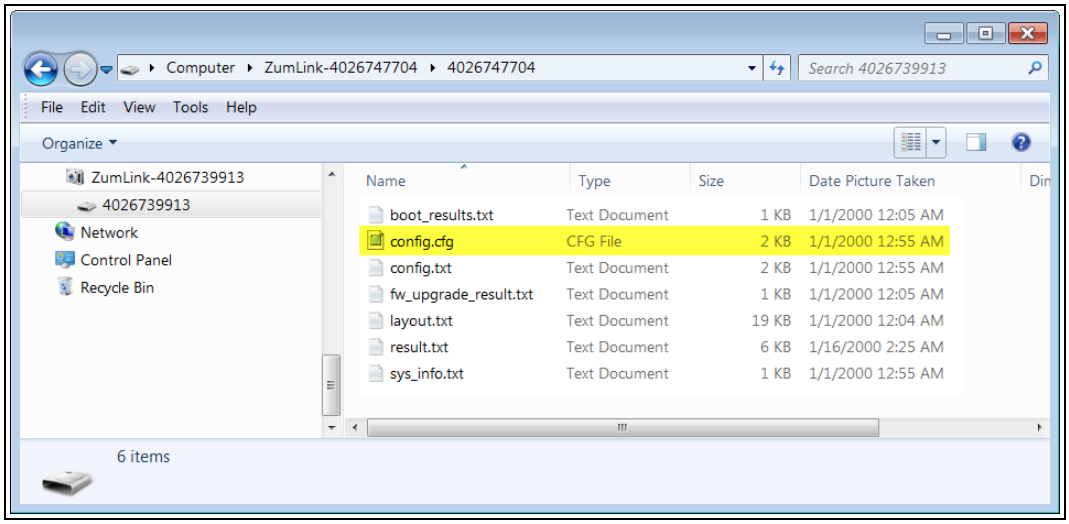


Figure 64: Changed .cfg file copied to the ZumLink window.

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

During the .cfg update process, the LEDs provide status and confirmation of update results.

> **Note**: The LEDs indicate a successful setup.
> See LEDs (on page 435) for additional information.

22. Optional: Double-click the **config.txt** file to view and verify the new Z9-P / Z9-PE / Z9-PE-GREY configuration.
23. As appropriate, repeat the Drag and Drop procedure to correct any errors.
24. Continue with ZumIQ Application Environment (on page 87).

6.3. CLI Configuration

This procedure provides a Tera Term terminal connection to the Z9-P / Z9-PE / Z9-PE-GREY CLI. Other terminal emulators (e.g., HyperTerminal, PuTTY) may be used.

The basic steps are:

A. Connect the Z9-P / Z9-PE / Z9-PE-GREY to the Computer (on page 65)

B. Tera Term Activation and ZumLink Setup (on page 66)

Note: The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

6.3.1. Connect the Z9-P / Z9-PE / Z9-PE-GREY to the Computer

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

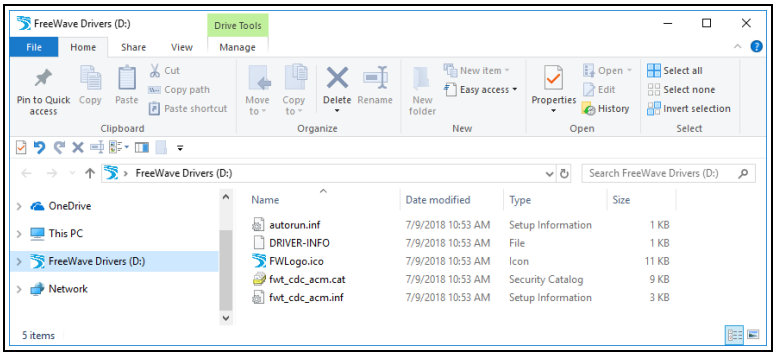


Figure 65: FreeWave Drivers window

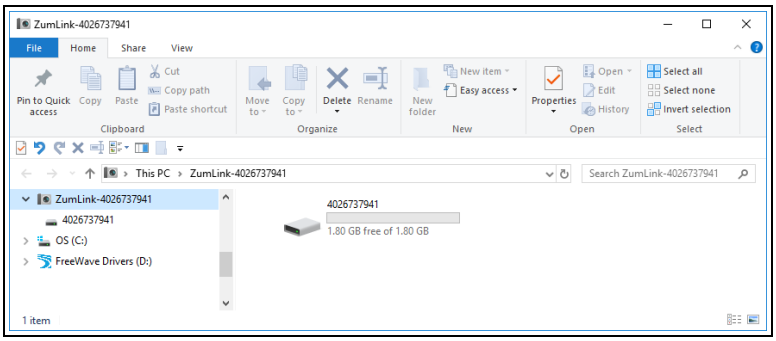


Figure 66: ZumLink window

2. Continue with Tera Term Activation and ZumLink Setup (on page 66).

6.3.2. Tera Term Activation and ZumLink Setup

Note: This procedure provides a Tera Term terminal connection to the Z9-P / Z9-PE / Z9-PE-GREY CLI. Other terminal emulators (e.g., HyperTerminal, PuTTY) may be used.
The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. On the computer connected to the Z9-P / Z9-PE / Z9-PE-GREY device, open a terminal program (e.g., Tera Term http://ttssh2.osdn.jp/).
2. In Tera Term, click the **File** menu and select **New Connection**.

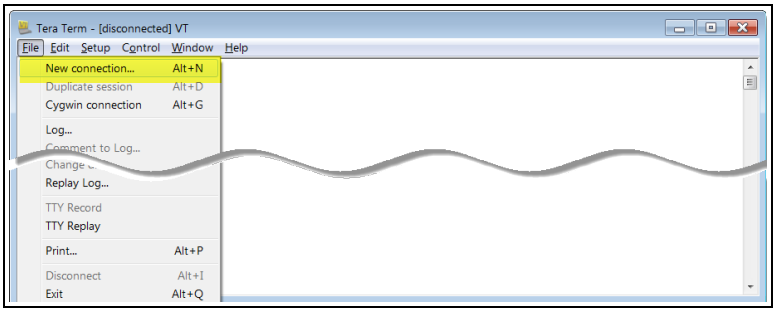


Figure 67: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P / Z9-PE / Z9-PE-GREY is connected to.

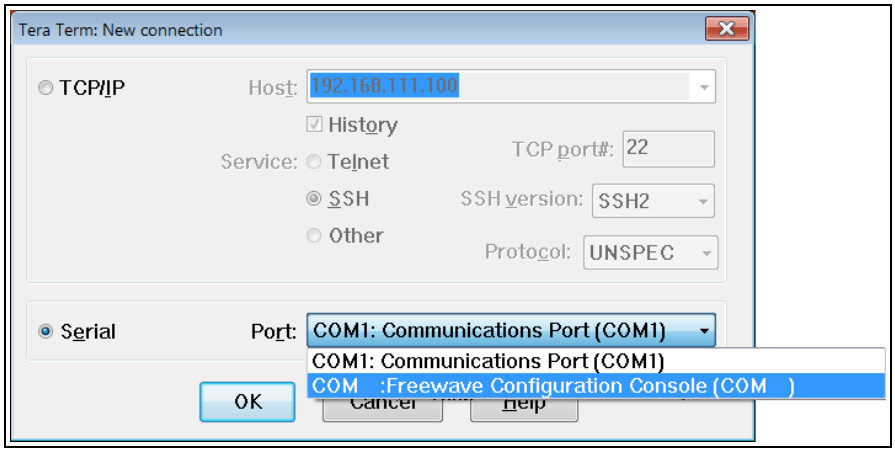


Figure 68: Select the ZumLink COM port

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**.

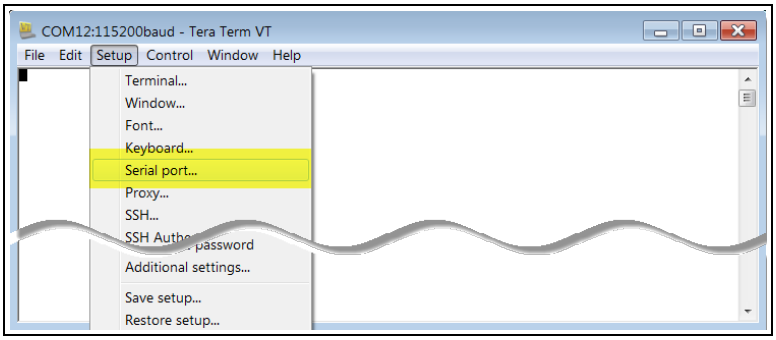


Figure 69: Serial menu > Setup Port

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

Note: The image shows the default Z9-P / Z9-PE / Z9-PE-GREY settings.

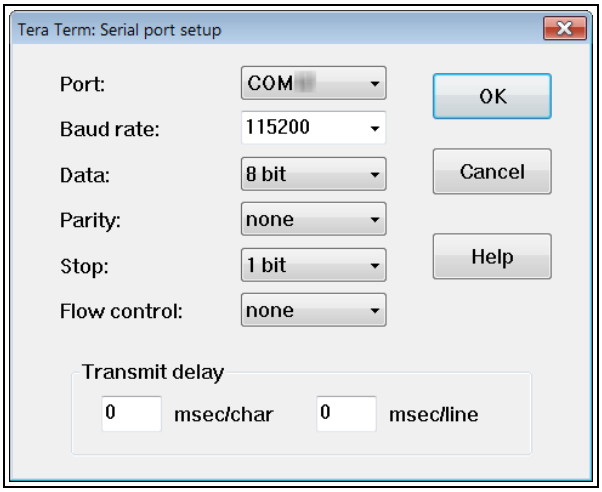


Figure 70: Tera Term: Serial Port Setup dialog box with Default Settings

6. **Important**: Verify, and change if required, the Tera Term serial port settings (except the **Port** setting) of the connected Z9-P / Z9-PE / Z9-PE-GREY so the settings are the same as the defaults shown in Figure 70.
7. Verify the COM port settings are:
   Baud Rate / **Baudrate**: 115200
   Data / **Databits**: 8 bit
   Parity: none
   Stop / **Stopbits**: 1 bit
8. Click **OK** to save the changes and close the dialog box.
9. In the Tera Term window, press <Enter>.
   The Z9-P / Z9-PE / Z9-PE-GREY CLI Login returns.
10. Enter **admin** for the **Username** and press <Enter>.
11. 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.

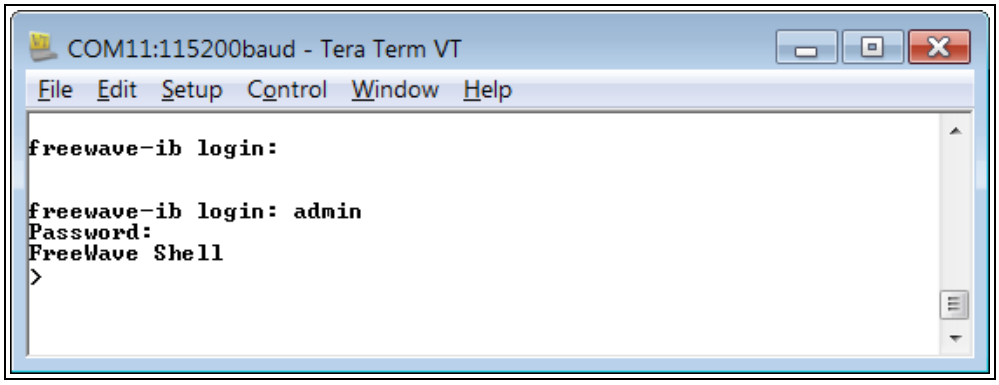


Figure 71: The FreeWave Shell returns.

Note: The login times out after 3600 seconds. Repeat the login procedure if needed.

12. At the > prompt, type **pages** and press <Enter>.
    The available Z9-P / Z9-PE / Z9-PE-GREY information appears.

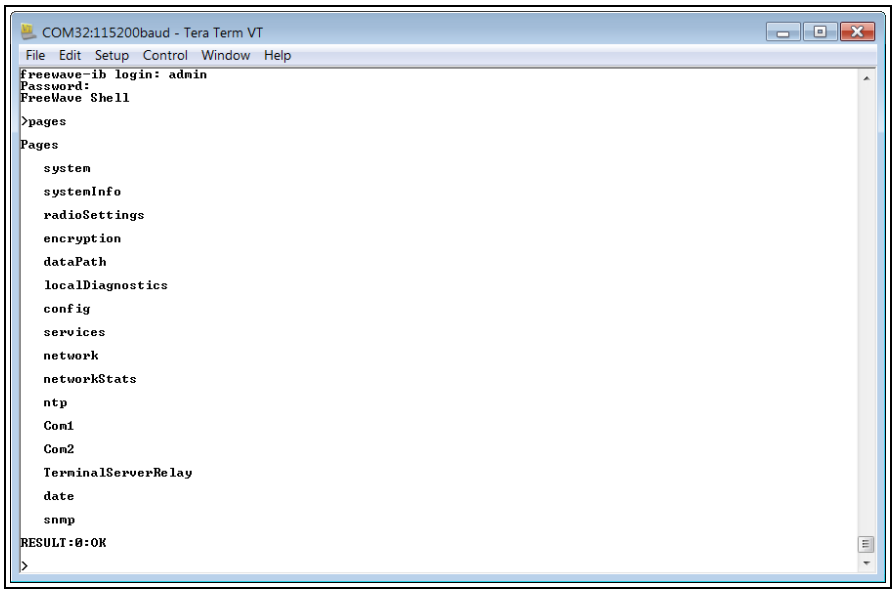


Figure 72: Z9-P / Z9-PE / Z9-PE-GREY Pages information

13. At the > prompt, type **network** and press <Enter>.
    The Z9-P / Z9-PE / Z9-PE-GREY **network** settings appear.

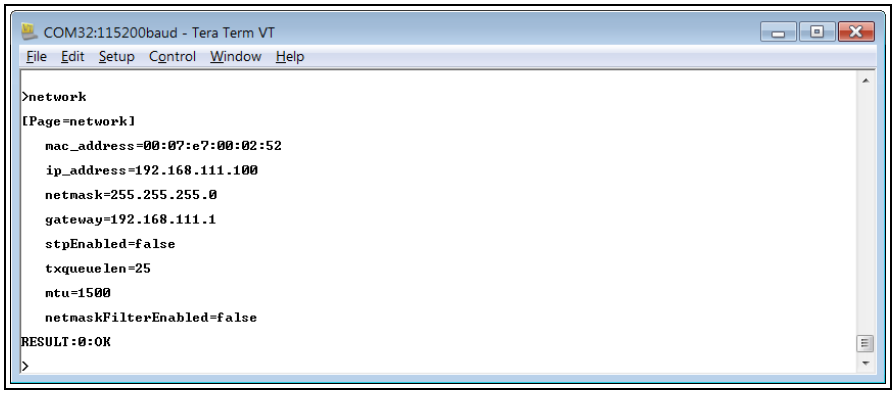


Figure 73: network Page window

Note: Steps 14 to 17 make the IP Address and nodeId unique to each Z9-P / Z9-PE / Z9-PE-GREY.
Other values may be defined as long as they are unique to each Z9-P / Z9-PE / Z9-PE-GREY.

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

Note: Where `nnn.nnn.nnn.nnn` is the IP address assigned by the IT department for the Z9-P / Z9-PE / Z9-PE-GREY network.

Note:

15. Optional: Change the gateway (on page 246) and the netmask (on page 249) addresses, if required, to meet the Z9-P / Z9-PE / Z9-PE-GREY network architecture.
16. At the > prompt, type **`radiosettings`** and press <Enter>.
The Z9-P / Z9-PE / Z9-PE-GREY **radioSettings** appear.

Important!: Figure 74 shows **ALL** available settings for the page.
Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

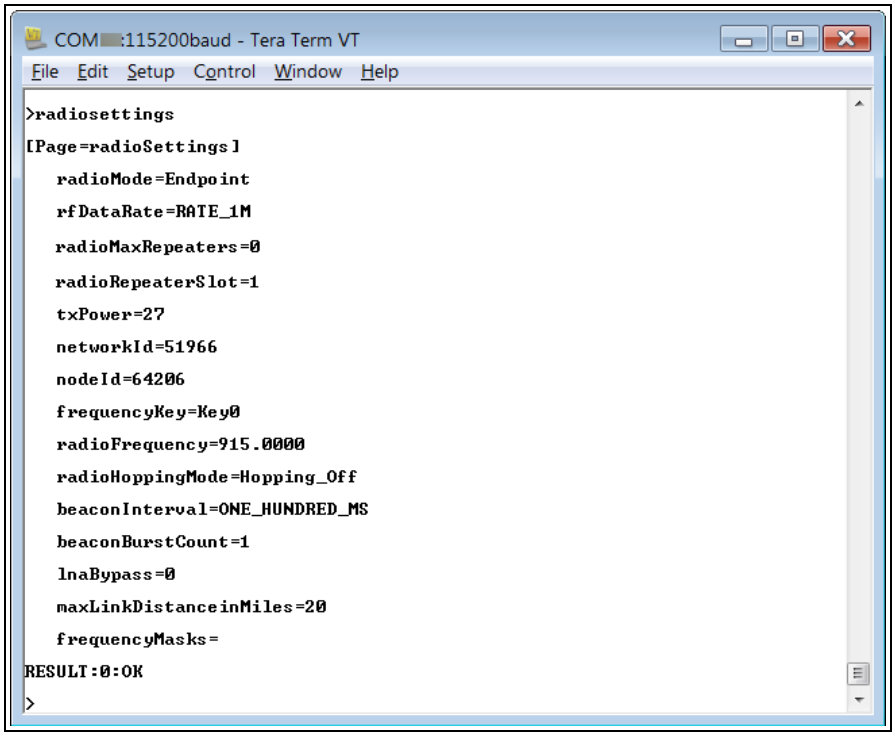


Figure 74: radioSettings Page

17. 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**.

18. At the > prompt, type **`save`** and press <Enter>.

> **Warning!** At this point, the connection to the Z9-P / Z9-PE / Z9-PE-GREY is disabled.

19. Re-connect to the Z9-P / Z9-PE / Z9-PE-GREY using the new IP Address entered in Step 14.
20. Optional: Complete the Change the Passwords (on page 157) procedure.
21. Optional: Upgrade to the latest firmware using the Firmware Upgrade (on page 28) procedure.

> **Important!**: **ONLY** upgrade the Z9-P / Z9-PE / Z9-PE-GREY firmware if the user values the new features and fixes within a firmware version.

6.3.3. Tera Term Activation and ZumIQ Setup

Note: This procedure provides a Tera Term terminal connection to the Z9-P / Z9-PE / Z9-PE-GREY CLI. Other terminal emulators (e.g., HyperTerminal, PuTTY) may be used.
The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. On the computer connected to the Z9-P / Z9-PE / Z9-PE-GREY device, open a terminal program (e.g., Tera Term http://ttssh2.osdn.jp/).
2. In Tera Term, click the **File** menu and select **New Connection**.

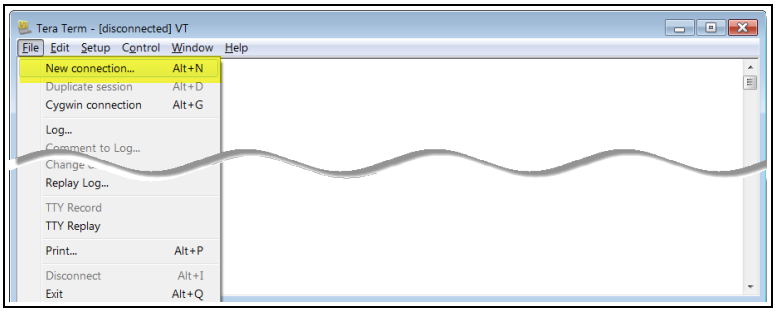


Figure 75: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P / Z9-PE / Z9-PE-GREY is connected to.

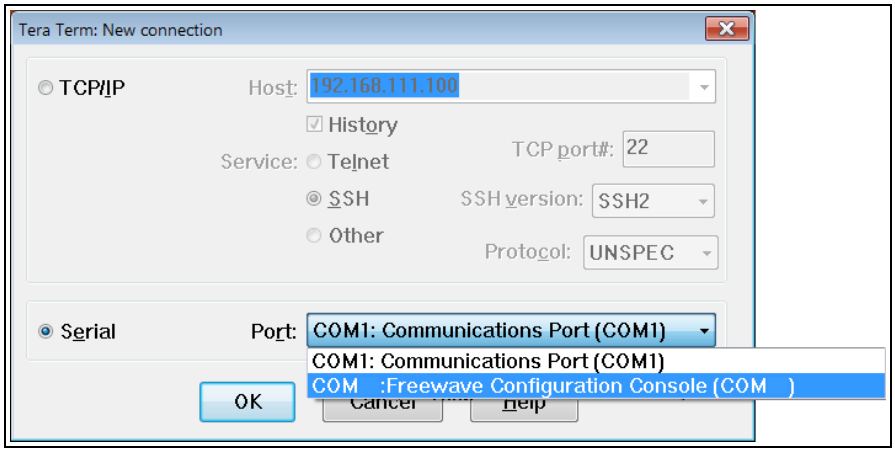


Figure 76: Select the ZumLink COM port

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**.

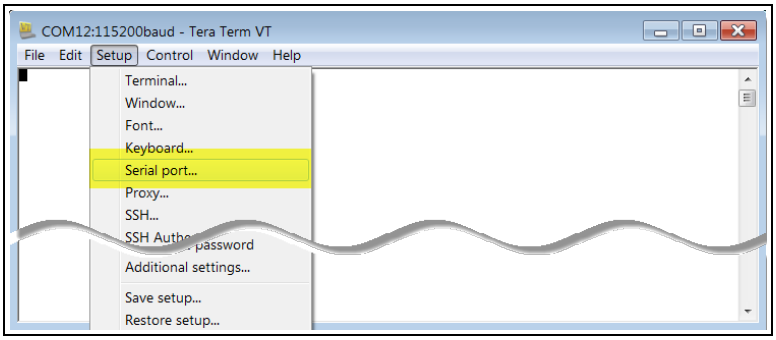


Figure 77: Serial menu > Setup Port

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

Note: The image shows the default Z9-P / Z9-PE / Z9-PE-GREY settings.

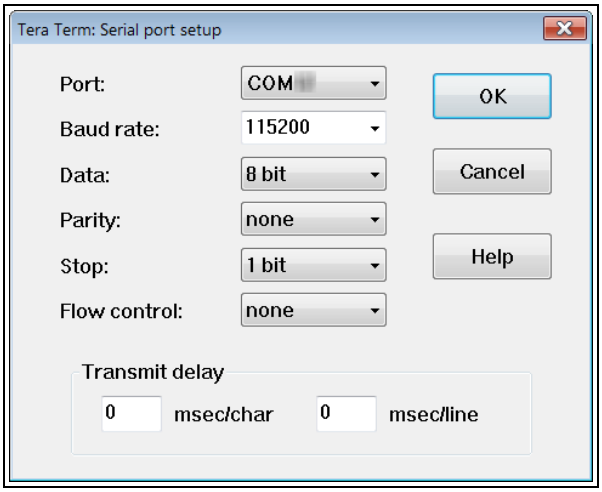


Figure 78: Tera Term: Serial Port Setup dialog box with Default Settings

6. **Important**: Verify, and change if required, the Tera Term serial port settings (except the **Port** setting) of the connected Z9-P / Z9-PE / Z9-PE-GREY so the settings are the same as the defaults shown in Figure 78.
7. Verify the COM port settings are:
   Baud Rate / **Baudrate**: 115200
   Data / **Databits**: 8 bit
   Parity: none
   Stop / **Stopbits**: 1 bit
8. Click **OK** to save the changes and close the dialog box.
9. In the Tera Term window, press <Enter>.
   The Z9-P / Z9-PE / Z9-PE-GREY CLI Login returns.
10. Enter `admin` for the **Username** and press <Enter>.
11. 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.

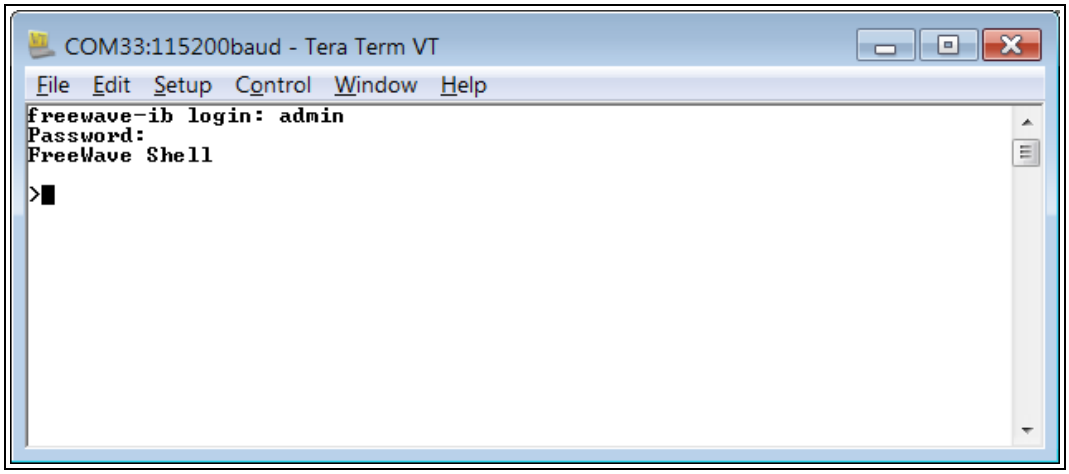


Figure 79: The FreeWave Shell returns.

Note: The login times out after 3600 seconds.
Repeat the login procedure if needed.

12. At the > prompt, type **network** and press <Enter>.
The Z9-P / Z9-PE / Z9-PE-GREY **network** settings appear.

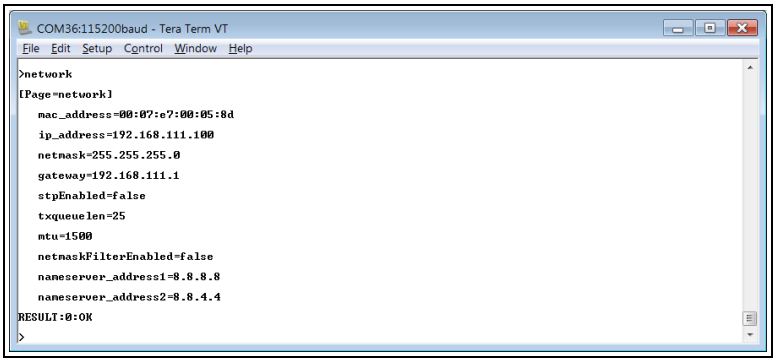


Figure 80: network Page window

Note: Steps 13 to 16 make the IP Address and nodeId unique to each Z9-P / Z9-PE / Z9-PE-GREY.
Other values may be defined as long as they are unique to each Z9-P / Z9-PE / Z9-PE-GREY.

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

> **Note**: Where `nnn.nnn.nnn.nnn` is the IP address assigned by the IT department for the Z9-P / Z9-PE / Z9-PE-GREY network.

14. Optional: Change the gateway (on page 246) and the netmask (on page 249) addresses, if required, to meet the Z9-P / Z9-PE / Z9-PE-GREY network architecture.
15. At the > prompt, type **`save`** and press <Enter>.

> **Warning!** At this point, the connection to the Z9-P / Z9-PE / Z9-PE-GREY is disabled.

16. Re-connect to the Z9-P / Z9-PE / Z9-PE-GREY using the new IP Address entered in Step 13.
17. Continue with ZumIQ Application Environment (on page 87).

6.4. Web Interface Configuration

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

The basic steps are:

A. Connect the Z9-P / Z9-PE / Z9-PE-GREY to the Computer (on page 76)
B. Setup the Computer IP Address Configuration (on page 77)
C. Web Interface Configuration - Z9-P / Z9-PE / Z9-PE-GREY (on page 81)

6.4.1. Connect the Z9-P / Z9-PE / Z9-PE-GREY to the Computer

Note: The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

1. Connect the CAT5e / CAT6 Ethernet cable to the Z9-P / Z9-PE / Z9-PE-GREY Ethernet port and the Ethernet port on the computer.
   The **FreeWave Drivers** and **ZumLink** windows may open.

   Note: One of the **Network Connections** icons may change to show the connected Z9-P / Z9-PE / Z9-PE-GREY.

2. Verify the ZumLink drivers are installed.
   See Install the Driver.

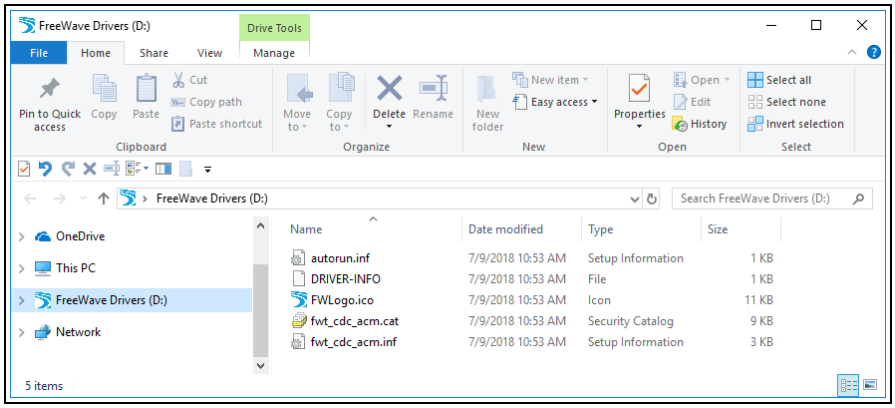


Figure 81: FreeWave Drivers window

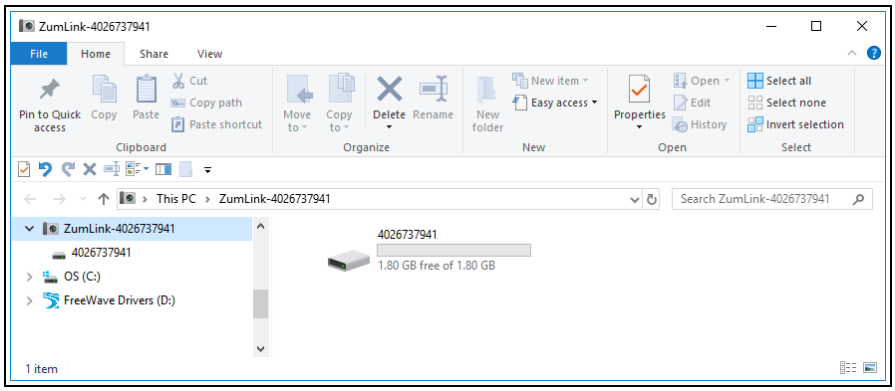


Figure 82: ZumLink window

3. Continue with Setup the Computer IP Address Configuration (on page 77).

6.4.2. Setup the Computer IP Address Configuration

Note: The images in this procedure are for Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. On the computer, click the Windows® **Start** button and select **Control Panel**.
2. View the **Control Panel** window by **Category** and click **Network and Sharing Center**. (Figure 83)

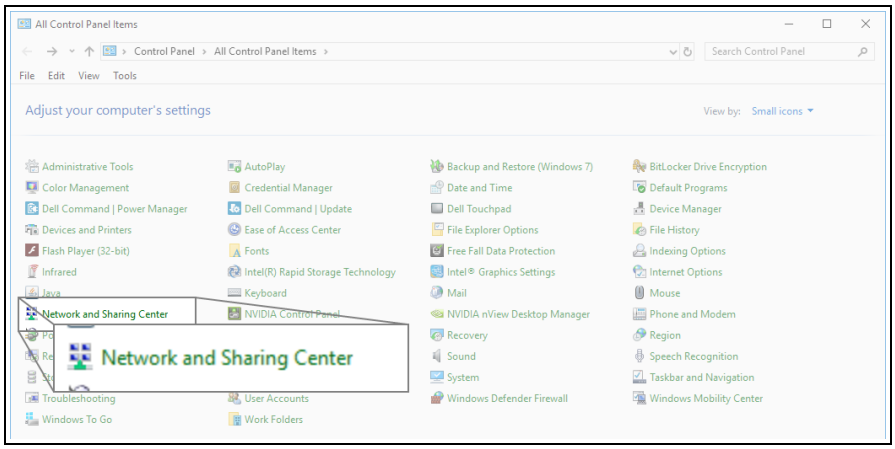


Figure 83: Control Panel > Network and Sharing Center

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

3. Click the **Change Adapter Settings** link. (Figure 84)

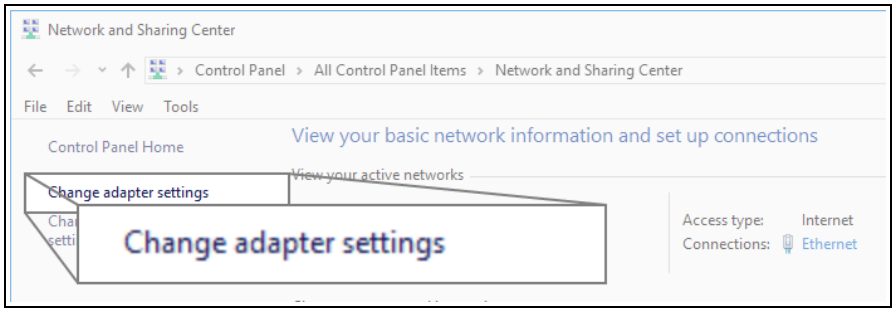


Figure 84: Change Adapter Settings Link

The **Network Connections** window opens. (Figure 85)

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

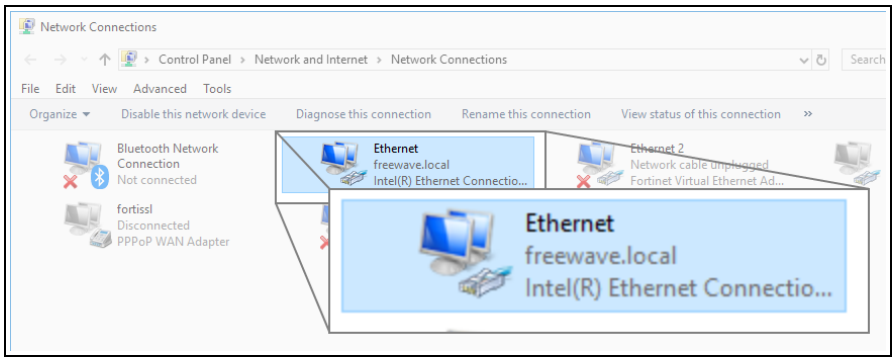


Figure 85: Network Connections window

The **Ethernet Status** dialog box opens. (Figure 86)

5. Click the **Properties** button.

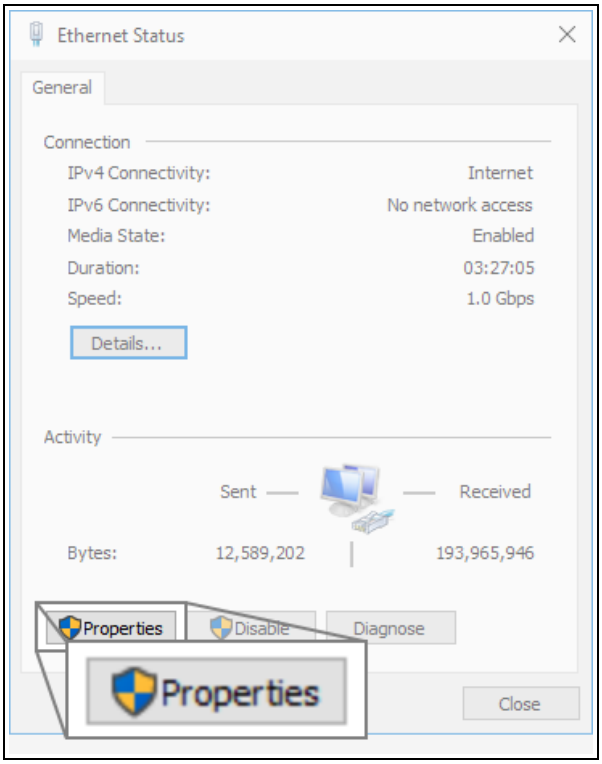


Figure 86: Ethernet Status dialog box

The **Ethernet Properties** dialog box opens.

6. Select the **Internet Protocol Version 4 (TCP/IPv4)** option. (Figure 87)
7. Click the **Properties** button.

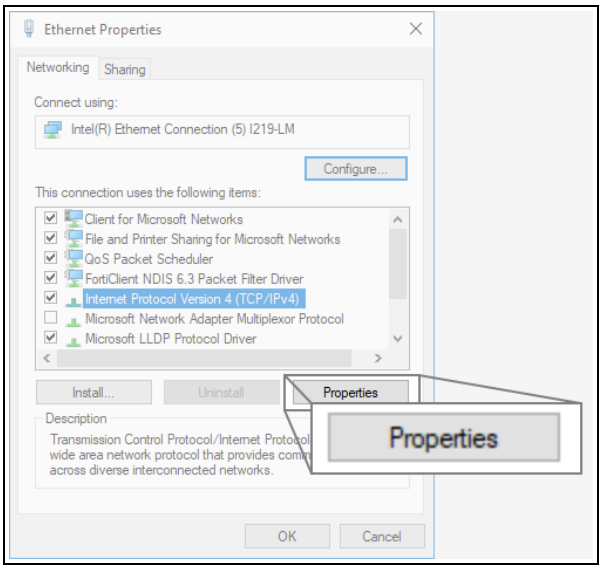


Figure 87: Ethernet Properties dialog box

The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens. (Figure 88)

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

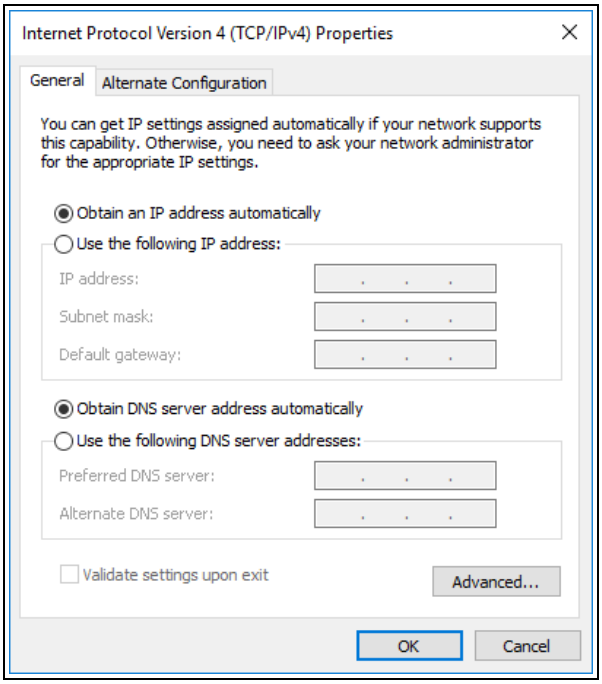


Figure 88: Default Example of Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

9. Select the **Use the following IP address** option button.

10. 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 / Z9-PE / Z9-PE-GREY or all other units in the network. (Figure 89)

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 / Z9-PE / Z9-PE-GREY IP Address is **192.168.111.100**.
The default subnet mask is **255.255.255.0**.

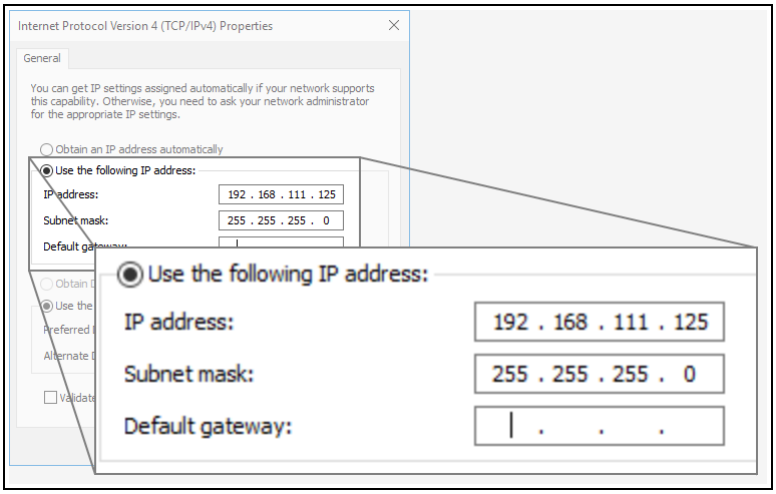


Figure 89: Changed Internet Protocol Version 4 (TCP/IPv4) Properties dialog box

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

11. Click **OK** to save the changes and close the dialog box.
12. Click **Close** twice to close the **Local Area Connection Properties** and **Local Area Connection Status** dialog boxes.
13. Continue with Web Interface Configuration - Z9-P / Z9-PE / Z9-PE-GREY (on page 81).

6.4.3. Web Interface Configuration - Z9-P / Z9-PE / Z9-PE-GREY

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

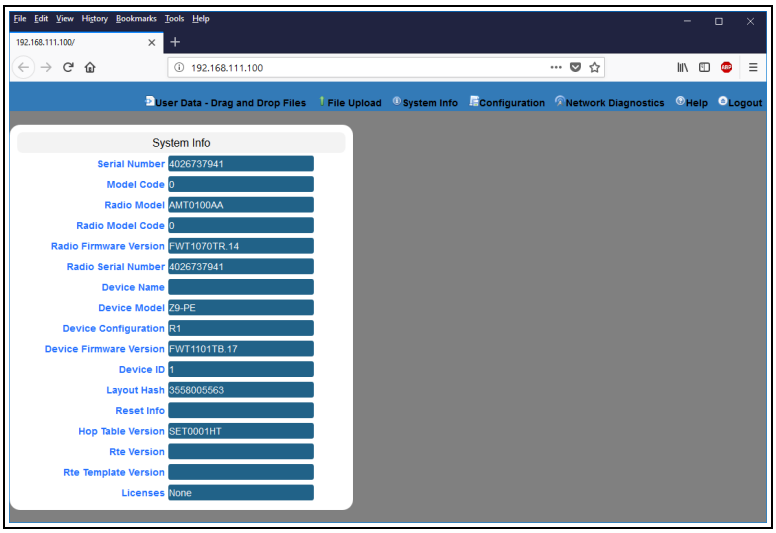


Figure 90: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 91)

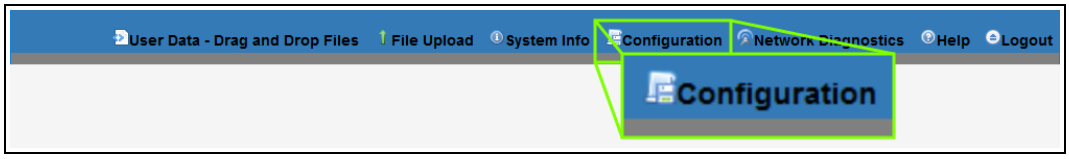


Figure 91: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 92)

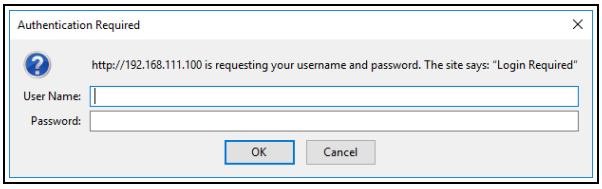


Figure 92: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 93)

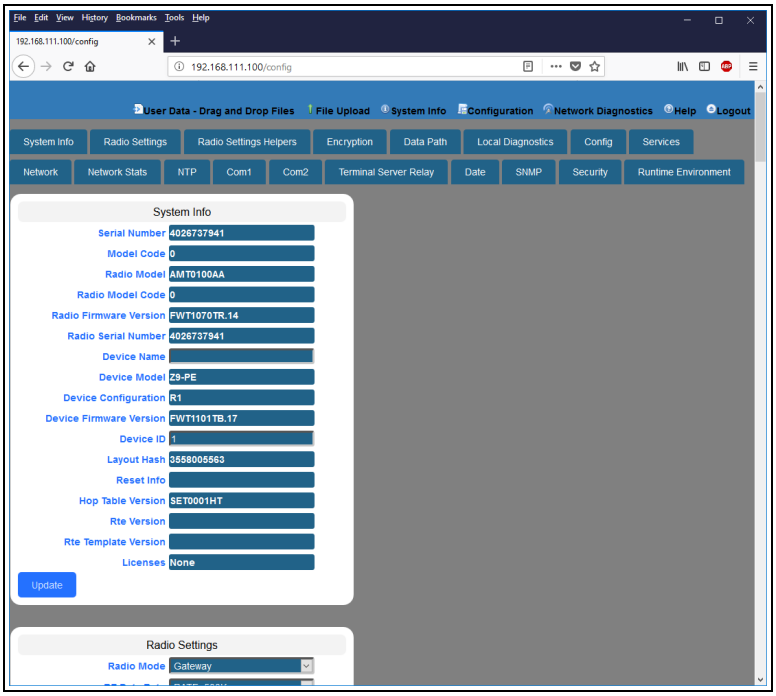


Figure 93: Configuration window

6. In the **Configuration** window, click the **Network** tab.
   The **Network** parameters are shown in Figure 94:

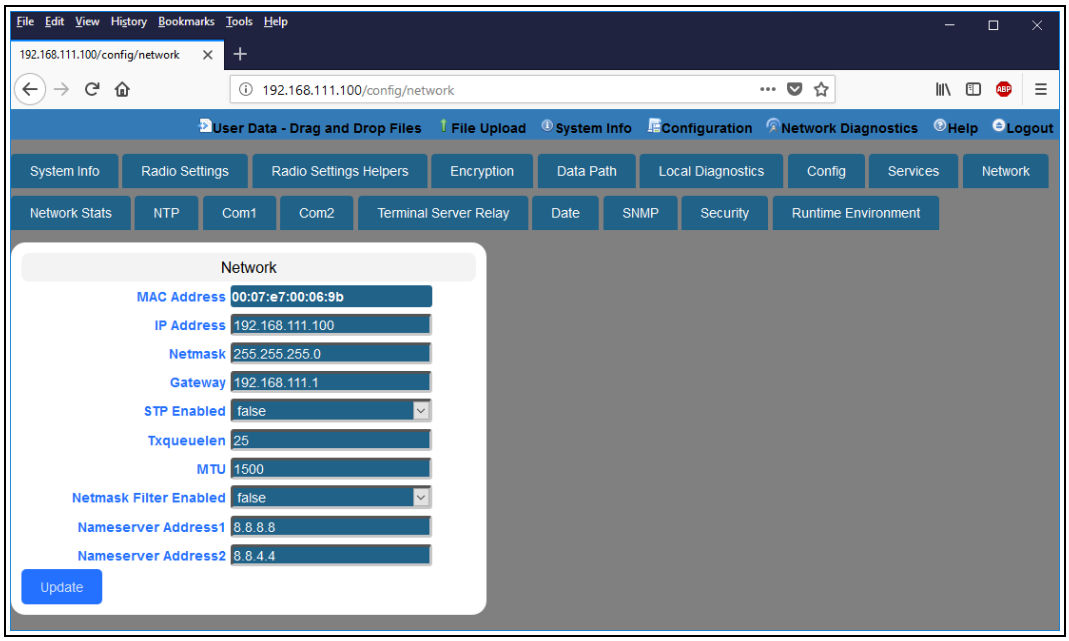


Figure 94: Network window

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

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

> **Note**: Where `nnn.nnn.nnn.nnn` is the IP address assigned by the IT department for the Z9-P / Z9-PE / Z9-PE-GREY network.

8. Optional: Change the gateway (on page 246) and the netmask (on page 249) addresses, if required, to meet the Z9-P / Z9-PE / Z9-PE-GREY network architecture.
9. Click the **Update** button to save the changed information.

Warning! At this point, the connection to the Z9-P / Z9-PE / Z9-PE-GREY is disabled.

---

10. Re-connect to the Z9-P / Z9-PE / Z9-PE-GREY using the new IP Address entered in Step 7.
11. In the **Configuration** window, click the **Radio Settings** tab.
The **Radio Settings** parameters are shown in Figure 95:

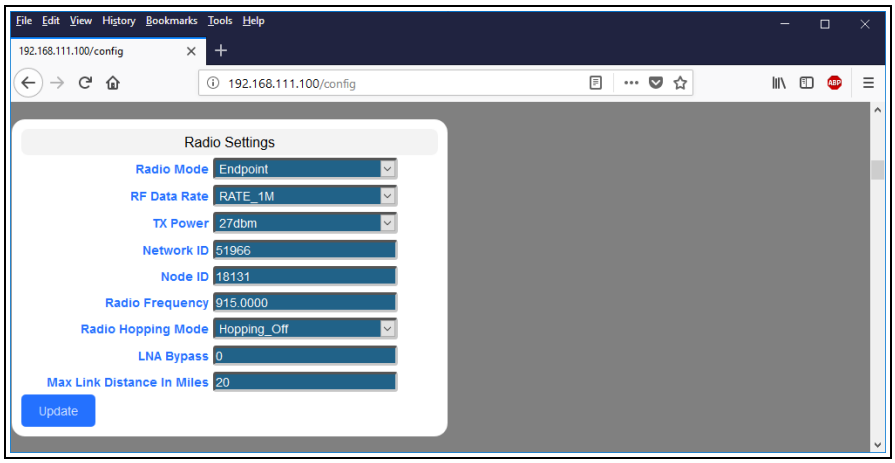


Figure 95: Radio Settings window

> **Important!**: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

12. 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.
13. Click the **Update** button to save the changed information.
14. Continue with:
    - Change the Passwords (on page 157)
    - Firmware Upgrade (on page 28)

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 - ZumLink (on page 53), the CLI Configuration (on page 65), or the Web Interface Configuration (on page 75) procedure.

Figure 96 shows a basic network setup for the **ZumLink** device.

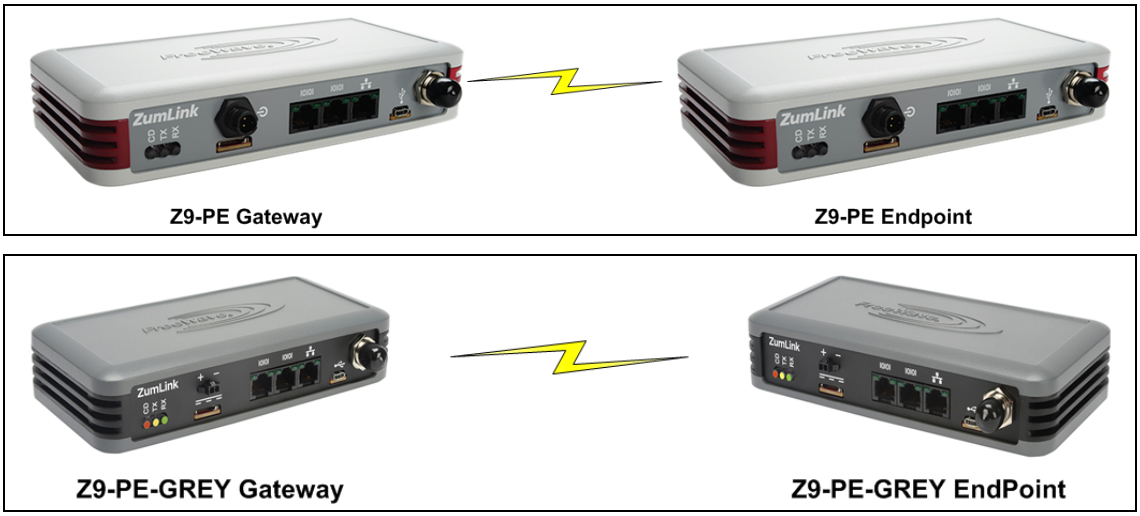


Figure 96: A Basic ZumLink Network

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 Upgrade - Drag and Drop
   - Firmware Upgrade - Web Interface

   Caution: Firmware v1.0.7.0 is **NOT a required** upgrade. **ONLY** upgrade the Z9-P / Z9-PE / Z9-PE-GREY firmware if the user values the new features and fixes within a firmware version.
3. Complete the CLI Configuration (on page 65) 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`.

   Tip: Entering **txpower=0** or **radiosettings.txpower=0** changes the output power to the minimum or 10 dB.

   Note: See radioSettings Parameters (on page 262) 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 435) for additional information.
9. Type `logout` and press <Enter> to exit the FreeWave Shell.

8. ZumIQ Application Environment

The Z9-P / Z9-PE / Z9-PE-GREY employs the ZumIQ Application Environment to provide application development and deployment for intelligent monitoring and control of remote sensors and devices.

Download and Install

Activation and Usage

8.1. Optional: Download the ZumIQ Application Environment

Complete this procedure if installing the ZumIQ Application Environment.

Note: The images in this procedure are for Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. On the http://support.freewave.com/ web page, open the **Firmware** window for the Z9-P / Z9-PE / Z9-PE-GREY.

   Important!: If continuing from the Download the Upgrade File (on page 29) procedure for the **Firmware v1_1_0_1.zip** file, return to the **Firmware** window. (Figure 97)

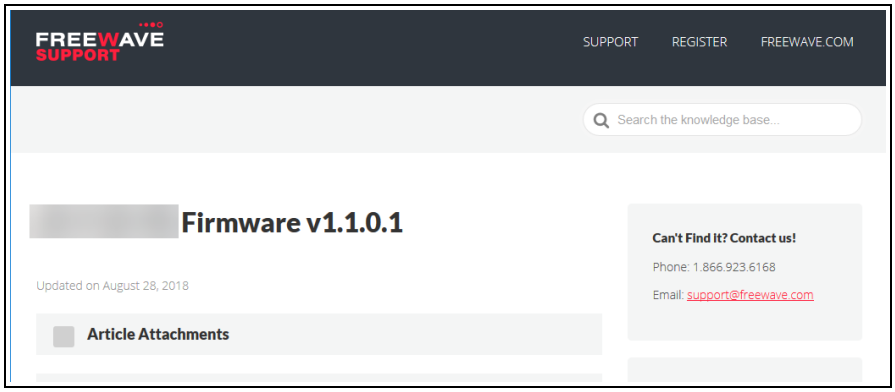


Figure 97: Closed Article Attachments window

2. Click the **Article Attachments** link to re-open the attachment box.
3. Select and click the **3_Optional_ZumIQ_Environment_v1_1_0_0.pkg** attachment. (Figure 98)

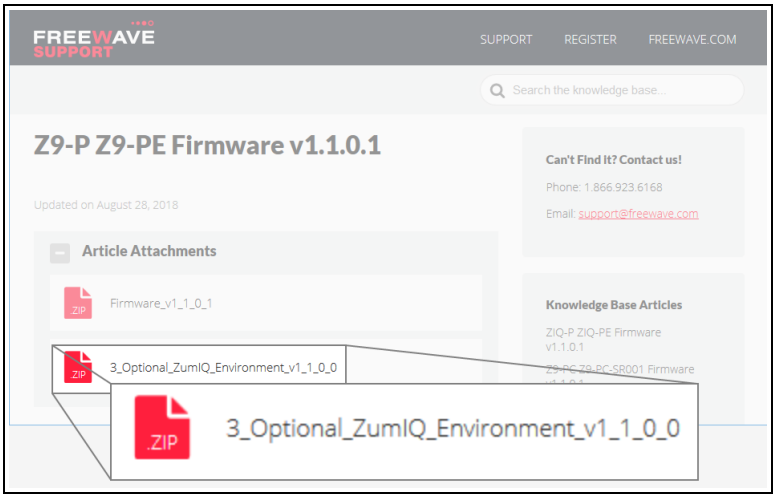


Figure 98: Z9-P / Z9-PE / Z9-PE-GREY Firmware Upgrade window with 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg Attachment

The **Opening** dialog box opens. (Figure 99)

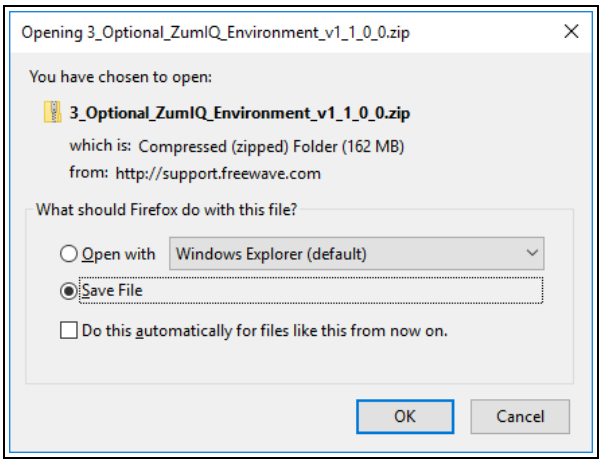


Figure 99: Opening 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg.zip dialog box

4. Click **OK**.
   The **Enter name of file to save to** dialog box opens. (Figure 100)

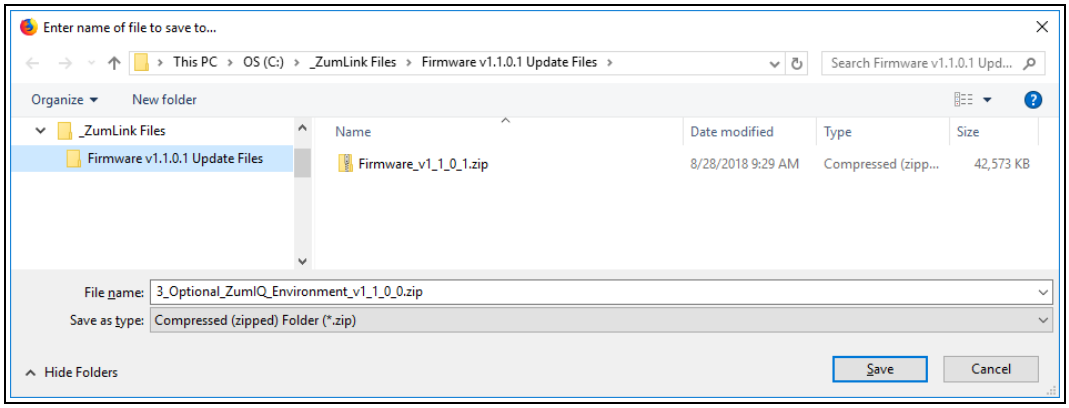


Figure 100: Enter name of file to save to dialog box

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 **Firmware v1_1_0_1.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 ZumIQ Application Environment installation.

9. Continue with:
   - Optional: Drag and Drop - Installation of ZumIQ Application Environment (on page 90)
   - Optional: Web Interface - Installation of ZumIQ Application Environment (on page 93)

8.2. Optional: Drag and Drop - Installation of ZumIQ Application Environment

FREEWAVE Recommends: If currently using the v1.0.6.0 developer environment, an upgrade to 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg is NOT required.

1. **IMPORTANT**: Install the 1_Device_Firmware_v1_1_0_1.pkg or 1_Device_Firmware_v1_1_0_1.pkg.txt file first.
   See Firmware Upgrade - Drag and Drop (on page 35).

   Warning! The Z9-P / Z9-PE / Z9-PE-GREY **MUST BE** upgraded to the Firmware v1_1_0_1 release or the ZumIQ Application Environment will NOT function.

2. Verify the Download the Upgrade File (on page 29) procedure is completed.
3. Locate and select the downloaded 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg upgrade file. (Figure 101)

   Caution: 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, Windows® 8.1, and Windows® 10.
   Failure to save the file with the correct extension type results in the copied file **NOT** integrating with the Z9-P / Z9-PE / Z9-PE-GREY.

4. If using some versions of Windows® 8, Windows® 8.1, or Windows® 10, change the extension of the .pkg file to .pkg.txt and select that file.

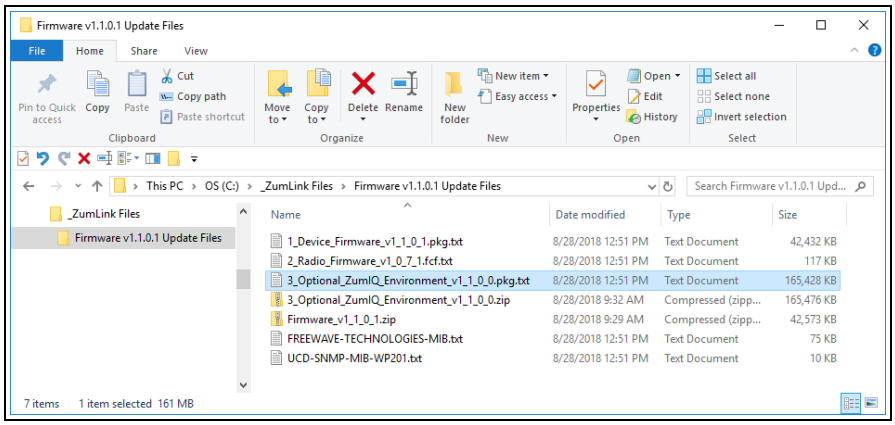


Figure 101: File Upload dialog box with Selected 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg.txt File

5. Drag and drop the .pkg or .pkg.txt file on to the **ZumLink** window. (Figure 102)

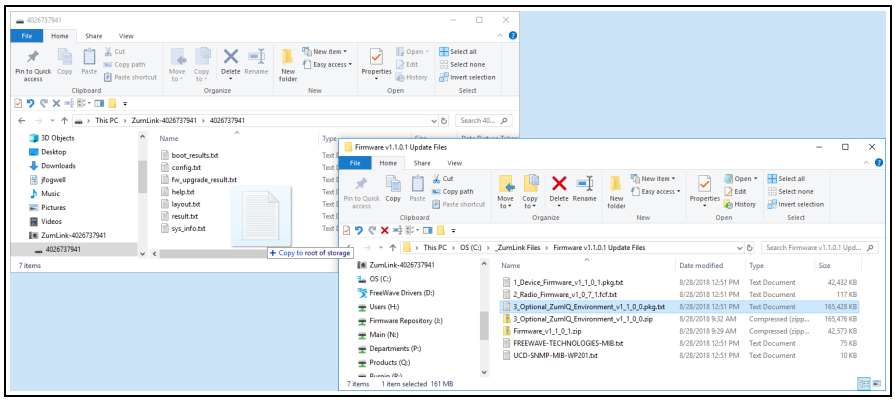


Figure 102: Drag and Drop the 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg.txt file to the ZumLink window

The **ZumLink** window is similar to Figure 103:

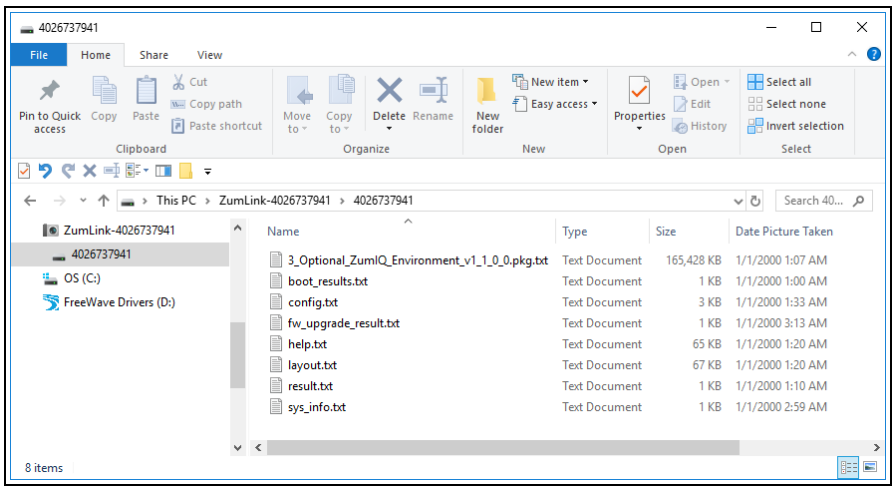


Figure 103: 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg.txt File Dropped in the ZumLink window

The .pkg or .pkg.txt file will disappear after approximately 6-10 minutes.

Note: Refresh the **ZumLink** window If, after 10-15 minutes, the .pkg.txt file has NOT disappeared.

Warning! DO NOT remove power from the Z9-P / Z9-PE / Z9-PE-GREY during or immediately after the firmware upgrade process!
Wait until the Home window (on page 351) Web Interface is accessible before removing power from the **ZumLink** device (approximately 6-8 minutes).

If power is removed prematurely during the upgrade process, the Web Interface pages may not be accessible.
Reinstall the .pkg file and **WAIT for the file upgrade process to complete**.

6. Optional: Open the **sys.info.txt** file to verify the upgrade information. (Figure 104)

> **Important!**: The image provides example information only.
> Each Z9-P / Z9-PE / Z9-PE-GREY provides its own unique information.

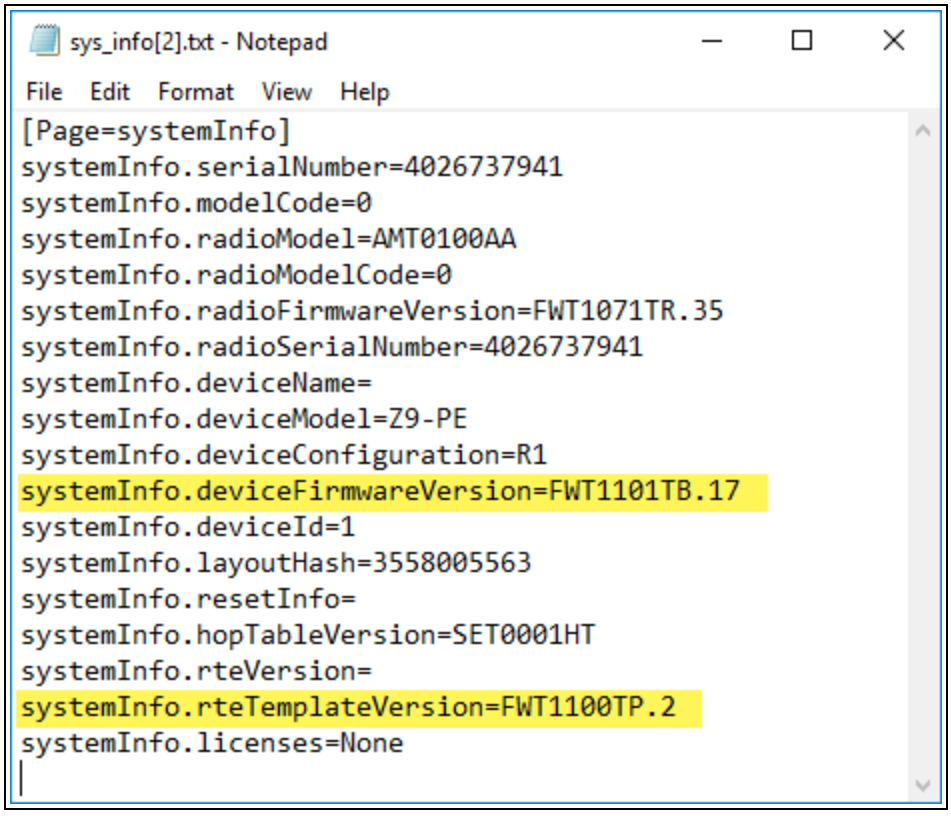


Figure 104: sys.info.txt file with Updated Firmware

> **Important!**: For the v1.1.0.1 upgrade, these settings should have this information:
> systemInfo.deviceFirmwareVersion=FWT1101TB.17
> Web Interface - Device Firmware Version is FWT1101TB.17
> systemInfo.rteTemplateVersion=FWT1100TP.2
> Web Interface - Rte Template Version is FWT1100TP.2
> If neither of these are listed in their respective settings, repeat the upgrade procedure.

8.3. Optional: Web Interface - Installation of ZumIQ Application Environment

FREEWAVE Recommends: If currently using the v1.0.6.0 developer environment, an upgrade to **3_Optional_ZumIQ_Environment_v1_1_0_0.pkg** is NOT required.

1. **IMPORTANT**: Install the **1_Device_Firmware_v1_1_0_1.pkg** or **1_Device_Firmware_v1_1_0_1.pkg.txt** file first.
   See Firmware Upgrade - Web Interface (on page 41).

   Warning! The Z9-P / Z9-PE / Z9-PE-GREY **MUST BE** upgraded to the **Firmware v1_1_0_1** release or the ZumIQ Application Environment will NOT function.

   Important!: If continuing from the Firmware Upgrade - Web Interface (on page 41) procedure for the **Firmware v1_1_0_1.zip** file, go to Step 7.
2. Verify the Download the Upgrade File (on page 29) procedure is completed.
3. Using a CAT5e / CAT6 Ethernet cable, connect the Z9-P / Z9-PE / Z9-PE-GREY 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 attached Z9-P / Z9-PE / Z9-PE-GREY.

   Note: If this is the first time the Z9-P / Z9-PE / Z9-PE-GREY is accessed, enter its default IP address of **192.168.111.100**.
   If the IP address was changed, enter that IP Address.
6. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
7. On the Menu bar, click the **File Upload** link. (Figure 105)

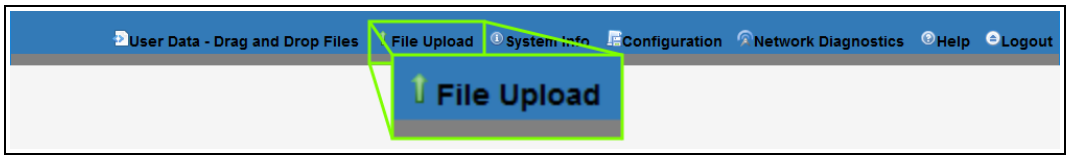


Figure 105: File Upload link

   The **Authentication Required** (Login) dialog box opens.
8. Enter **admin** in both the **User Name** and **Password** text boxes and click **OK**.
   The **Login** dialog box closes and theFile Upload window opens. (Figure 106)

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

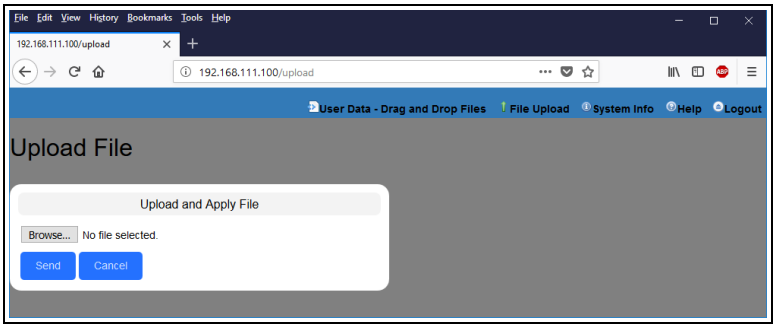


Figure 106: File Upload window

9. Click the **Browse** button.
   The **File Upload** dialog box opens.
10. Locate and select the downloaded **3_Optional_ZumIQ_Environment_v1_1_0_0.pkg** upgrade file. (Figure 107)

> **Caution**: 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, Windows® 8.1, and Windows® 10.
> Failure to save the file with the correct extension type results in the copied file **NOT** integrating with the Z9-P / Z9-PE / Z9-PE-GREY.

11. If using some versions of Windows® 8, Windows® 8.1, or Windows® 10, change the extension of the **.pkg** file to **.pkg.txt** and select that file.

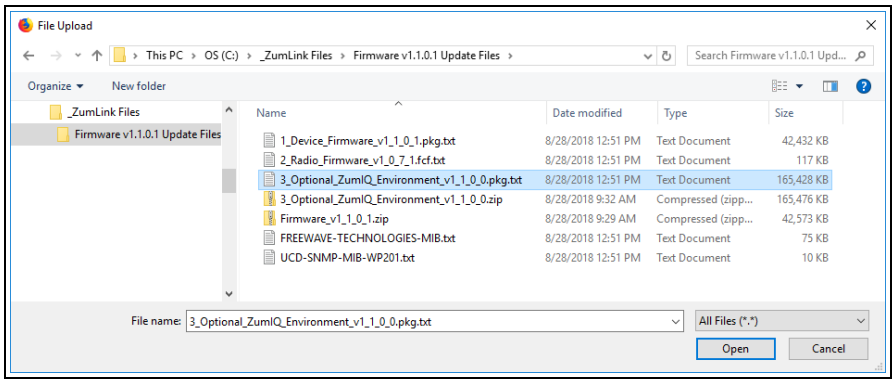


Figure 107: File Upload dialog box with Selected 3_Optional_ZumIQ_Environment_v1_1_0_0.pkg.txt File

12. Click **Open**.
    The dialog box closes and the **File Upload** window returns showing the selected file. (Figure 108)

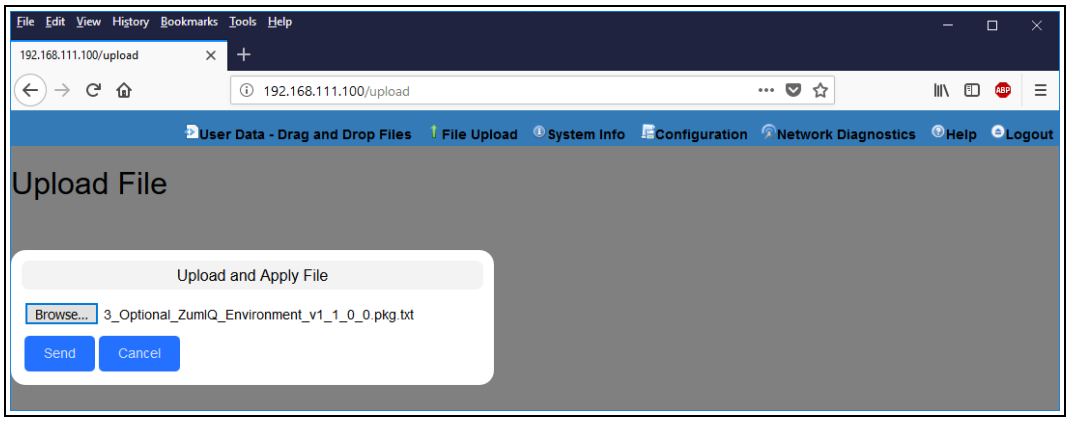


Figure 108: File Upload window with Selected .pkg.txt File

13. Click **Send**.
The **File Upload** window changes to show the completed upload percentage to the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 109)

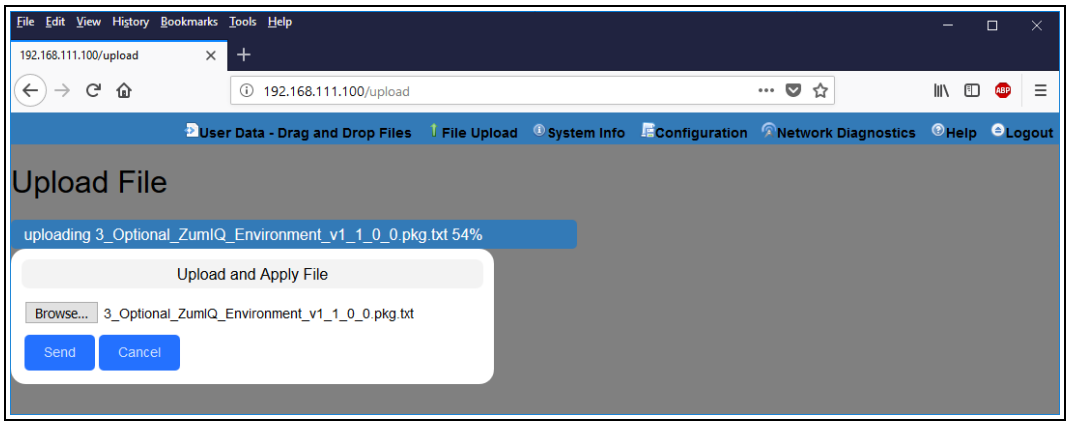


Figure 109: File Upload window Showing Uploading Percentage

14. Wait for the .pkg or .pkg.txt file to be applied (≈ 6-10 minutes).

Warning! DO NOT remove power from the Z9-P / Z9-PE / Z9-PE-GREY during or immediately after the firmware upgrade process!
Wait until the Home window (on page 351) Web Interface is accessible before removing power from the **ZumLink** device (approximately 6-8 minutes).

If power is removed prematurely during the upgrade process, the Web Interface pages may not be accessible.
Reinstall the .pkg file and **WAIT for the file upgrade process to complete**.

The **File Upload** window refreshes and shows the completed and uploaded file applied to the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 110)

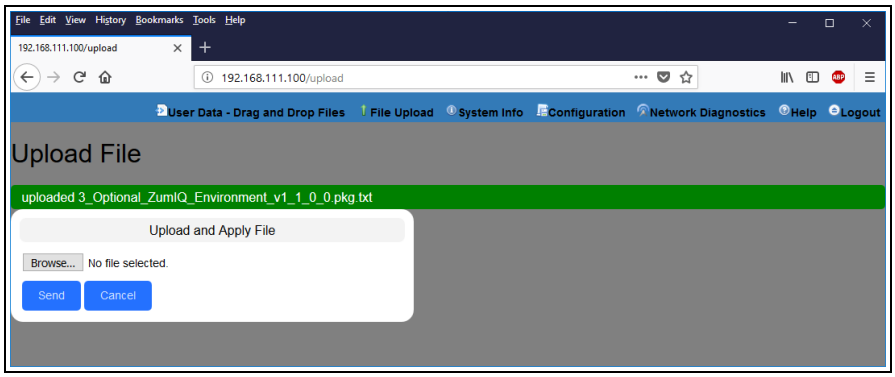


Figure 110: File Upload window Showing Completed Upload of the Selected File

15. Click the **System Info** link. (Figure 111)

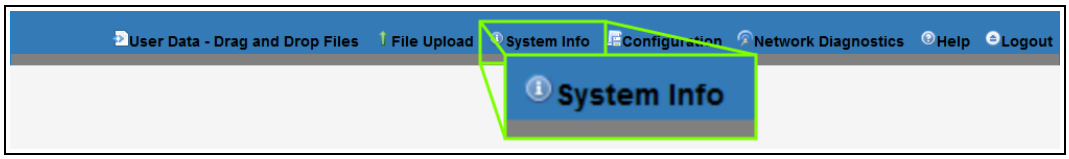


Figure 111: System Info link

The System Info window opens showing the updated firmware on the Z9-P / Z9-PE / Z9-PE-GREY. (Figure 112)

> **Important!**: The image provides example information only.
> Each Z9-P / Z9-PE / Z9-PE-GREY provides its own unique information.

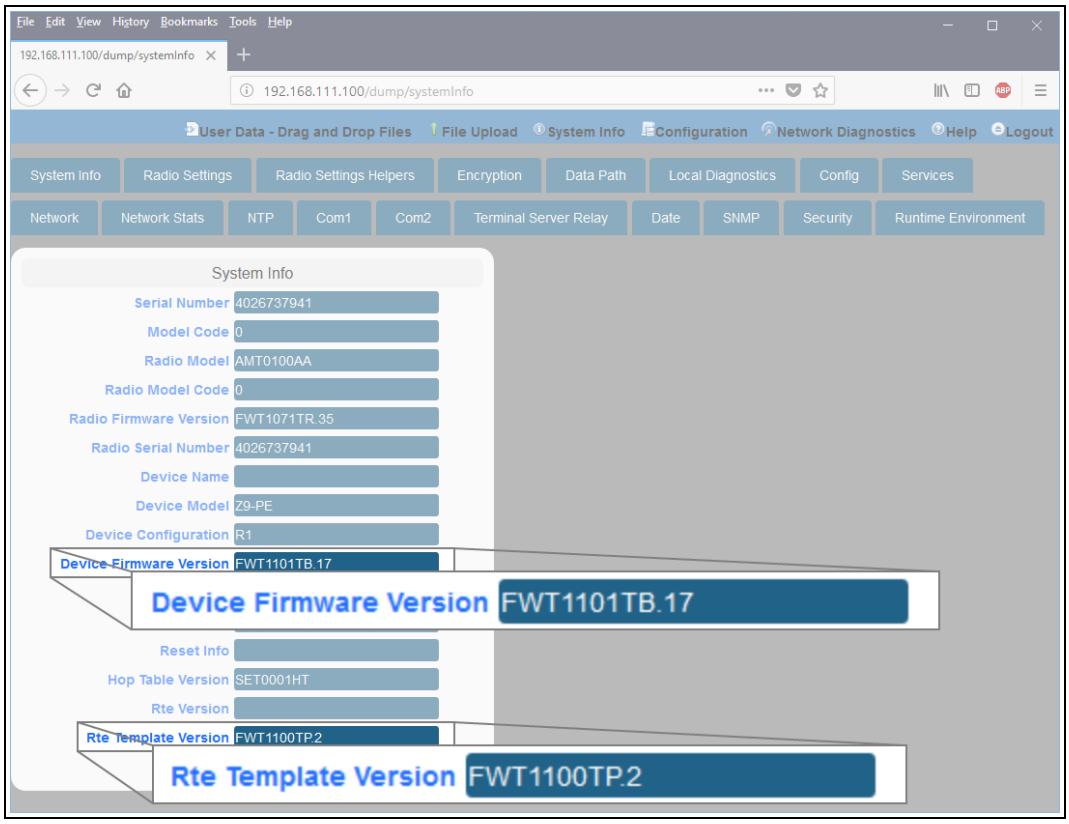


Figure 112: System Info window

Important!: For the v1.1.0.1 upgrade, these settings should have this information:
systemInfo.deviceFirmwareVersion=FWT1101TB.17
Web Interface - Device Firmware Version is FWT1101TB.17
systemInfo.rteTemplateVersion=FWT1100TP.2
Web Interface - Rte Template Version is FWT1100TP.2
If neither of these are listed in their respective settings, repeat the upgrade procedure.

8.4. Activating ZumIQ

Warning! The process of activating ZumIQ will install a fresh copy of the Linux development environment that supports ZumIQ.

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

Note: The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

Procedure

1. Complete the Tera Term Activation and ZumIQ Setup (on page 71).
2. Log in to the Z9-P / Z9-PE / Z9-PE-GREY CLI as **admin**.
3. At the > prompt, type **systemInfo** and press <Enter>.
   The **systemInfo** parameters appear. (Figure 113)

   Note: See the systemInfo Parameters (on page 312) for detailed information about the parameters.

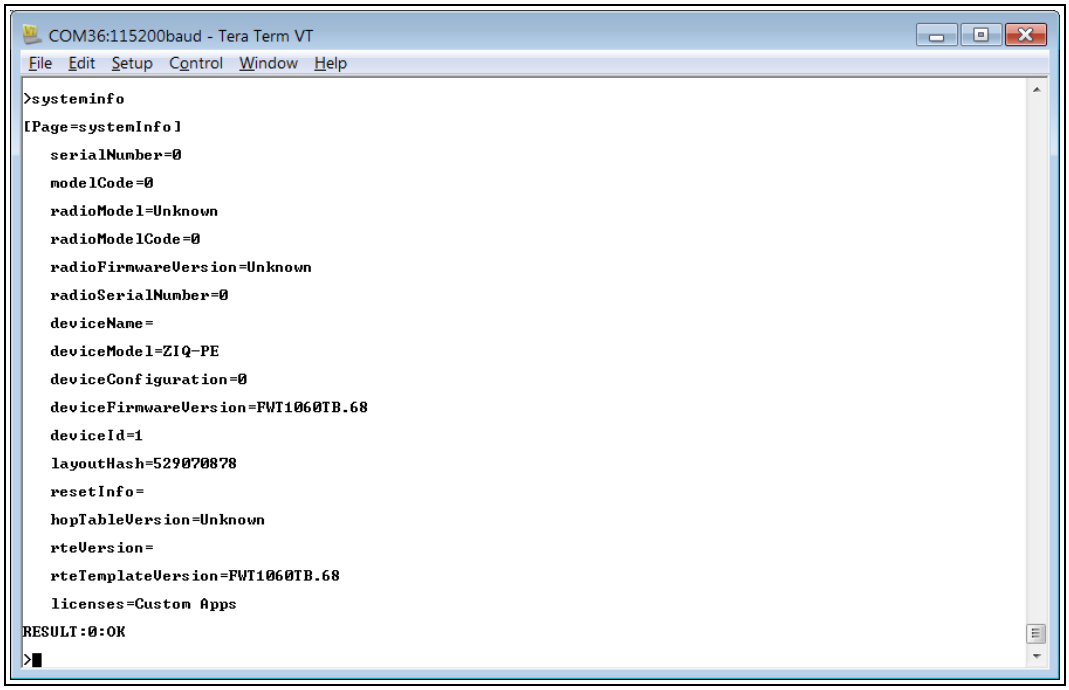


Figure 113: systemInfo Pages information

4. Verify these parameters have these values:

Verification Settings	
Parameter	**Value**
radioFirmwareVersion (on page 318)	FWT1040TA.11
deviceFirmwareVersion (on page 313)	FWT1060TB.68
rteVersion (on page 320)	(blank)
rteTemplateVersion (on page 320)	FWT1060TB.68
licenses (on page 316)	Custom Apps

5. At the > prompt, type **`rteReset=Hard`** and press <Enter>.
   This will stage the development runtimeEnvironment to be applied on the next reboot.
6. At the > prompt, type the **exact command** of **`reset=now`** and press <Enter>.
   This reboots the Z9-P / Z9-PE / Z9-PE-GREY and copies the Linux application environment into the runtime location.
   This will take ~3-4 minutes to complete.

Warning! At this point, the connection to the Z9-P / Z9-PE / Z9-PE-GREY is disabled.

7. Close the Tera Term window.
8. Disconnect and reconnect the USB cable from the computer.
   The **AutoPlay ZumLink** and **ZumLink** windows open again.
9. Continue with Verify ZumIQ Activation (on page 100).

8.5. Verify ZumIQ Activation

Note: The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

Procedure

1. **Important**: Verify the Activating ZumIQ (on page 98) procedure is completed.
2. Open a new Tera Term window.
3. Log in to the Z9-P / Z9-PE / Z9-PE-GREY CLI as **admin**.
4. At the > prompt, type **systemInfo** and press <Enter>.
   The **systemInfo** parameters appear. (Figure 114)

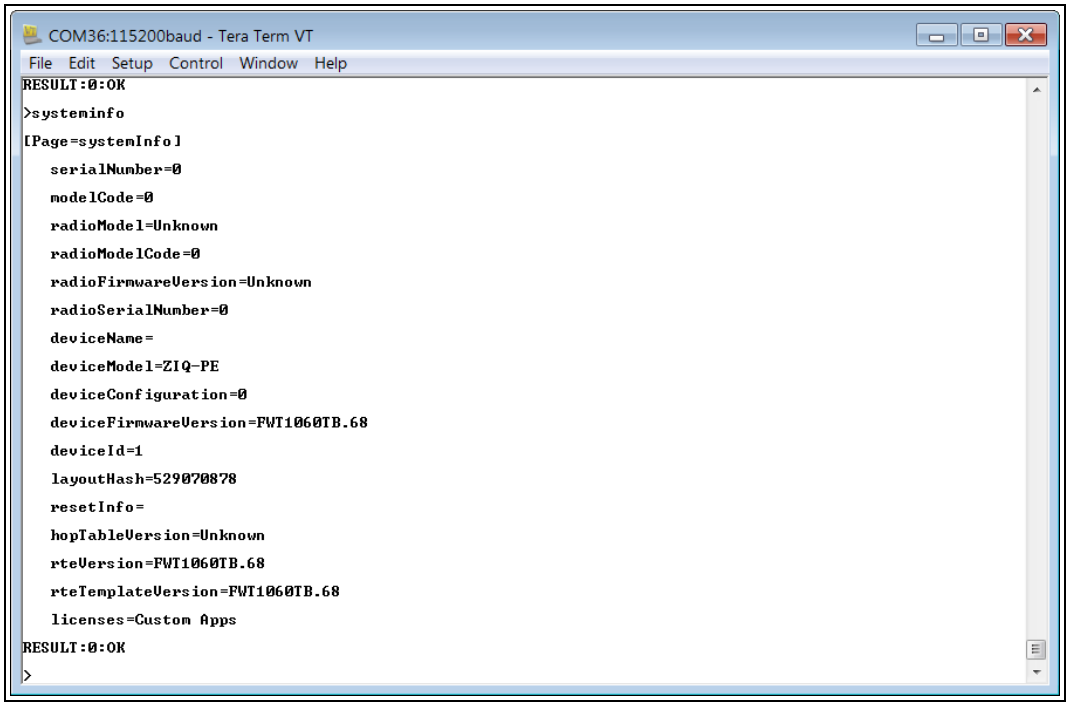


Figure 114: systemInfo Pages information

5. Verify the **rteTemplateVersion** and **rteVersion** values match these parameters:

Verify Activation Parameters	
Parameter	**Value**
radioFirmwareVersion (on page 318)	FWT1040TA.11
deviceFirmwareVersion (on page 313)	FWT1060TB.68

Verify Activation Parameters	
Parameter	**Value**
rteVersion (on page 320)	FWT1060TB.68 **Important!**: This value is updated after ZumIQ is activated.
rteTemplateVersion (on page 320)	FWT1060TB.68
licenses (on page 316)	Custom Apps

Important!: If the **rteVersion** is (blank) then the ZumIQ is NOT activated.
Repeat the Activating ZumIQ (on page 98) procedure.

6. Type `logout` and press <Enter> to exit the FreeWave Shell.
7. Continue with Using ZumIQ as DEVUSER (on page 102).

8.6. Using ZumIQ as DEVUSER

Once logged into ZumIQ as **devuser**, developers gain access to the **devuser** home directory where applications and associated tools and services are stored. The directory also has several pre-loaded tools such as Python language support and helper scripts to pull in other external tools and services.

Once a developer is ready to start building an application in ZumIQ, 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 ZumIQ Activation (on page 100) is completed.
2. Log in to the Z9-P / Z9-PE / Z9-PE-GREY CLI as **devuser**.
   The default password is **devuser**.
   A Linux Bash prompt appears. (Figure 115)

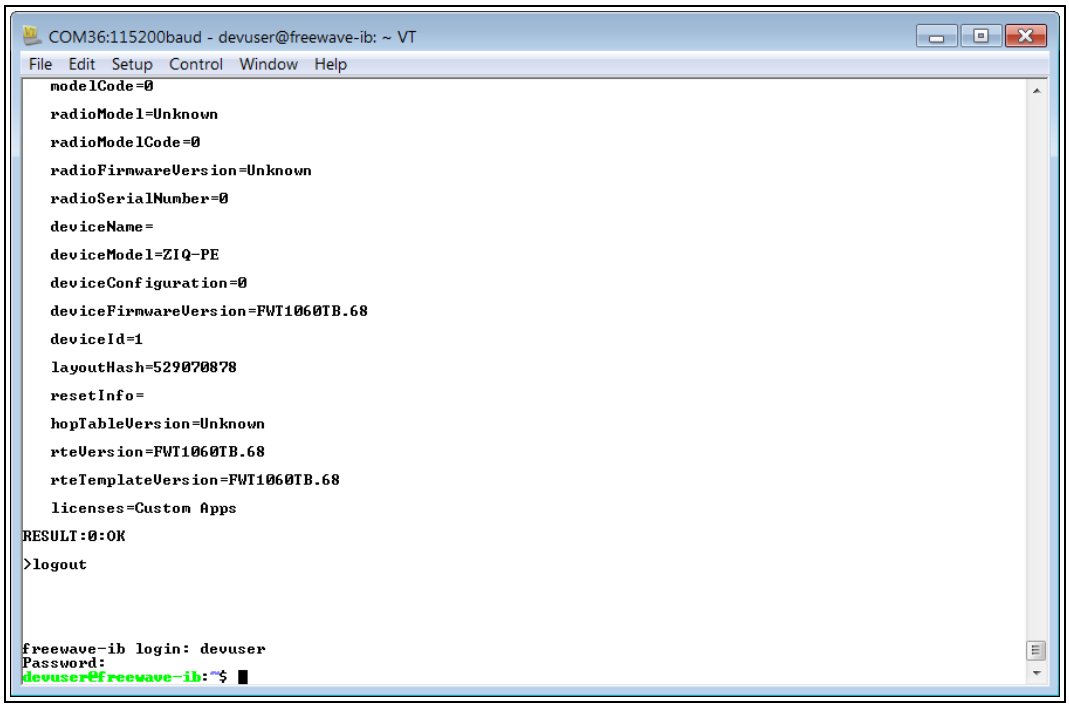


Figure 115: Linux Bash Prompt for the Z9-P / Z9-PE / Z9-PE-GREY DEVUSER

3. Go to: https://github.com/FreeWaveTechnologies/ZumIQ.
   The FreeWave Github ZumIQ Main Page opens. (Figure 116)

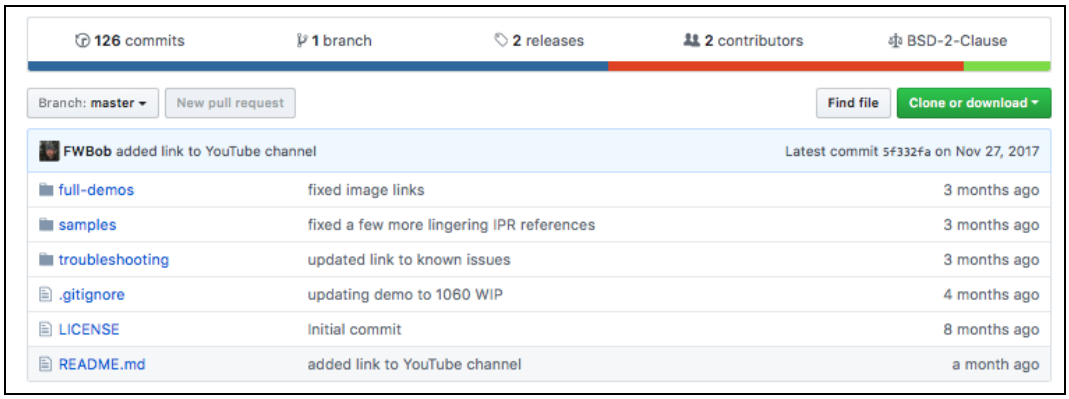


Figure 116: FreeWave GitHub ZumIQ Main Page

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

4. Scroll to the bottom of the **Main** page and click the Wiki link for ZumIQ app development information. (Figure 117)

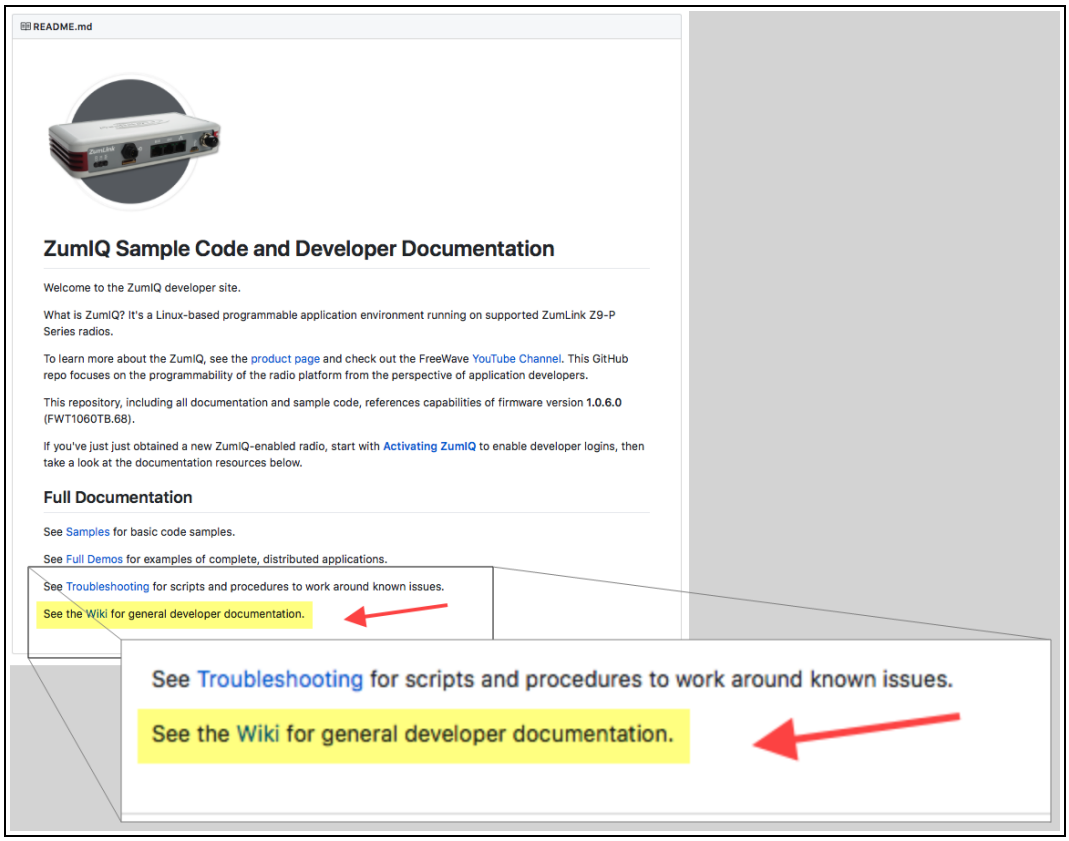


Figure 117: Wiki link on the FreeWave GitHub ZumIQ Main Page

9. Web Interface Administration

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

9.1. Access the Web Interface

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

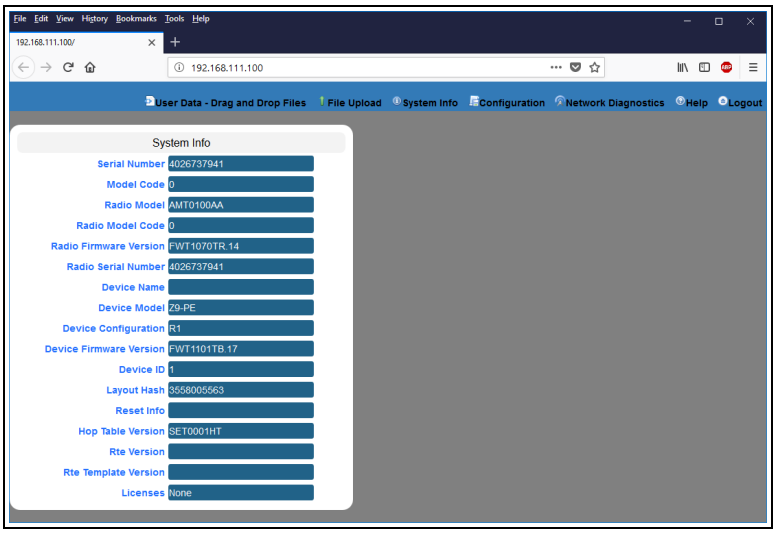


Figure 118: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 119)

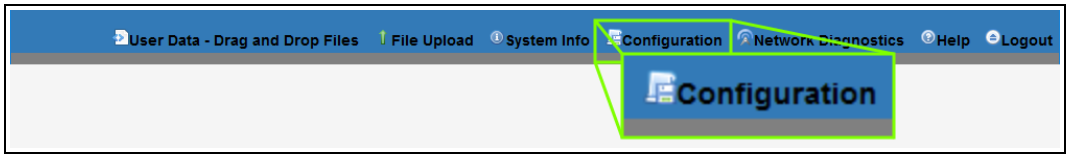


Figure 119: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 120)

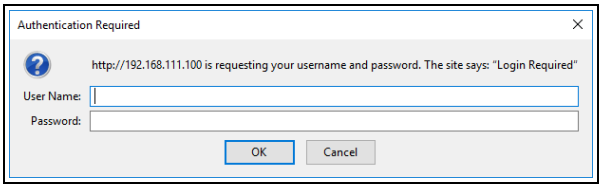


Figure 120: Authentication Required (Login) dialog box

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

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

The Config window (on page 339) opens. (Figure 121)

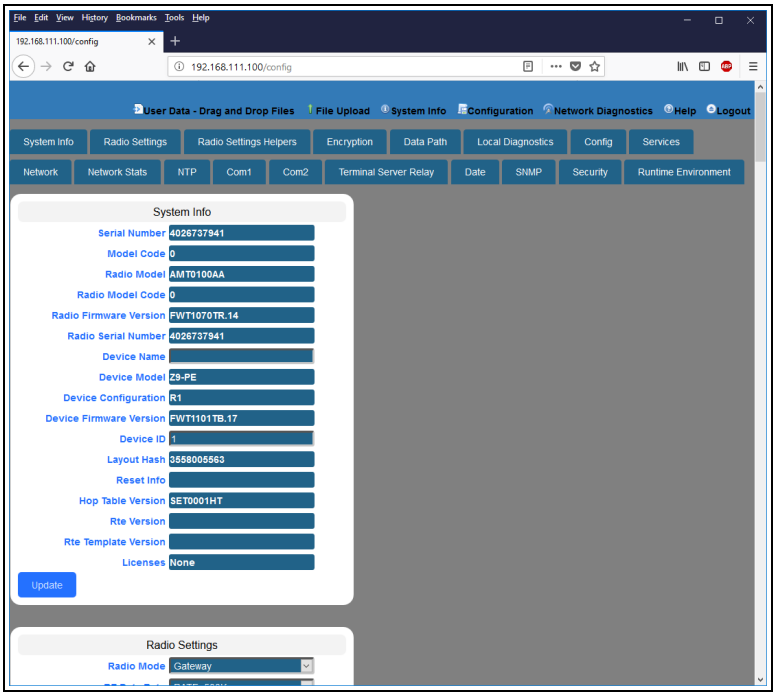


Figure 121: Configuration window

9.2. Change the COM Parameters

Note: See the COM Parameters (on page 191) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

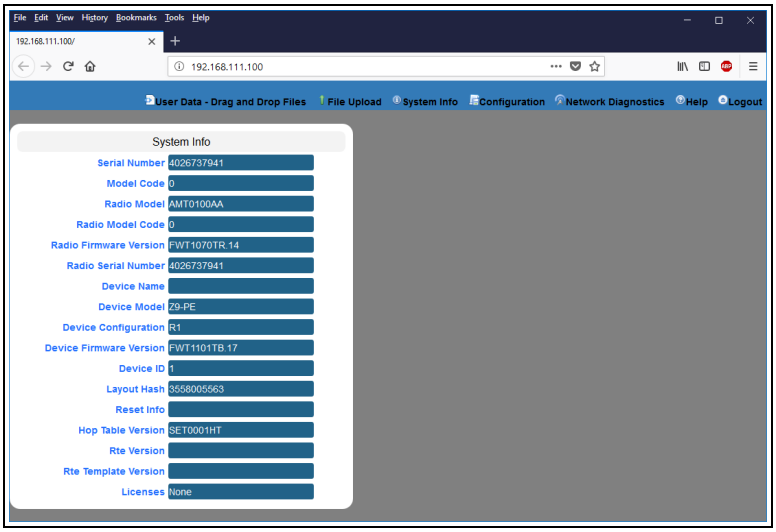


Figure 122: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 123)

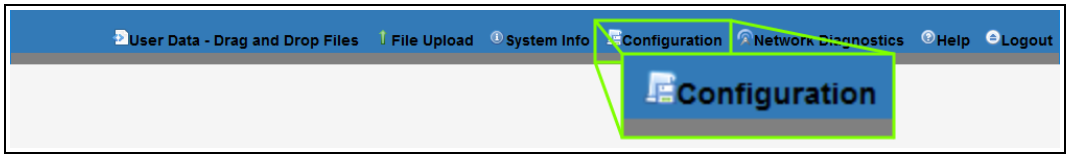


Figure 123: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 124)

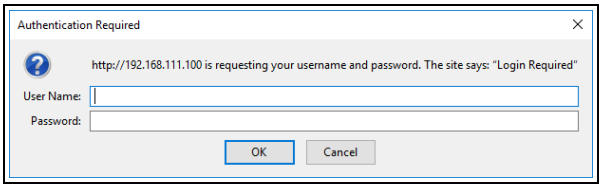


Figure 124: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 125)

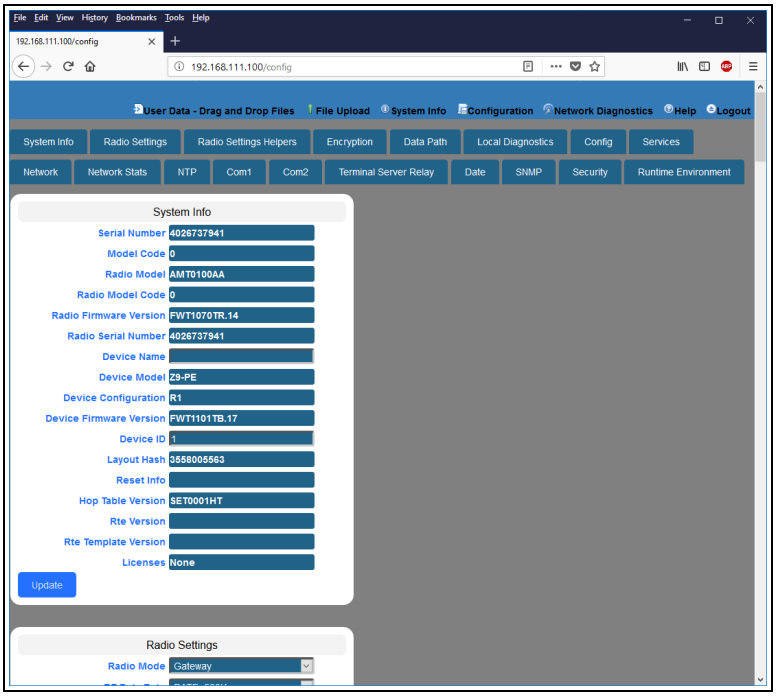


Figure 125: Configuration window

6. Click either the **COM1** or **COM2** tab.
   The **COM1** or **COM2** parameters are shown in Figure 126 or Figure 127 respectively.

   Note: See the COM Parameters (on page 191) for detailed information about the parameters. The parameters for **COM1** and **COM2** are the same except for the **TerminalServerPort** parameter setting.

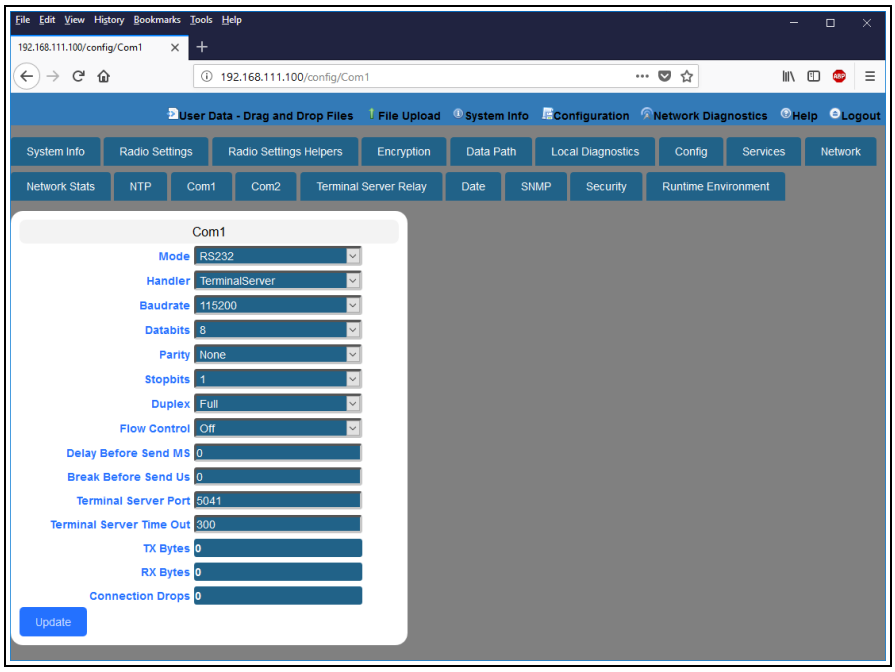


Figure 126: COM1 window

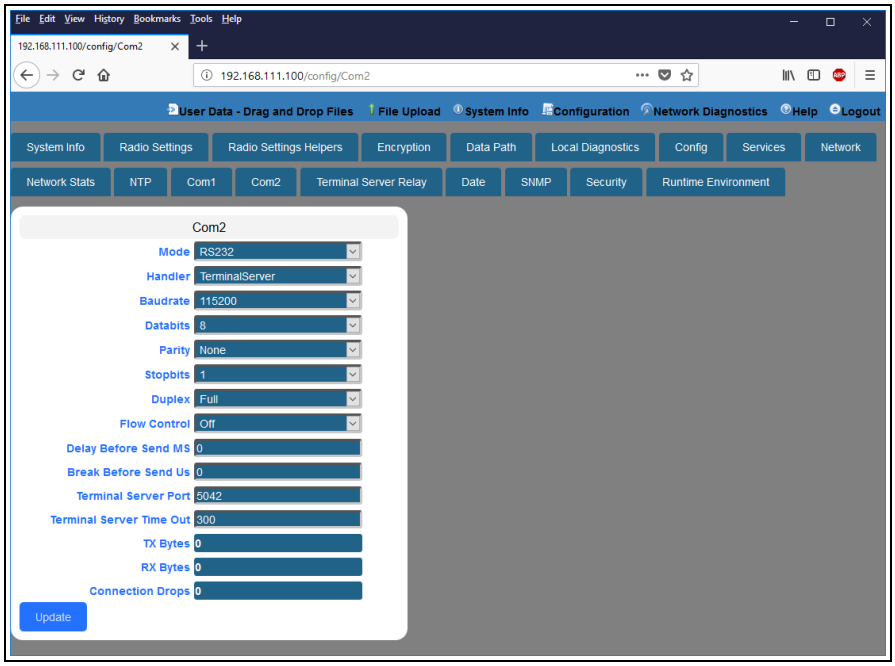


Figure 127: COM2 window

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. Click the **Flow Control** list box arrow and select **Hardware** to activate **flowControl** for COM2.

> **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 Relay** setting, 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 receiving data from the network.

> **Note**: TxBytes (on page 202), RxBytes (on page 200), and connectionDrops (on page 193) are Read-only parameters.

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

9.3. Change the Data Path Parameters

Note: See the dataPath Parameters (on page 209) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

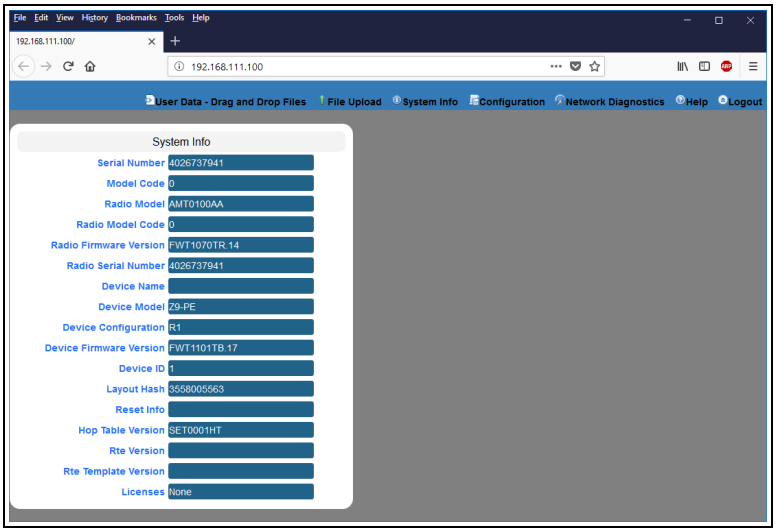


Figure 128: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 129)

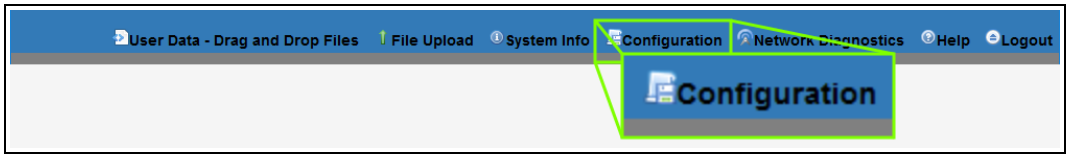


Figure 129: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 130)

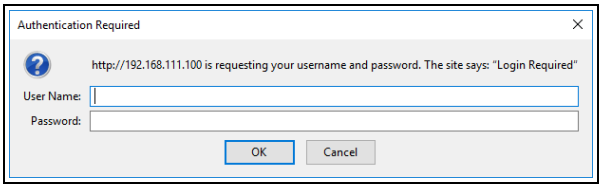


Figure 130: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 131)

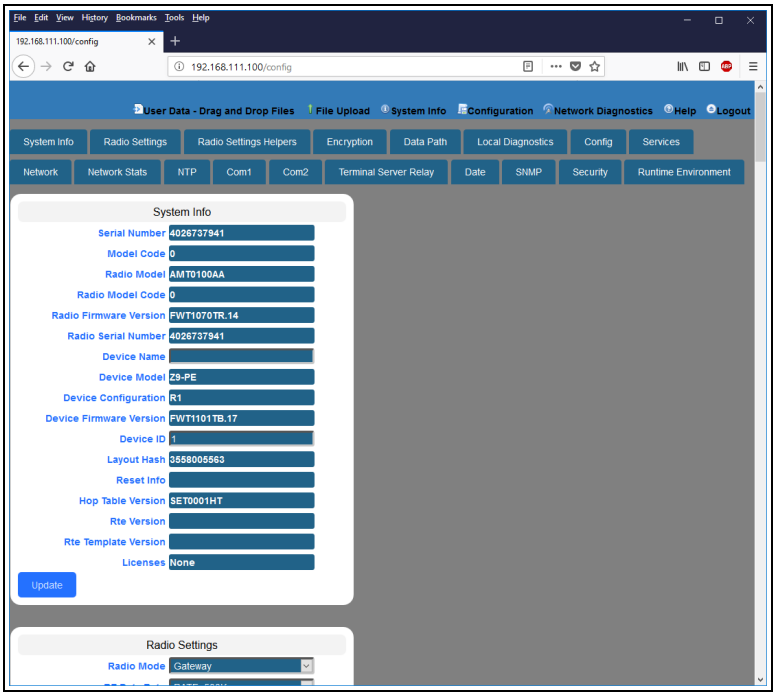


Figure 131: Configuration window

6. Click the **Data Path** tab.
   The **Data Path** parameters are shown in Figure 132.

   Note: See the dataPath Parameters (on page 209) for detailed information about the parameters.

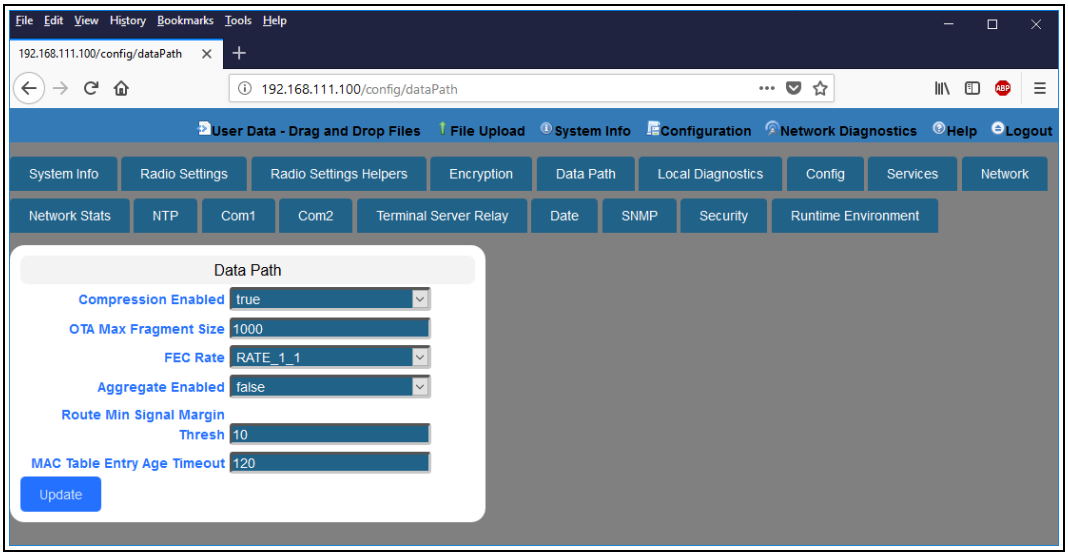


Figure 132: Data Path window

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 RadioBadCRC (on page 234) count is more than 15% of the total transmitted packets (the RadioLLTx (on page 236) count), enabling the fecRate (on page 212) setting is beneficial.

9.4. Change the Encryption Parameters

Note: See the encryption Parameters (on page 222) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

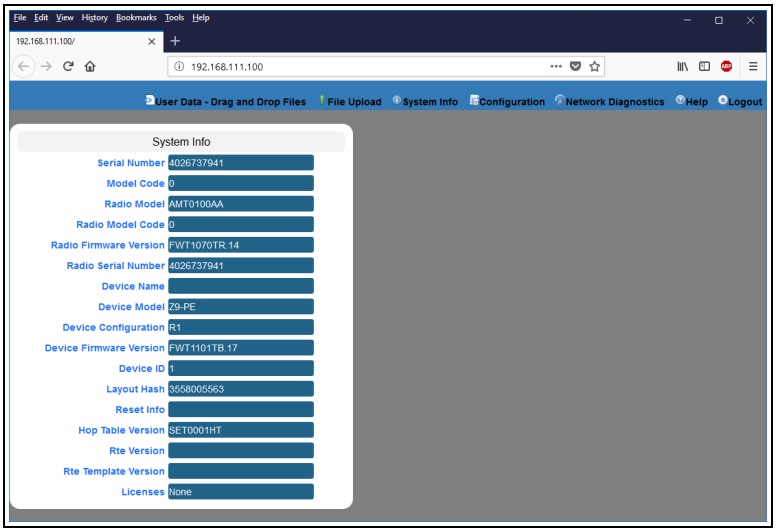


Figure 133: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 134)

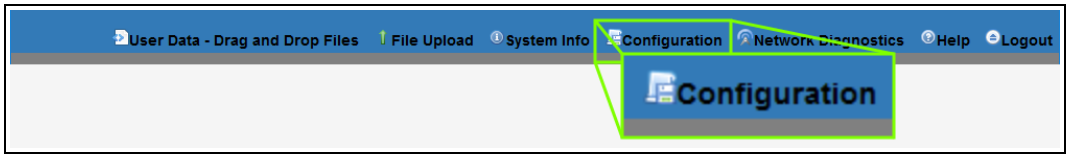


Figure 134: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 135)

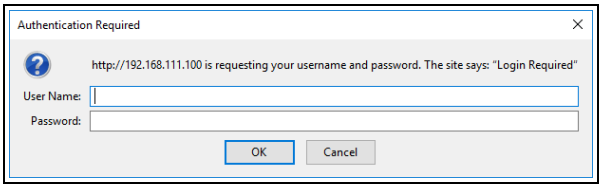


Figure 135: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 136)

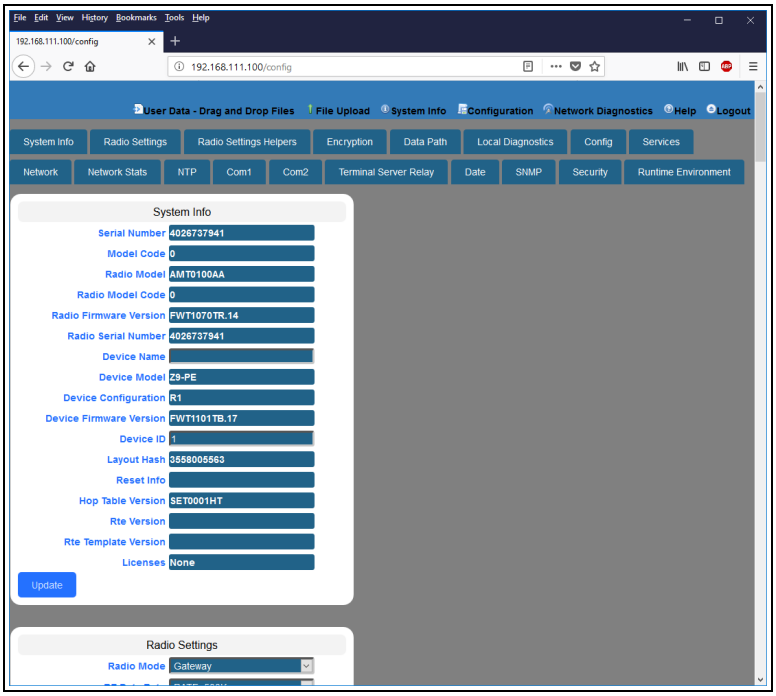


Figure 136: Configuration window

6. Click the **Encryption** tab.
   The **Encryption** parameters are shown in Figure 137.

   Note: See the encryption Parameters (on page 222) for detailed information about the parameters.

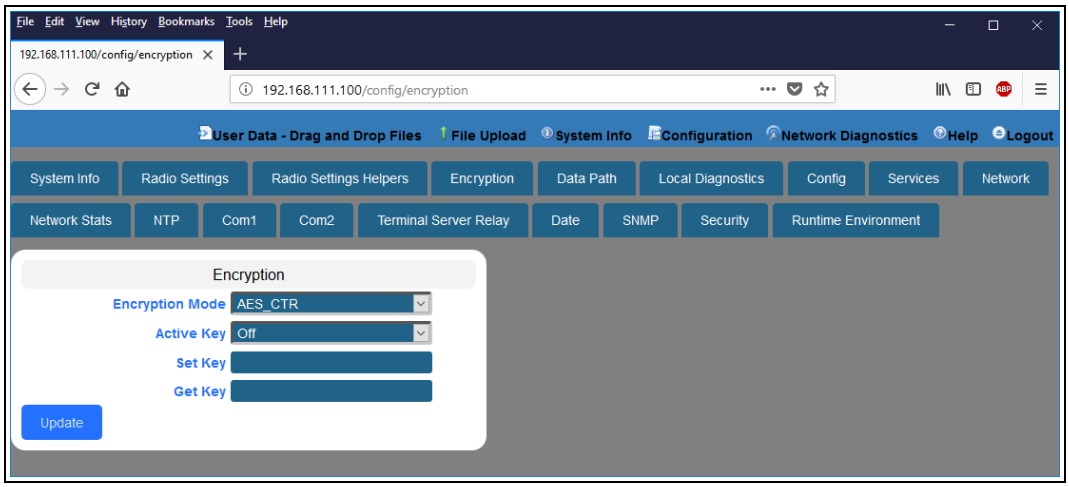


Figure 137: Encryption window

7. Click the **Encryption Mode** list box arrow and select the designated encryption mode.

   Note: The activeKey (on page 223), setKey (on page 225), and getKey (on page 224) parameters are read-only in the Web Interface.
   They can be changed in the CLI.

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

9.5. Change the Local Diagnostics

Note: See the localDiagnostics Parameters (on page 227) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

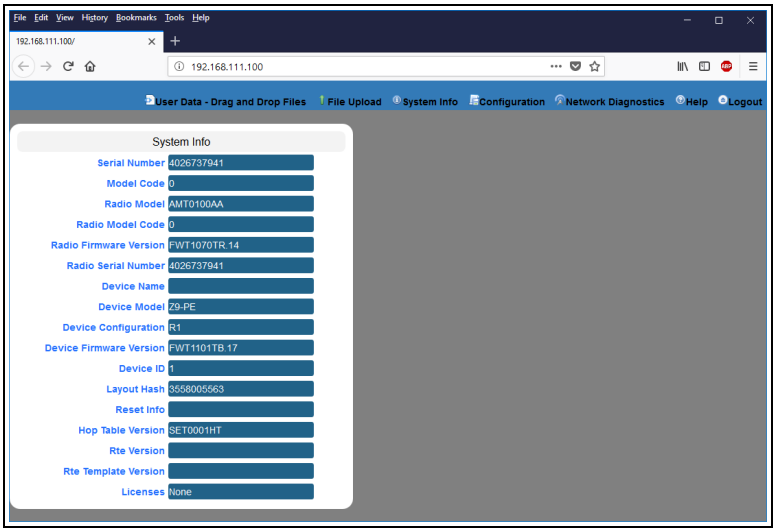


Figure 138: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 139)

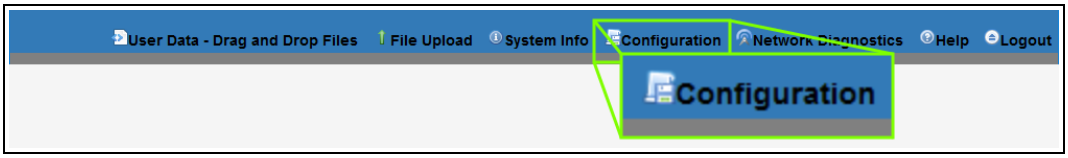


Figure 139: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 140)

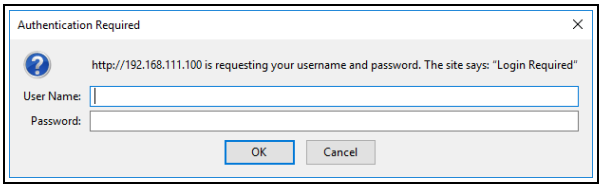


Figure 140: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 141)

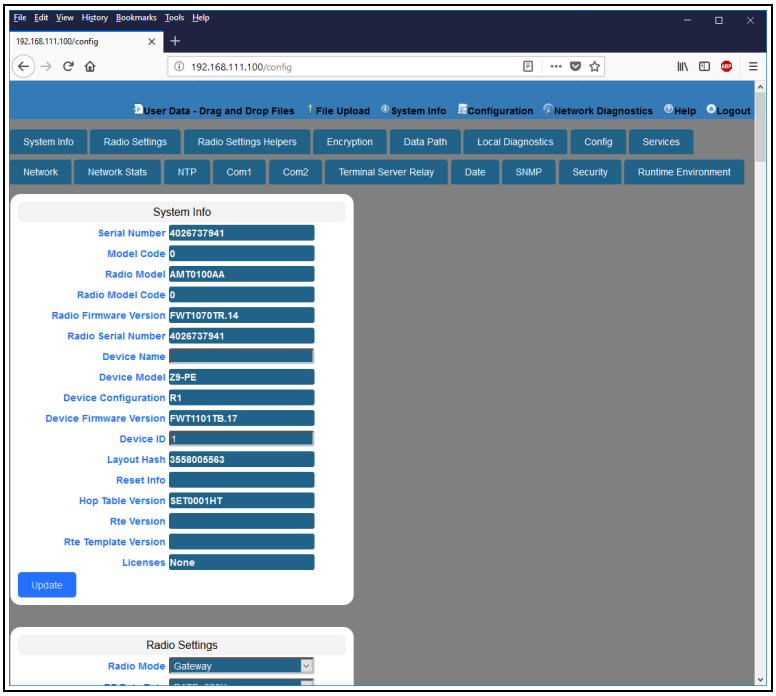


Figure 141: Configuration window

6. Click the **Local Diagnostics** tab.
   The **Local Diagnostics** window opens.

   Note: See the localDiagnostics Parameters (on page 227) for detailed information about the parameters.

7. Scroll to locate the **Monitored Node** text box. (Figure 142)

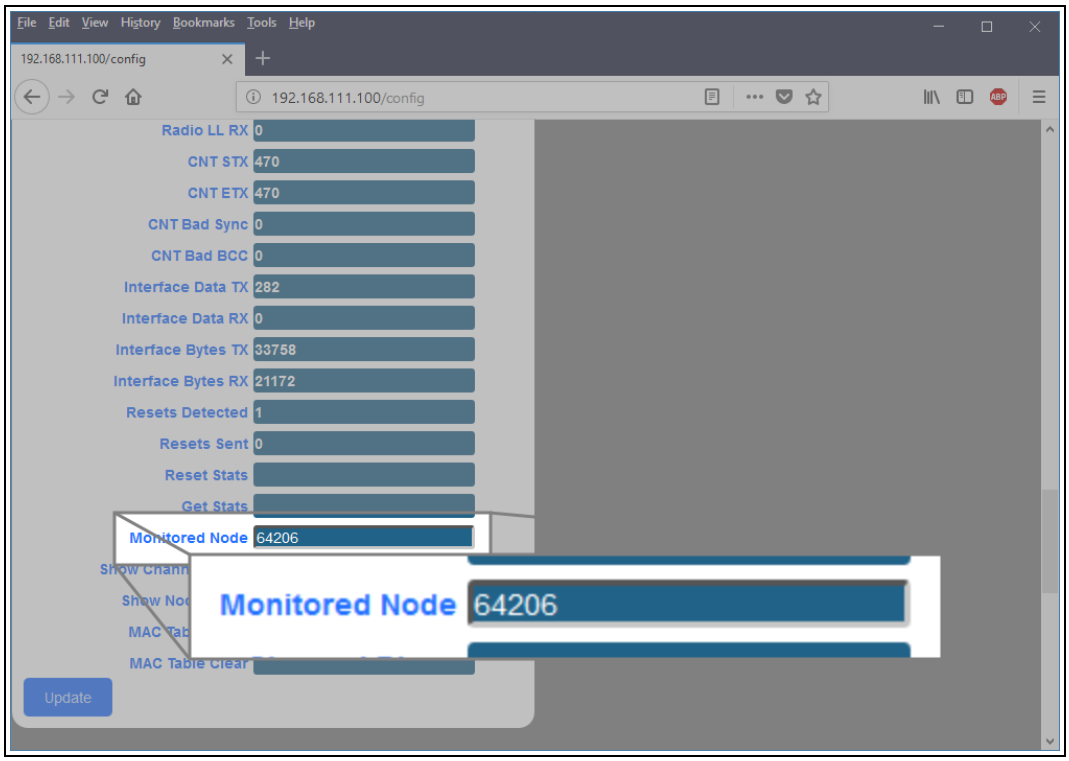


Figure 142: Local Diagnostics window

8. In the **Monitored Node** text box, enter the nodeId (on page 272) to monitor.
9. Click the **Update** button to save the changed information.

FREEWAVE Recommends: When viewing local diagnostics, if the RadioBadCRC (on page 234) count is more than 15% of the total transmitted packets (the RadioLLTx (on page 236) count), enabling the fecRate (on page 212) setting is beneficial.

9.6. Change the Network Parameters

Note: See the network Parameters (on page 245) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

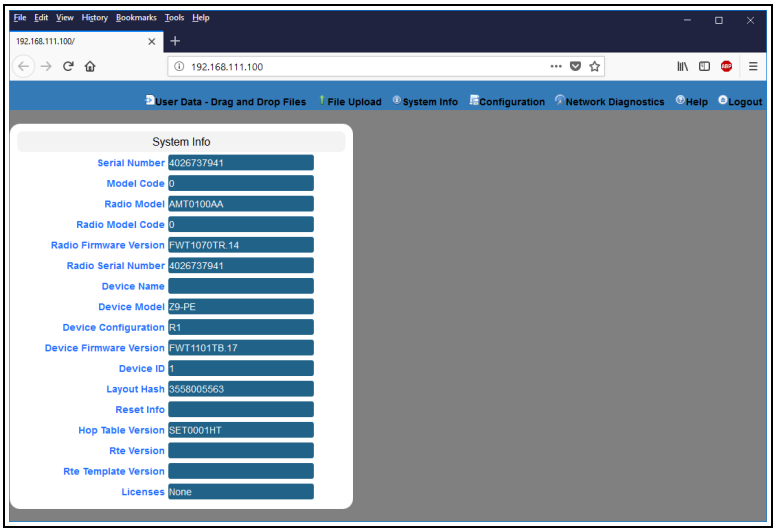


Figure 143: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 144)

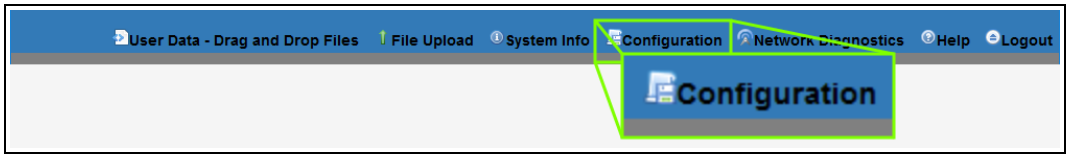


Figure 144: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 145)

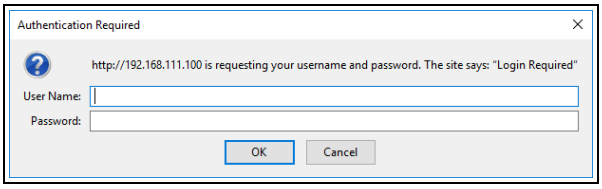


Figure 145: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 146)

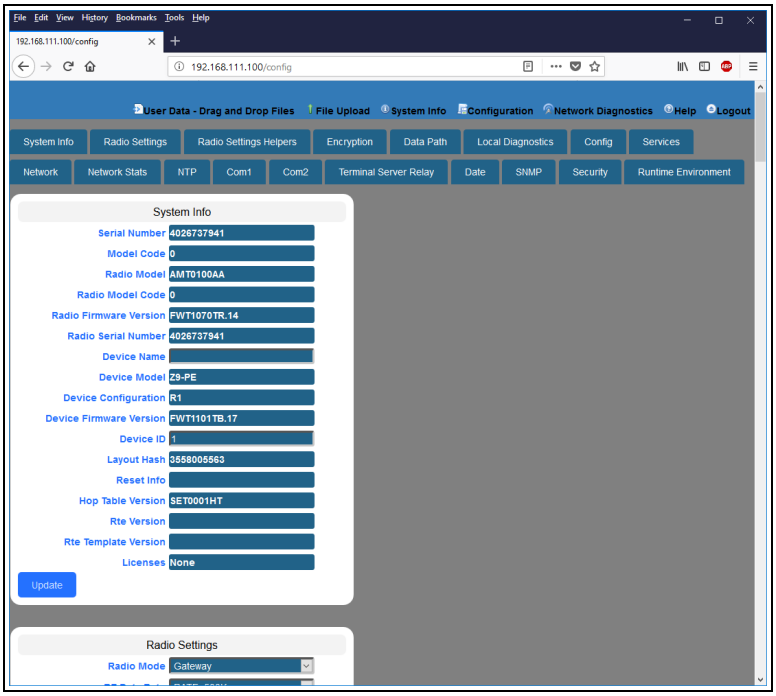


Figure 146: Configuration window

6. Click the **Network** tab.
   The **Network** parameters are shown in Figure 147.

   Note: See the network Parameters (on page 245) for detailed information about the parameters.

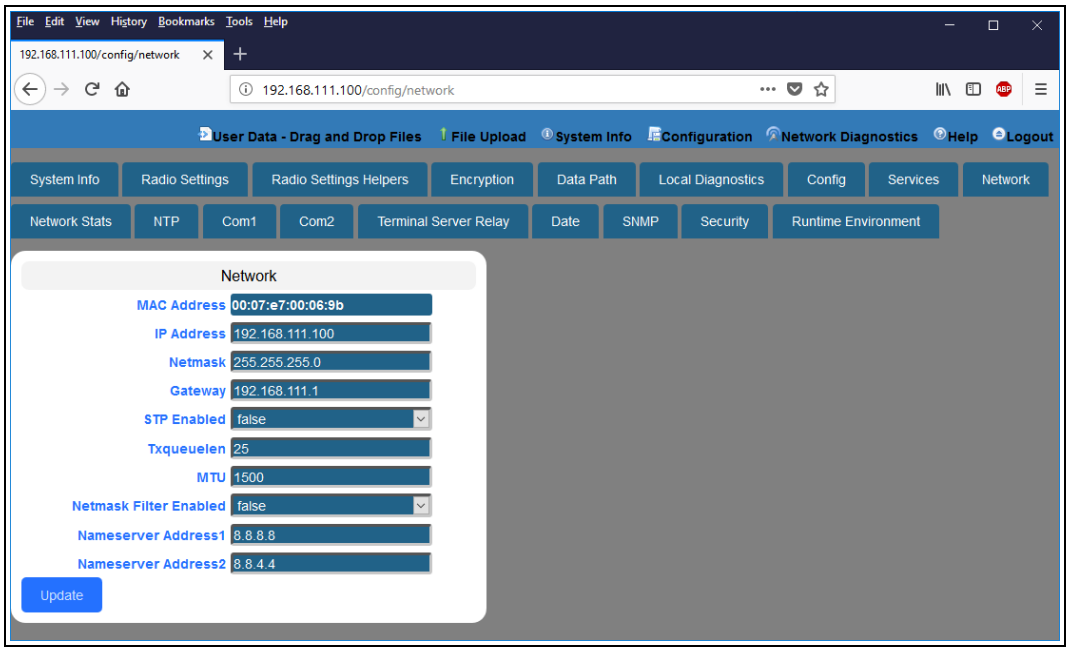


Figure 147: Network window

> **Note**: The mac_address (on page 247) 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 / Z9-PE / Z9-PE-GREY assigned by the IT department for the network.
   b. In the **Netmask** text box, enter the Netmask of the Z9-P / Z9-PE / Z9-PE-GREY.
   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..
8. Click the **Update** button to save the changed information.

9.7. Change the NTP Parameters

Note: See the NTP Parameters (on page 258) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

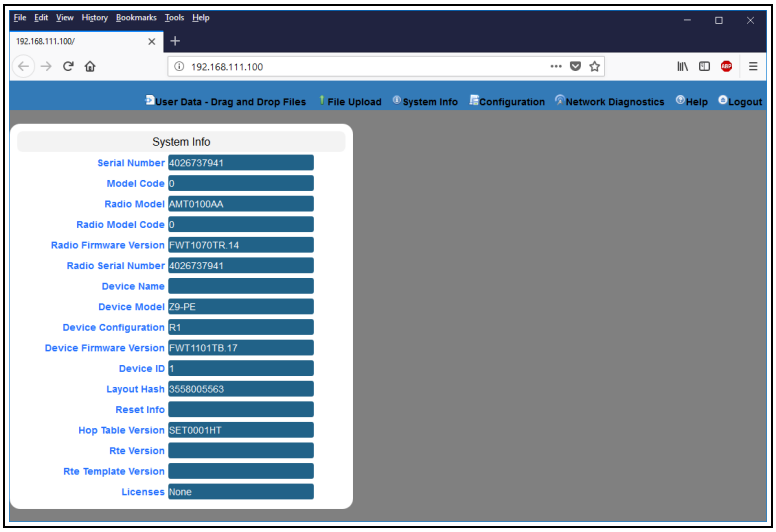


Figure 148: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 149)

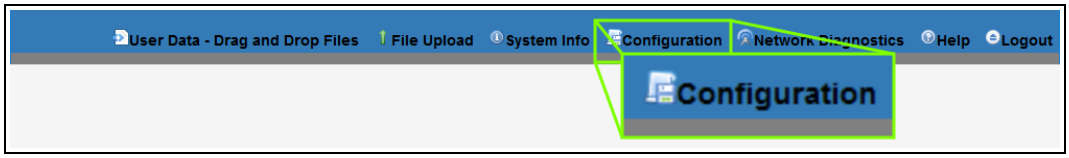


Figure 149: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 150)

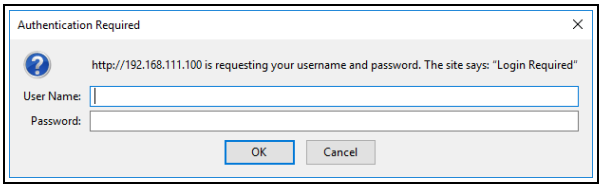


Figure 150: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 151)

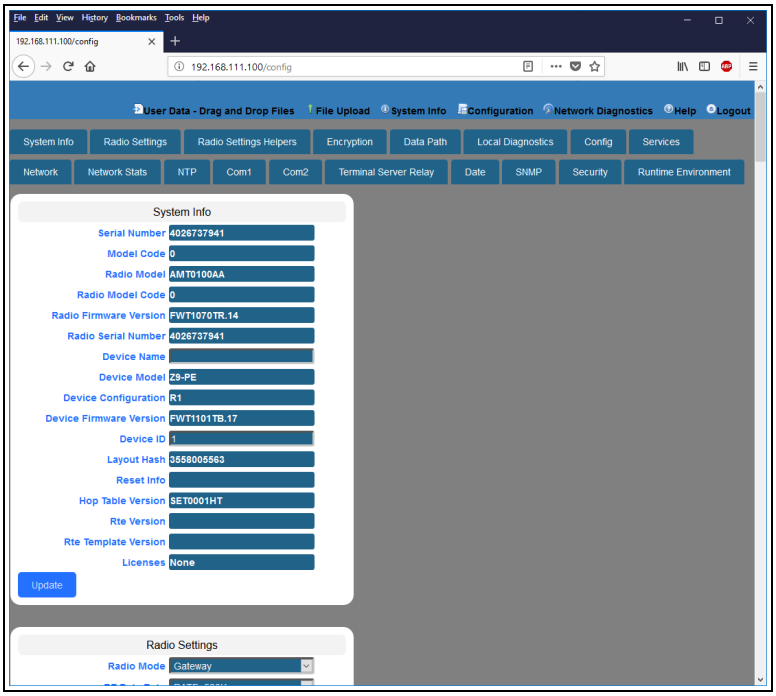


Figure 151: Configuration window

6. Click the **NTP** tab.
   The **NTP** parameters are shown in Figure 152.

   Note: See the NTP Parameters (on page 258) for detailed information about the parameters.

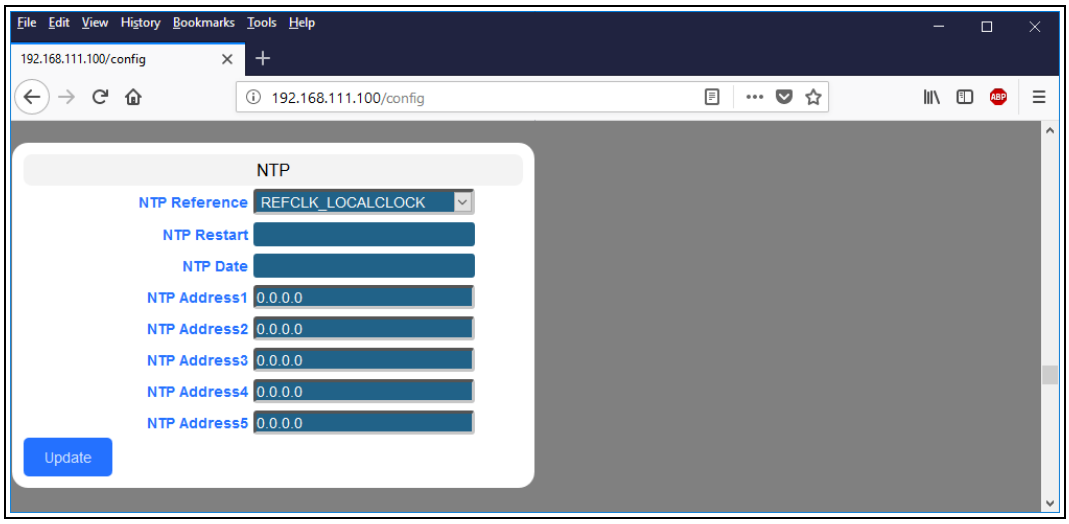


Figure 152: NTP window

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 (on page 259) 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.

9.8. Change the Radio Settings Parameters - Endpoints

Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

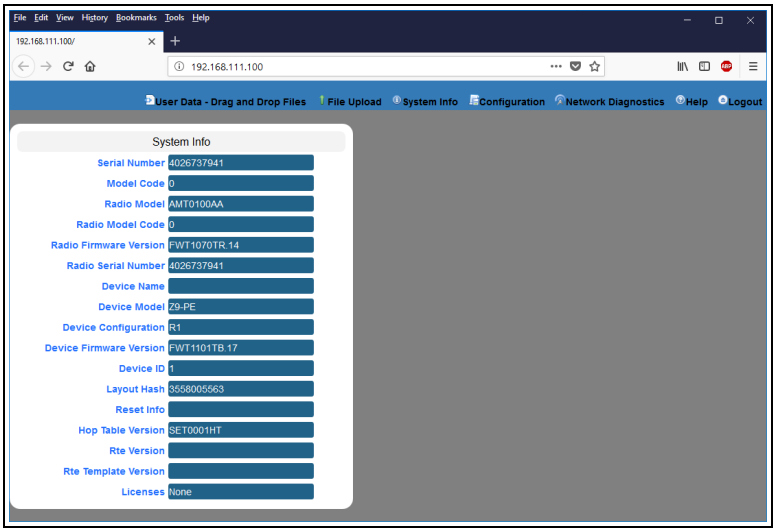


Figure 153: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 154)

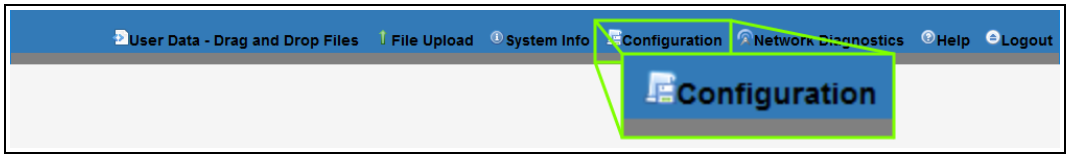


Figure 154: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 155)

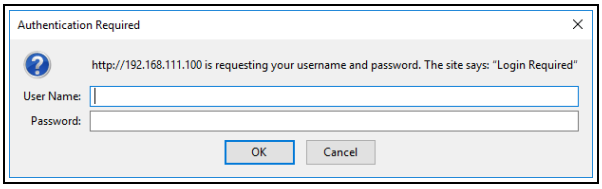


Figure 155: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 156)

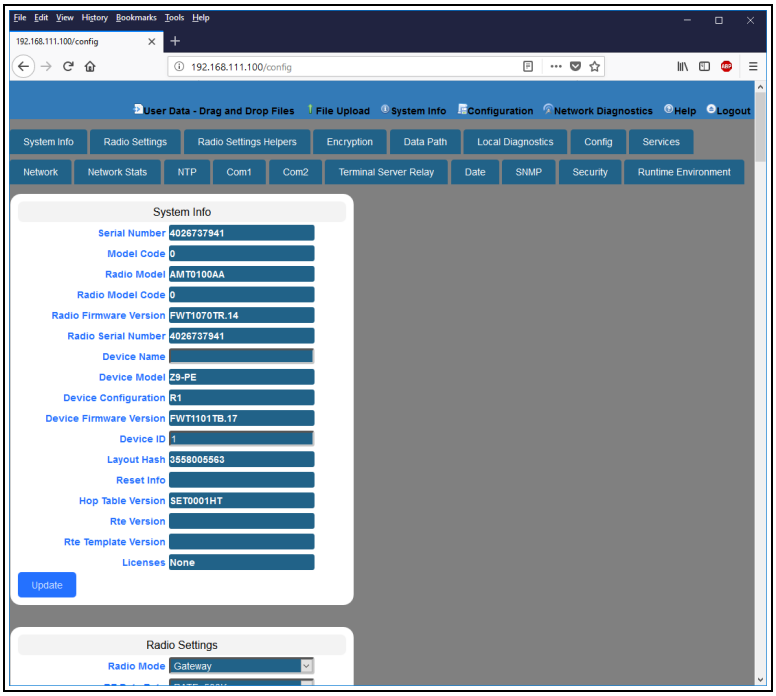


Figure 156: Configuration window

6. Click the **Radio Settings** tab.
7. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P / Z9-PE / Z9-PE-GREY as an **Endpoint**.
   The **Radio Settings** parameters are shown in Figure 157.

   Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

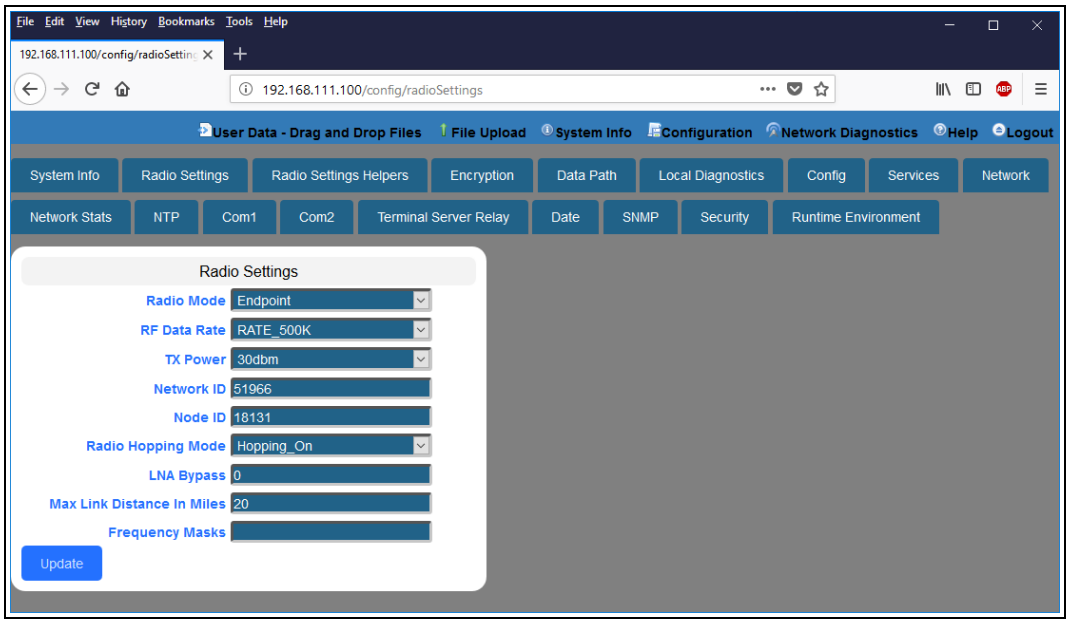


Figure 157: Radio Settings window - Endpoint

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 / Z9-PE / Z9-PE-GREY.
   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 **nodeId** instead of the auto-generated **nodeId**.
   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) between any nodes 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 frequencyMasks (on page 267) for detailed information.

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

9.9. Change the Radio Settings Parameters - Endpoint-Repeaters

Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

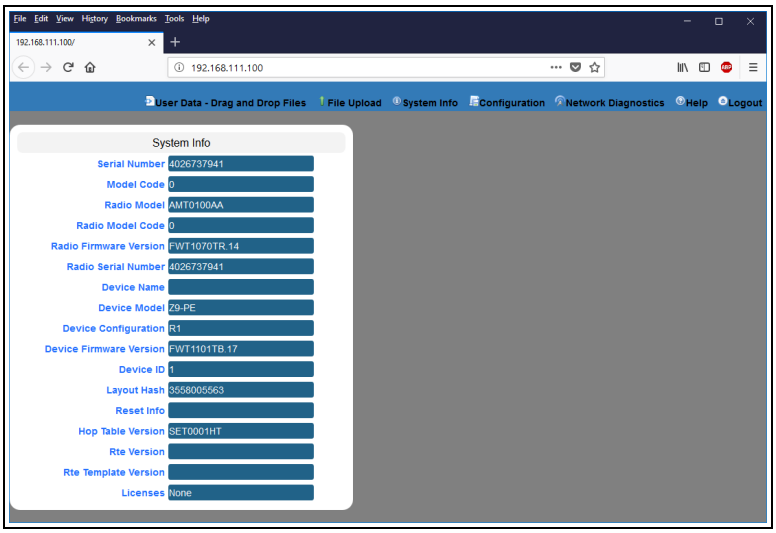


Figure 158: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 159)

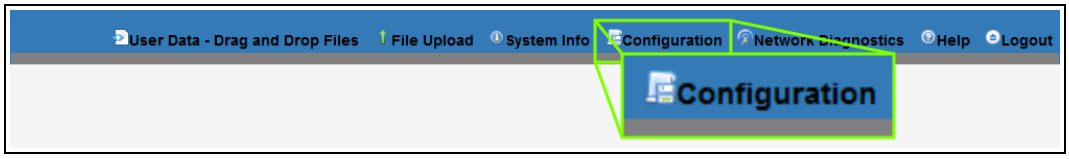


Figure 159: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 160)

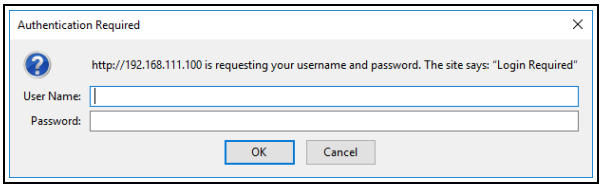


Figure 160: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 161)

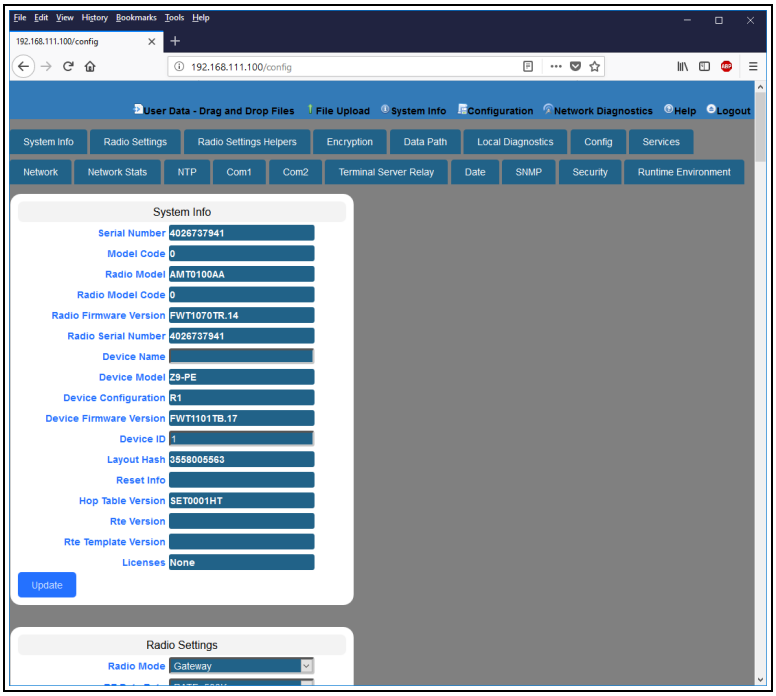


Figure 161: Configuration window

6. Click the **Radio Settings** tab.
7. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P / Z9-PE / Z9-PE-GREY as an **Endpoint_Repeater**.
   The **Radio Settings** parameters are shown in Figure 162.

   Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

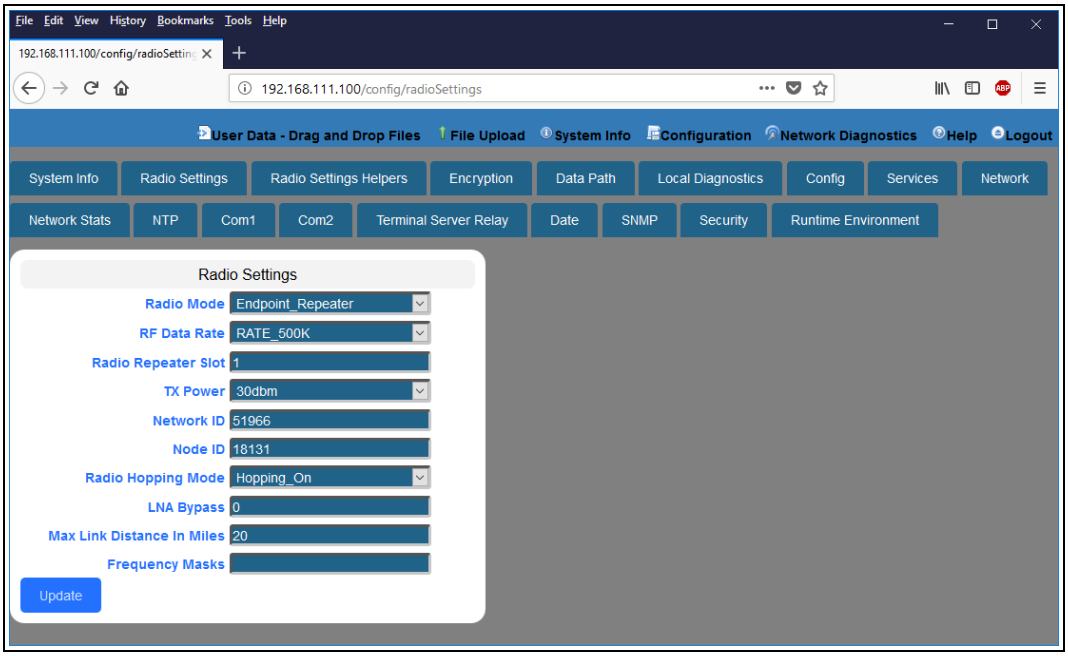


Figure 162: Radio Settings window - Endpoint

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. 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 / Z9-PE / Z9-PE-GREY.
   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 **nodeId** instead of the auto-generated **nodeId**.
   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) between any nodes 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 frequencyMasks (on page 267) for detailed information.

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

9.10. Change the Radio Settings Parameters - Gateways

Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

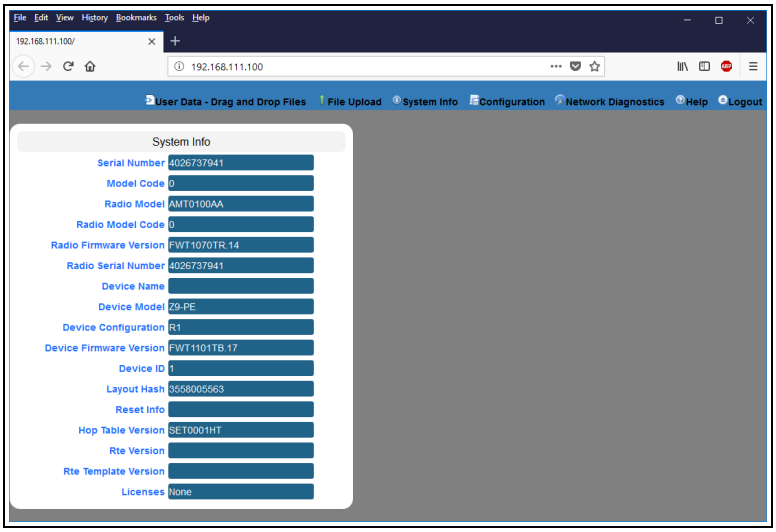


Figure 163: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 164)

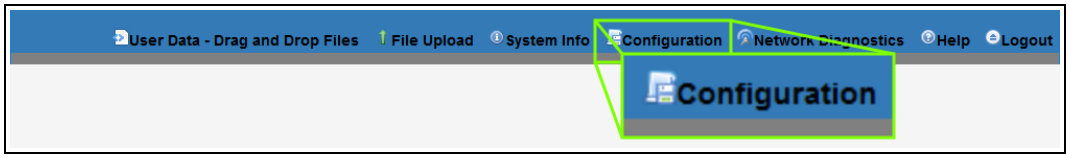


Figure 164: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 165)

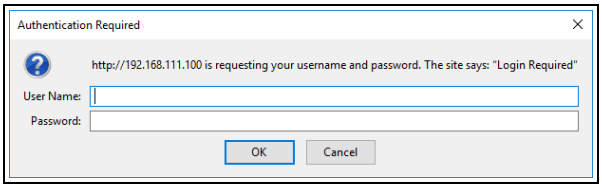


Figure 165: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 166)

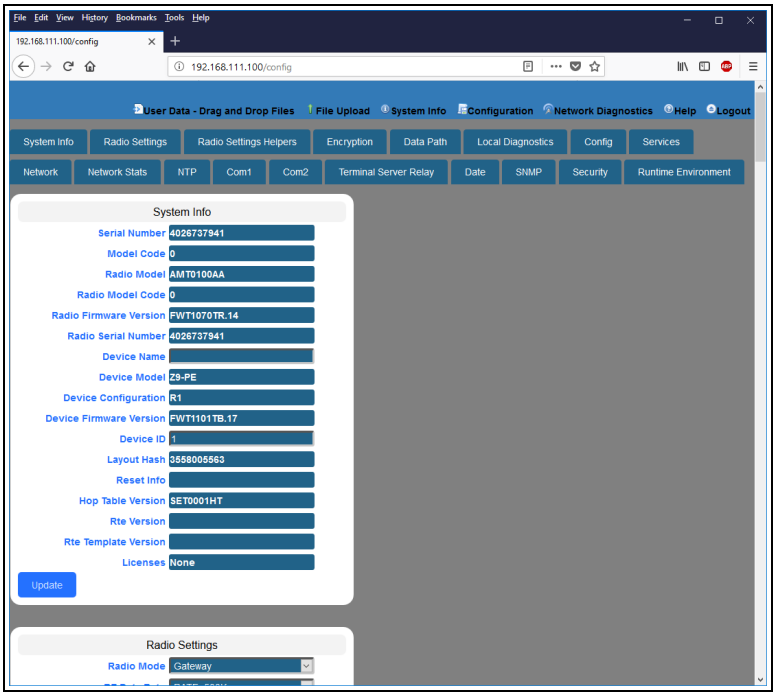


Figure 166: Configuration window

6. Click the **Radio Settings** tab.
7. Accept the **Radio Mode** default of **Gateway**.
   The **Radio Settings** parameters are shown in Figure 167:

   Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

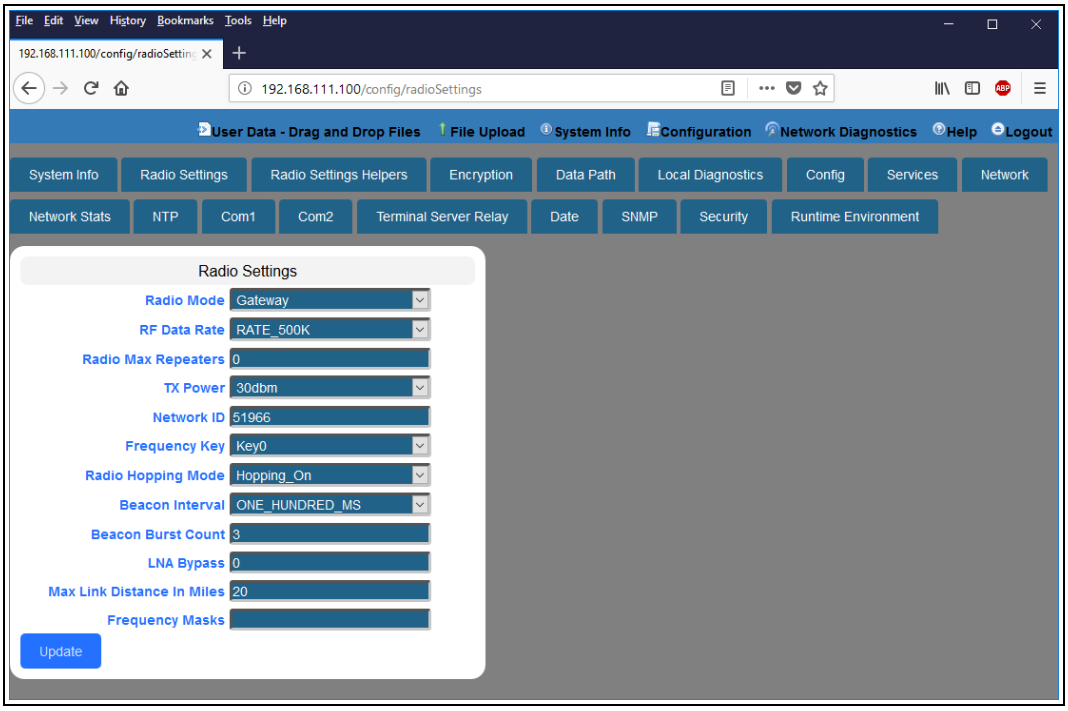


Figure 167: Radio Settings window - Gateway

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 / Z9-PE / Z9-PE-GREY.
   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 beaconInterval 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) between any nodes 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 frequencyMasks (on page 267) for detailed information.

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

9.11. Change the Radio Settings Parameters - Gateway-Repeaters

Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

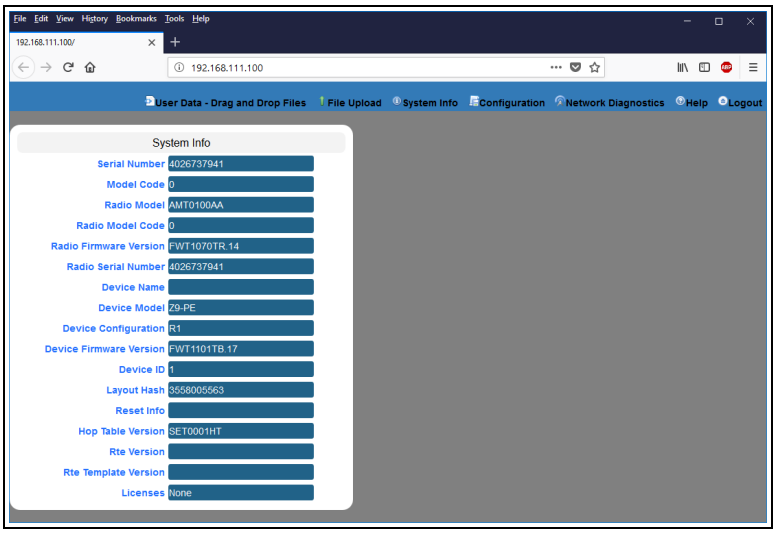


Figure 168: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 169)

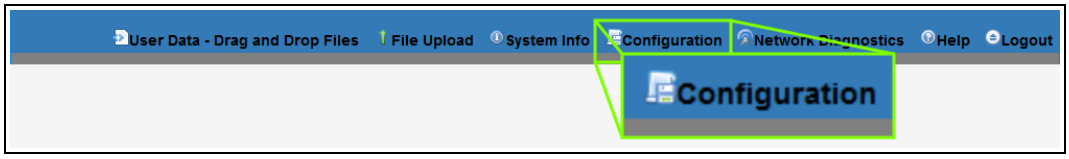


Figure 169: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 170)

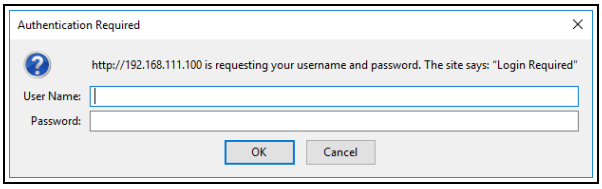


Figure 170: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 171)

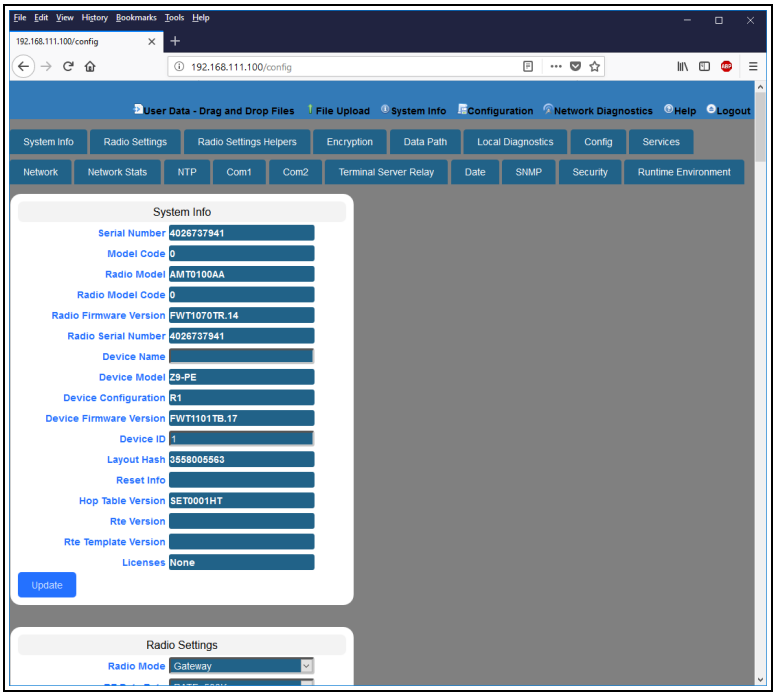


Figure 171: Configuration window

6. Click the **Radio Settings** tab.
7. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P / Z9-PE / Z9-PE-GREY as a **Gateway_Repeater**.
   The **Radio Settings** parameters are shown in Figure 172:

   Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

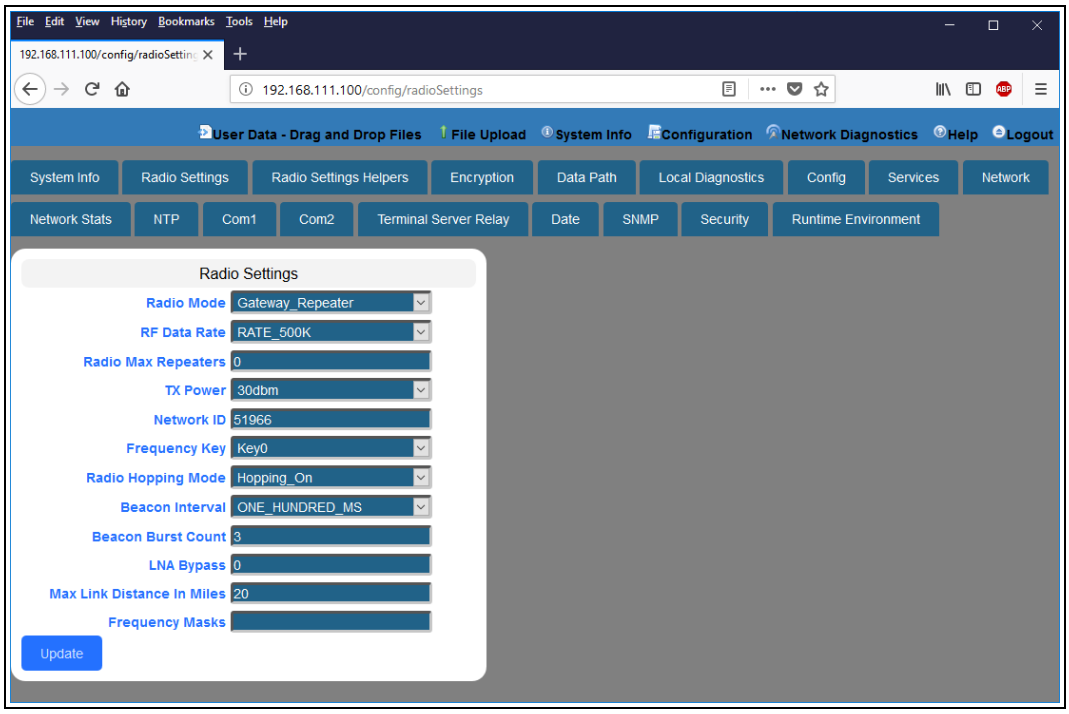


Figure 172: Radio Settings window - Gateway

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 / Z9-PE / Z9-PE-GREY.
   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 beaconInterval 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) between any nodes 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 frequencyMasks (on page 267) for detailed information.

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

9.12. Change the Security Parameters

Note: See the security Parameters (on page 293) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

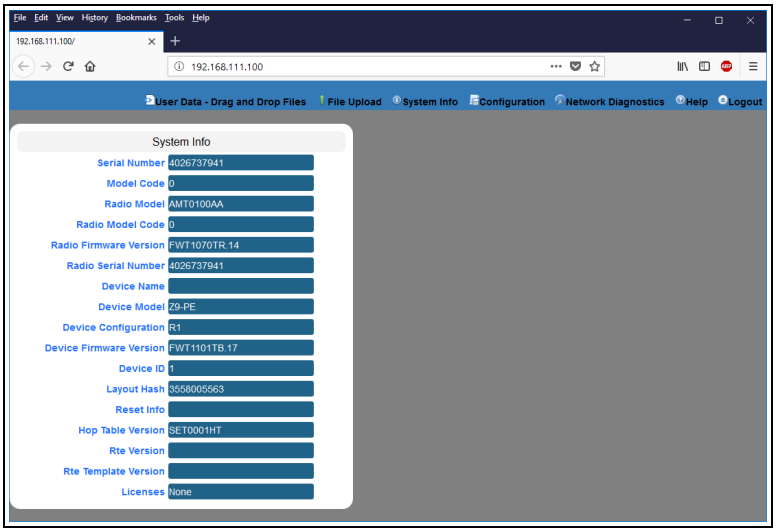


Figure 173: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 174)

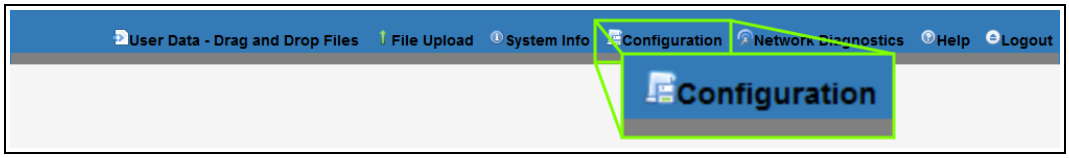


Figure 174: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 175)

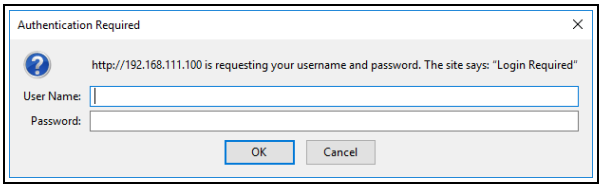


Figure 175: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 176)

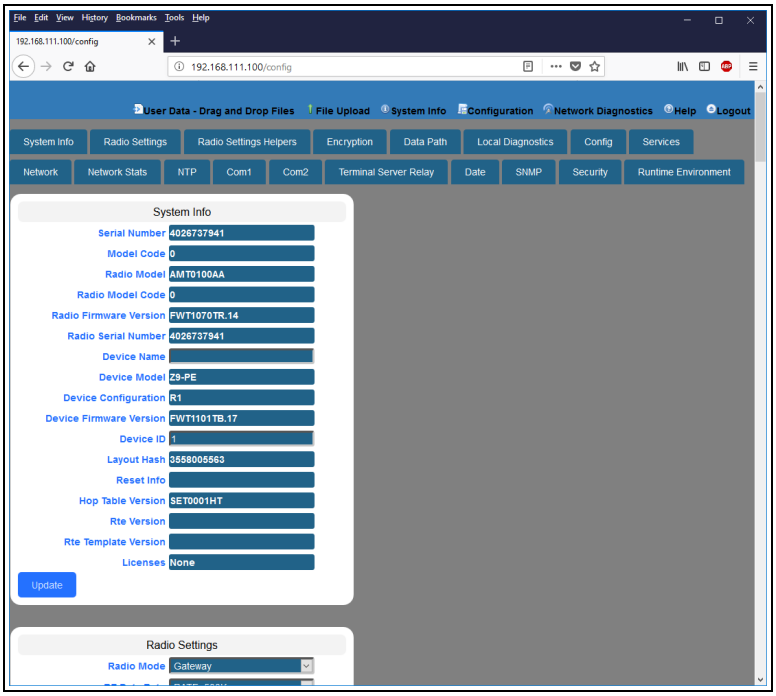


Figure 176: Configuration window

6. Click the **Security** tab.
   The **Security** parameters are shown in Figure 177.

   Note: See the security Parameters (on page 293) for detailed information about the parameters.

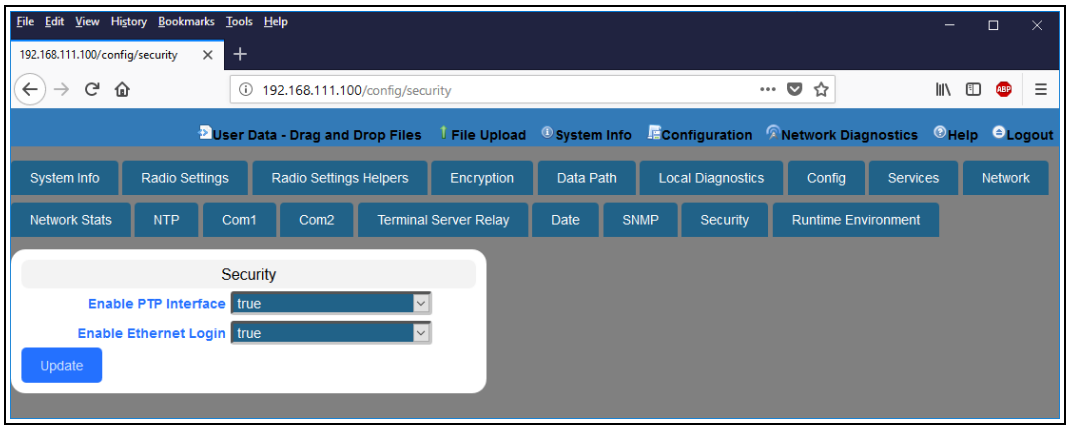


Figure 177: Security window

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 enableEthernetLogin (on page 294) 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 enablePtpInterface (on page 294) parameter for additional information.

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

9.13. Change the Services Parameters

Note: See the services Parameters (on page 296) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

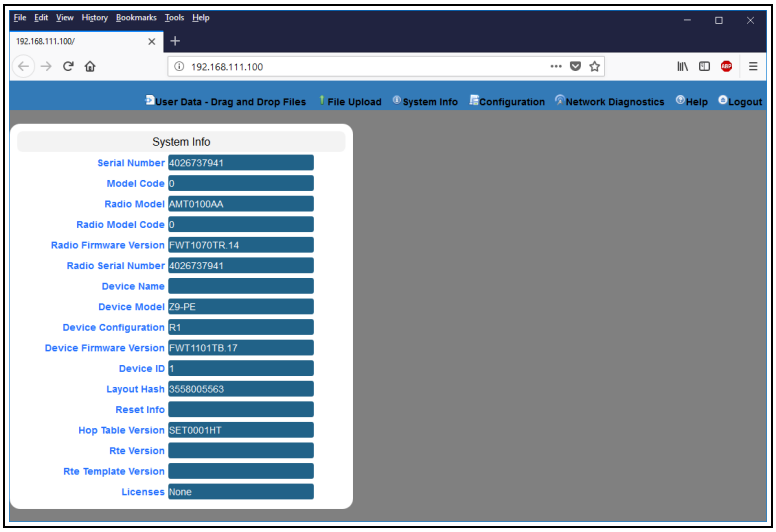


Figure 178: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 179)

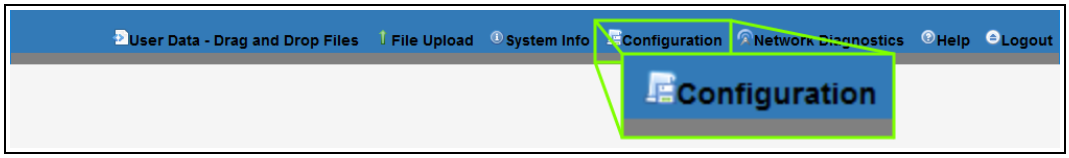


Figure 179: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 180)

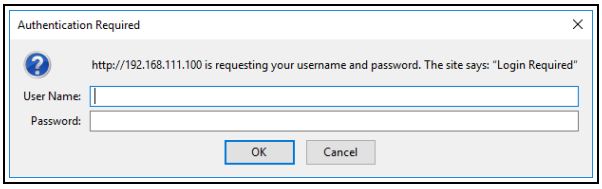


Figure 180: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 181)

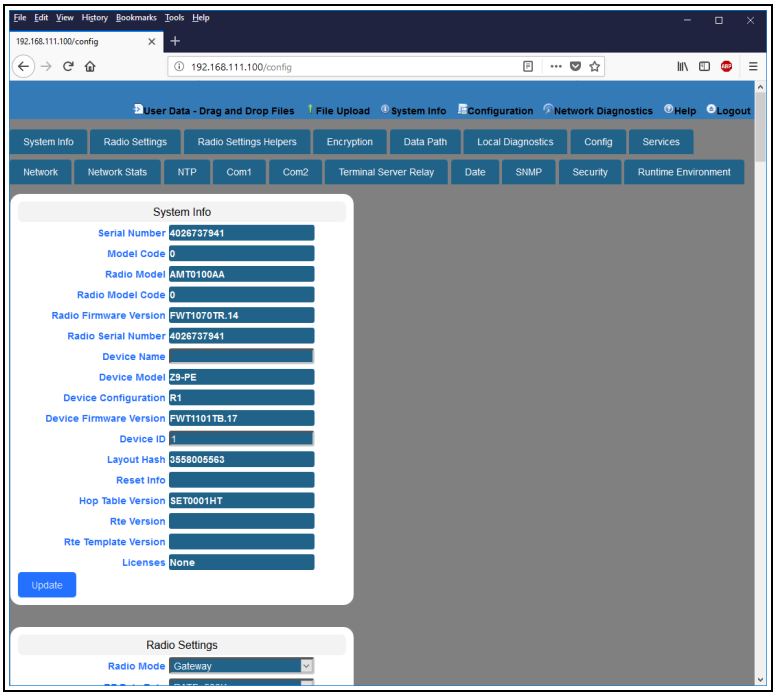


Figure 181: Configuration window

6. Click the **Services** tab.
   The **Services** parameters are shown in Figure 182.

   Note: See the services Parameters (on page 296) for detailed information about the parameters.

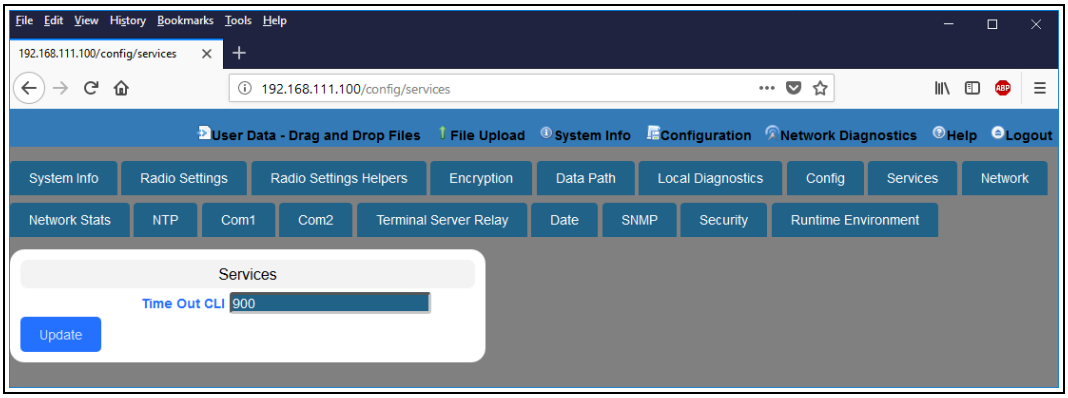


Figure 182: Services window

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.

9.14. Change the SNMP Parameters

Note: See the SNMP Parameters (on page 298) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

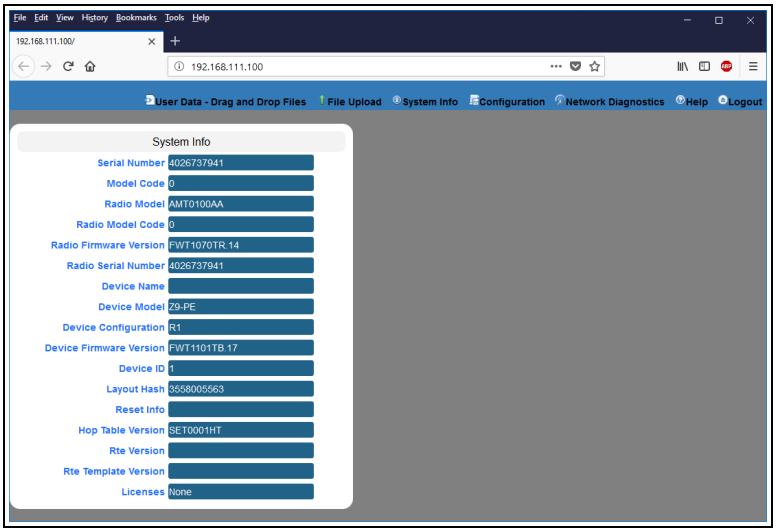


Figure 183: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 184)

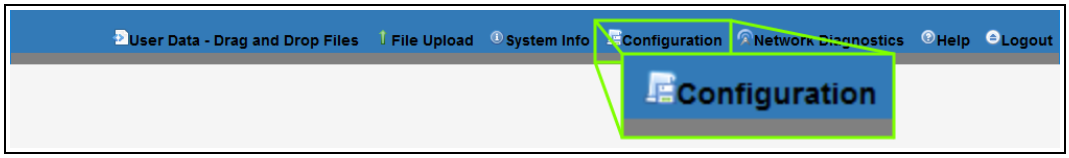


Figure 184: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 185)

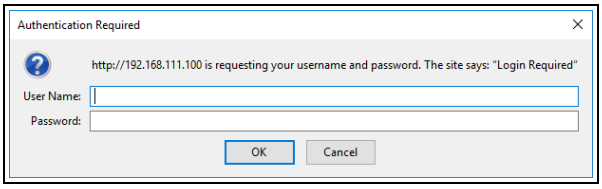


Figure 185: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 186)

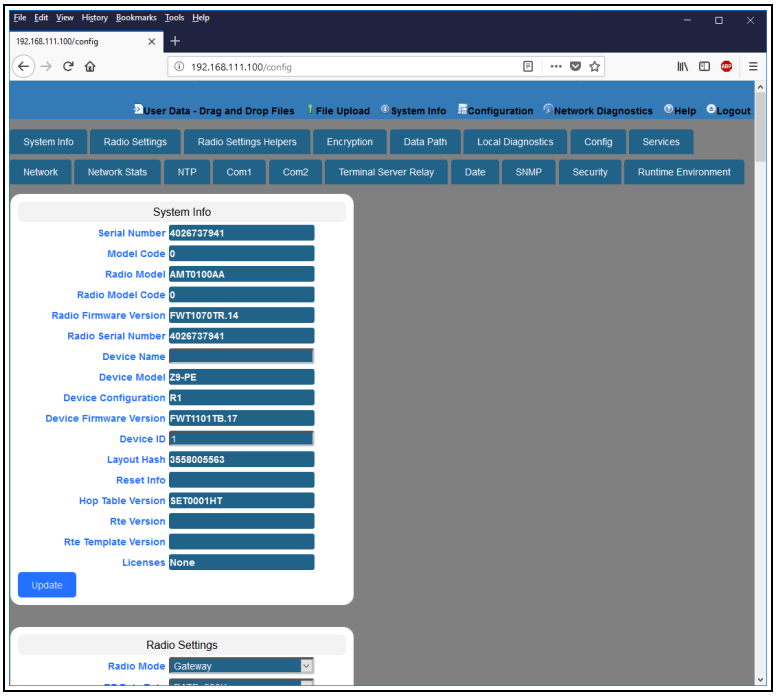


Figure 186: Configuration window

6. Click the **SNMP** tab.
   The **SNMP** parameters are shown in Figure 187.

   Note: See the SNMP Parameters (on page 298) for detailed information about the parameters.

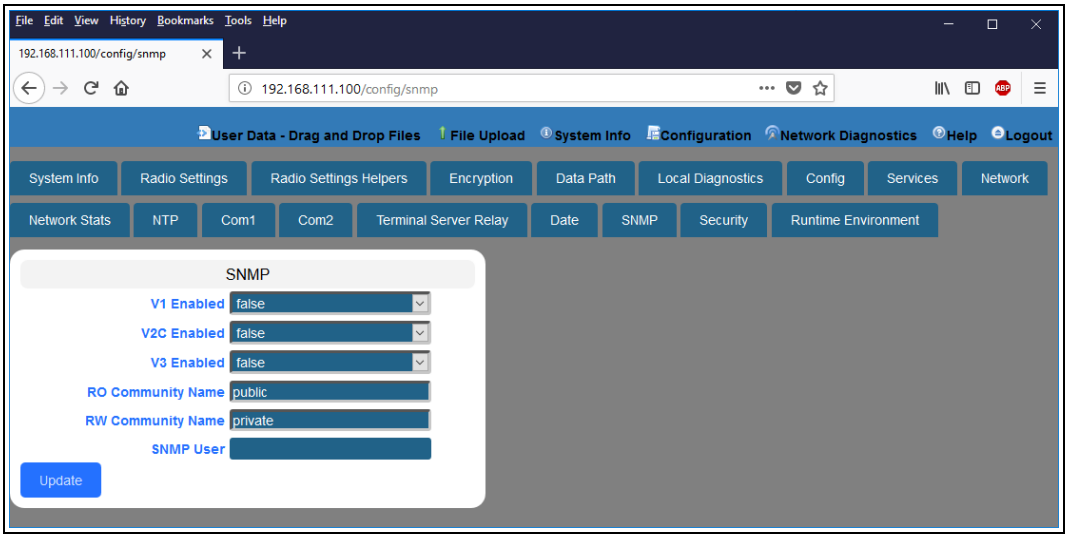


Figure 187: SNMP window

7. As applicable, change these parameters:
   a. Click the **V1 Enabled** list box arrow and select **True** to enable SNMP V1.

      Note: By default, the **v1 Enabled** is NOT enabled (set to False).
      See the v1Enabled (on page 301) 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 v2cEnabled (on page 302) 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 v3Enabled (on page 302) 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.

9.15. Change the System Info Parameters

Note: See the systemInfo Parameters (on page 312) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

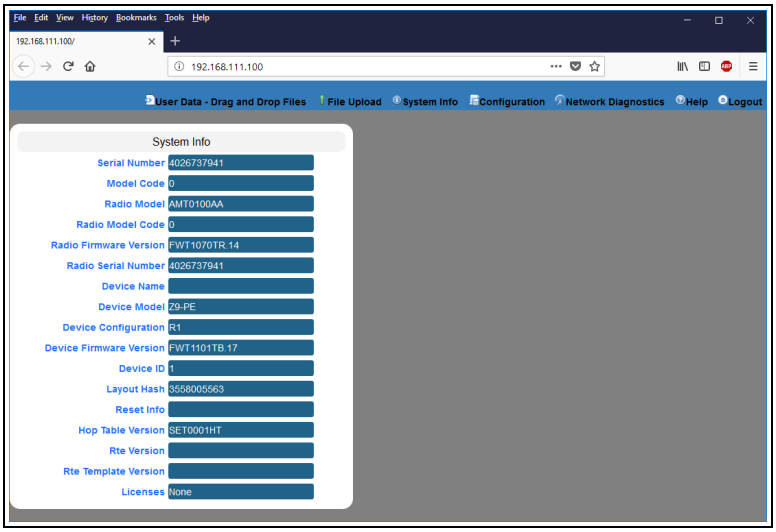


Figure 188: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 189)

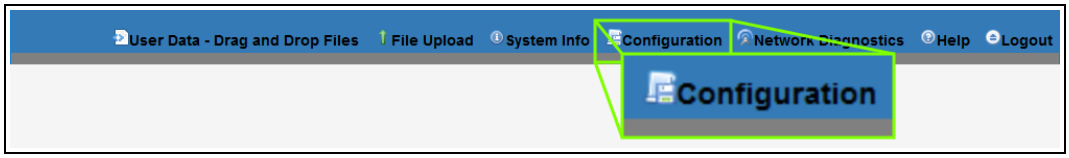


Figure 189: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 190)

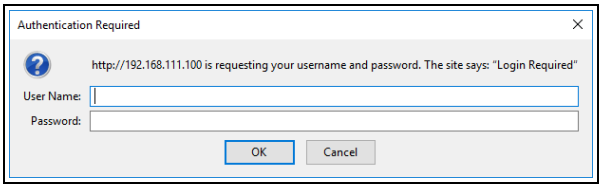


Figure 190: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 191)

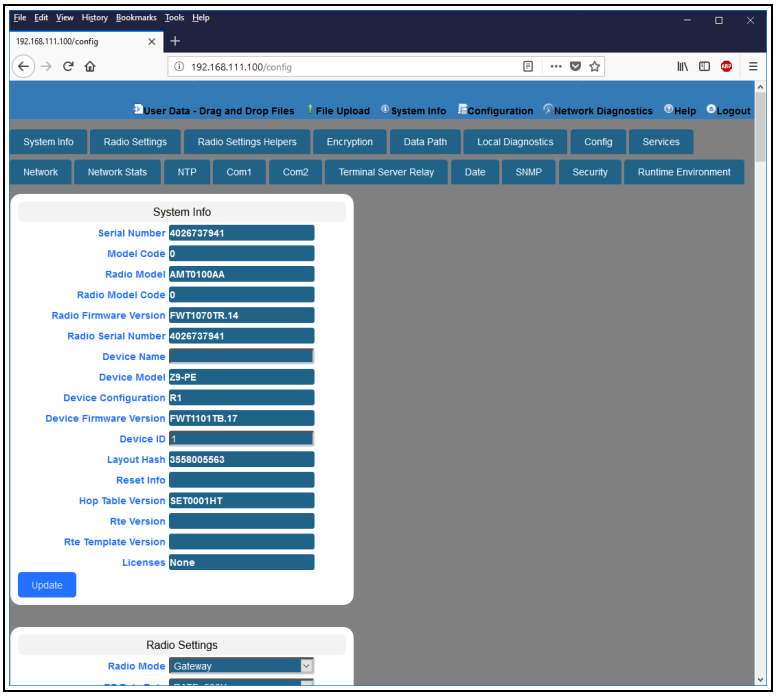


Figure 191: Configuration window

6. Click the **System Info** tab.
   The **System Info** parameters are shown in Figure 192:

   Note: See the systemInfo Parameters (on page 312) for detailed information about the parameters.

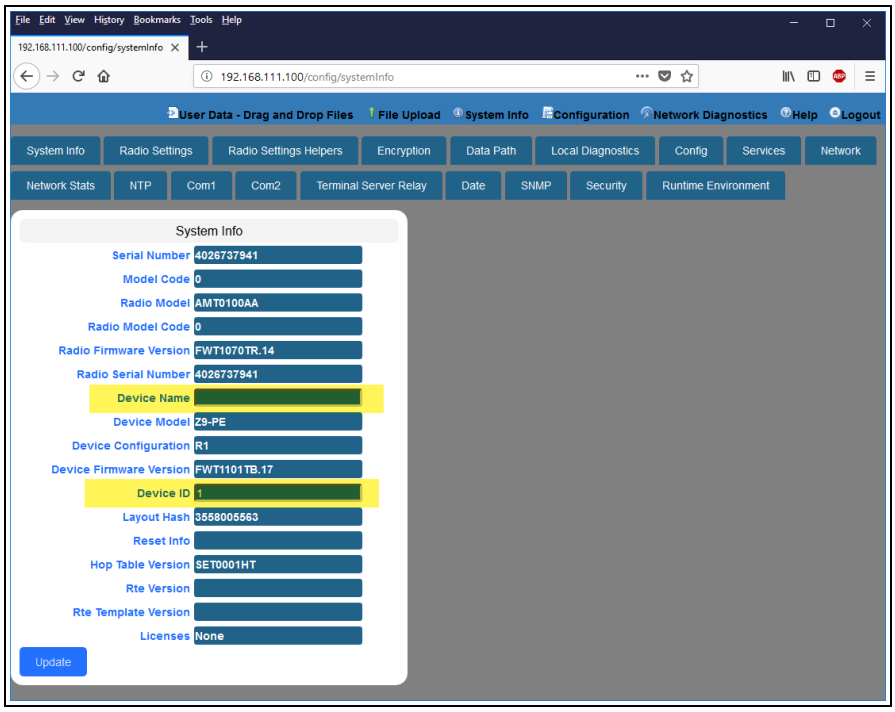


Figure 192: System Info window

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

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

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

9.16. Change the Terminal Server Relay Parameters

Note: See the TerminalServerRelay Parameters (on page 322) for detailed information about the parameters.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.

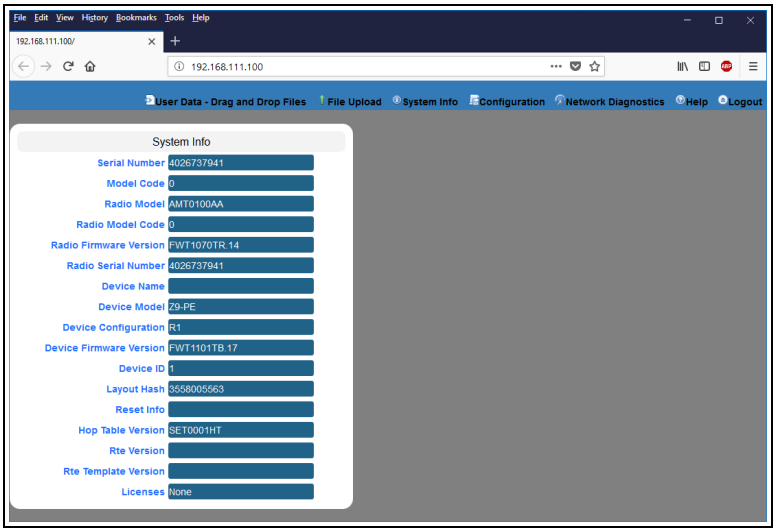


Figure 193: Home window

4. On the Menu bar, click the **Configuration** link. (Figure 194)

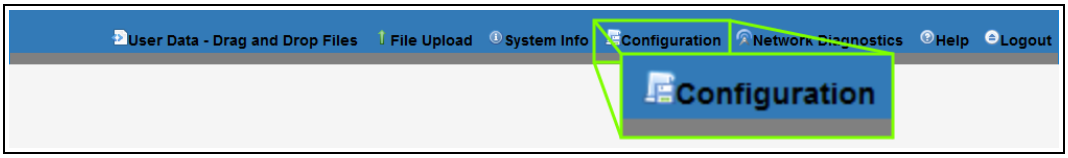


Figure 194: Configuration link

The **Authentication Required** (Login) dialog box opens. (Figure 195)

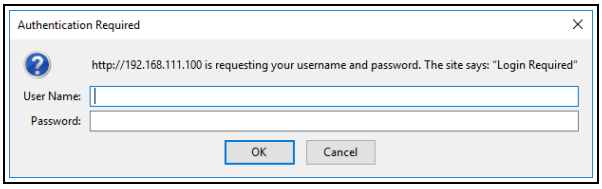


Figure 195: Authentication Required (Login) dialog box

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

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

   The Config window (on page 339) opens. (Figure 196)

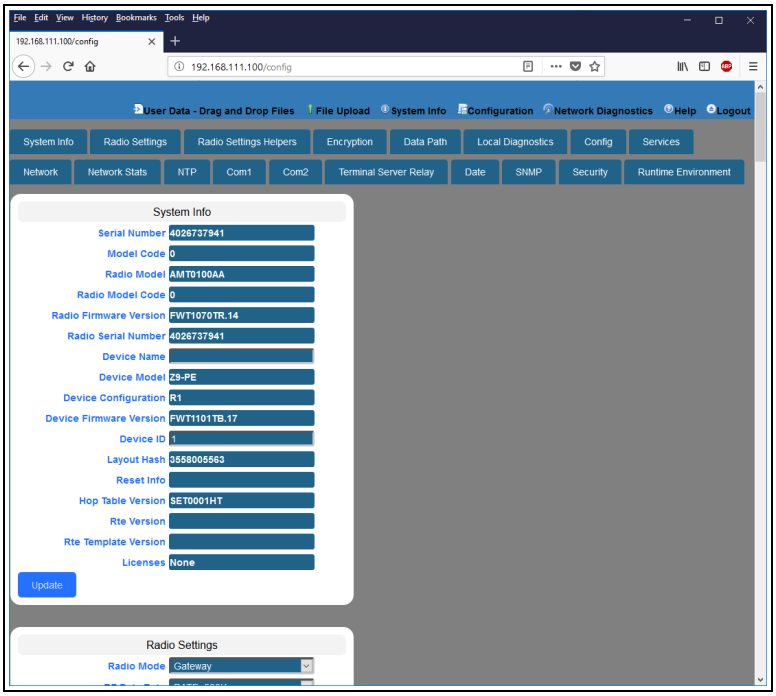


Figure 196: Configuration window

6. Click the **Terminal Server Relay** tab.
   The **Terminal Server Relay** parameters are shown in Figure 197.

   Note: See the TerminalServerRelay Parameters (on page 322) for detailed information about the parameters.

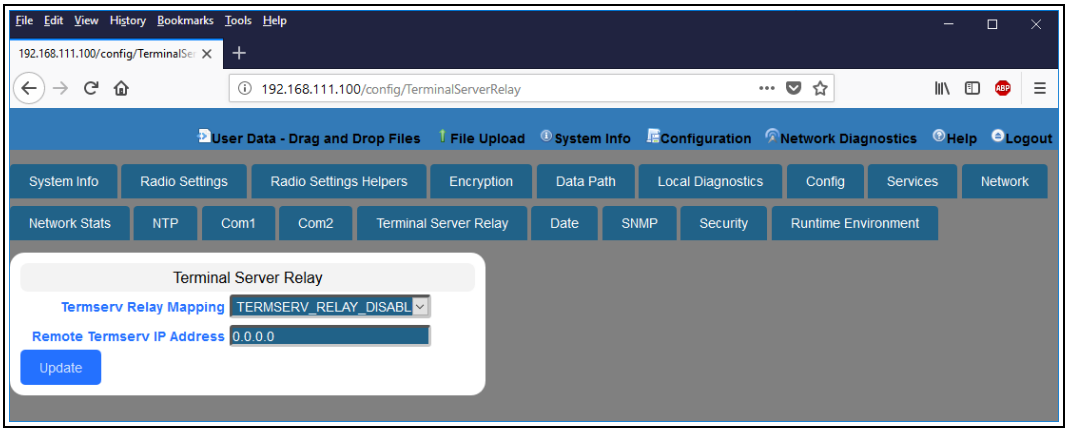


Figure 197: Terminal Server Relay window

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.

10. Change the Passwords

Important!: The Z9-P / Z9-PE / Z9-PE-GREY password is ONLY changed through the CLI. See CLI Configuration (on page 65) to connect via CLI.

FREEWAVE Recommends: From a security standpoint, it is best practice to change **both** the **admin** password and the **devuser** passwords.

10.1. Change the ADMIN Password

1. Login to the FreeWave CLI using the current **username** and **password**.
2. Use this command format to change the password:
`system.password=[oldpassword],[newpassword],[newpassword]` and press <Enter>.

Example: The default password is `admin`.
The CLI to change this is:
`system.password=admin,NewPasswrd123,NewPasswrd123`.

Note: An error message appears when there is an error in typing the new password command.

10.2. Change the DEVUSER Password

1. Login to the **devuser** account using the current devuser **password**.
2. Use this command format to change the password:
`password=[oldpassword],[newpassword],[newpassword]` and press <Enter>.

Example: The default password is `devuser`.
The CLI to change this is:
`password=devuser,NewPasswrd123,NewPasswrd123`.

Note: An error message appears when there is an error in typing the new password command.

11. 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 (`network.netmaskFilterEnabled=true`) 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.

Note: This procedure provides a Tera Term terminal connection to the Z9-P / Z9-PE / Z9-PE-GREY CLI. Other terminal emulators (e.g., HyperTerminal, PuTTY) may be used.
The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

Procedure

1. On the computer connected to the Z9-P / Z9-PE / Z9-PE-GREY device, open a terminal program (e.g., Tera Term http://ttssh2.osdn.jp/).
2. In Tera Term, click the **File** menu and select **New Connection**.

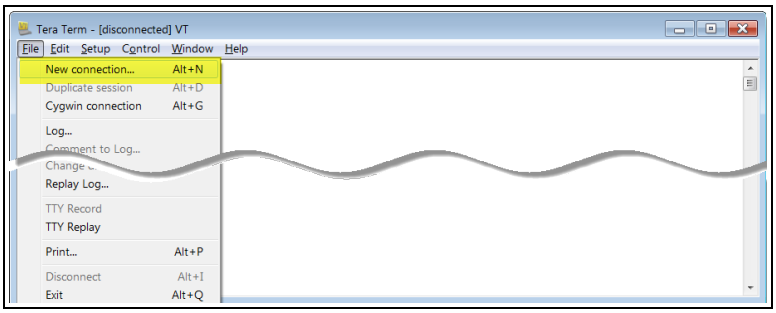


Figure 198: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P / Z9-PE / Z9-PE-GREY is connected to.

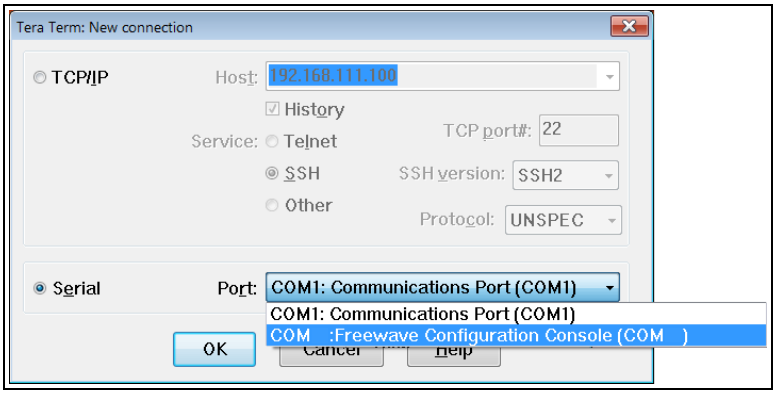


Figure 199: Select the ZumLink COM port

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

4. Click **OK** to save the changes and close the dialog box.
5. In the Tera Term window, click the **Setup** menu and select **Serial Port**.

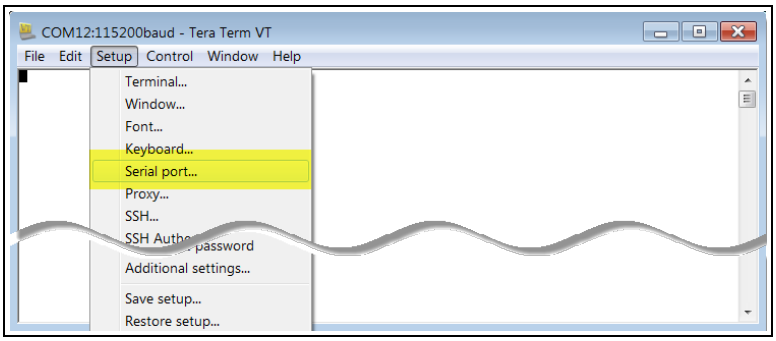


Figure 200: Serial menu > Setup Port

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

Note: The image shows the default Z9-P / Z9-PE / Z9-PE-GREY settings.

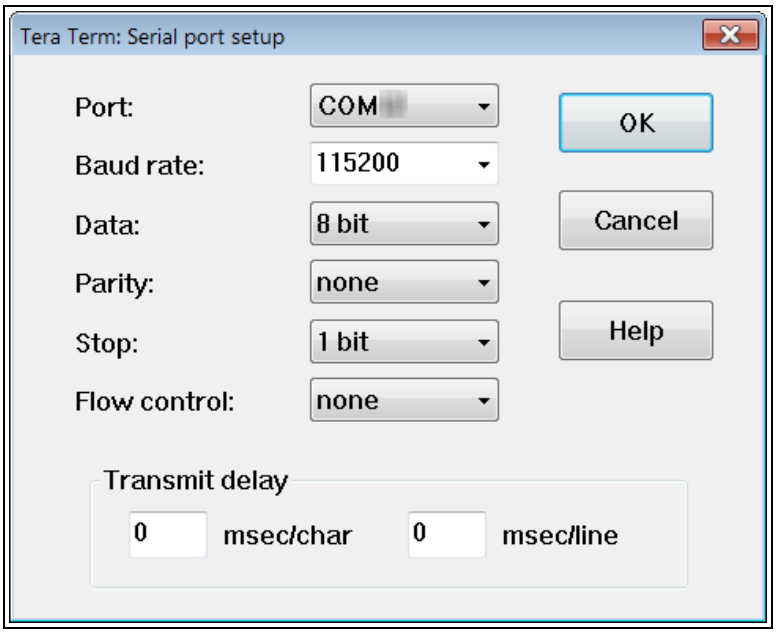


Figure 201: Tera Term: Serial Port Setup dialog box with default settings

6. **Important**: Verify, and change if required, the Tera Term serial port settings (except the **Port** setting) of the connected Z9-P / Z9-PE / Z9-PE-GREY so the settings are the same as the defaults shown in Figure 201.
7. Verify the COM port settings are:
   Baud Rate / **Baudrate**: 115200
   Data / **Databits**: 8 bit
   Parity: none
   Stop / **Stopbits**: 1 bit
8. Click **OK** to save the changes and close the dialog box.
9. In the Tera Term window, press <Enter>.
   The Z9-P / Z9-PE / Z9-PE-GREY CLI Login returns.
10. Login to the FreeWave CLI using the current **username** and **password**.

    Note: The password does not appear when typing - it looks blank.

    The **FreeWave Shell** returns.

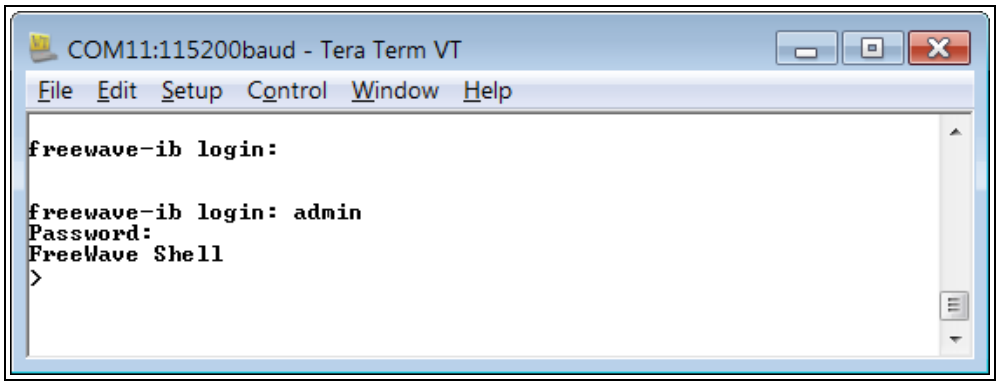


Figure 202: The FreeWave Shell returns.

Note: The login times out after 3600 seconds.
Repeat the login procedure if needed.

11. At the > prompt, type **network** and press <Enter>.
The **ZumLink network** settings appear.

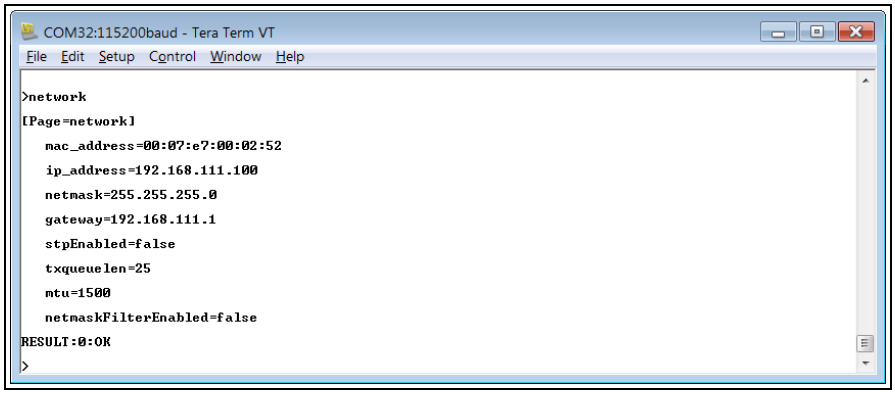


Figure 203: network Settings Page

12. At the > prompt, type **network.netmaskFilterEnabled=true** and press <Enter>.
The IP Filtering is now active on the **ZumLink** device.

Tip: The IP Filtering setting (**network.netmaskFilterEnabled=true**) 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.

13. At the > prompt, type **save** and press <Enter>.

Note: See Example: Network Topology with Traffic at the Gateway (on page 163).

11.0.1. Example: Network Topology with Traffic at the Gateway

Figure 204 shows:

- 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.

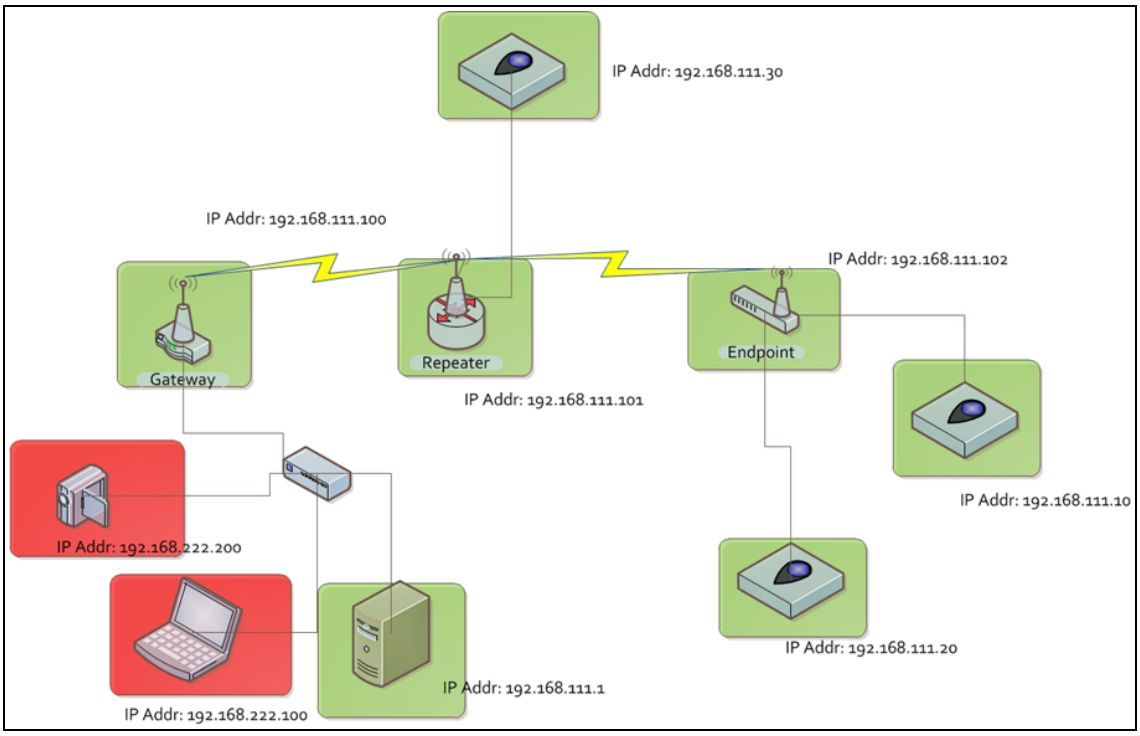


Figure 204: Network Topology with Traffic at the Gateway but not Desired on the Rest of the Network

Figure 204 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.

12. 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.

This section has this information:

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-Repeaters 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 beaconBurstCount (on page 263) 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.

12.1. Repeater - Setup Table

These tables show the basic setting configurations in a Repeater network with either:

- Hopping OFF Repeater Setup (on page 166)
- Hopping ON Repeater Setup (on page 167)

Note: For detailed procedures, see Basic Gateway and Endpoint-Repeater Setup (on page 169).

12.1.1. 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 dataPath Parameters (on page 209), network Parameters (on page 245), or radioSettings Parameters (on page 262) for additional information.

12.1.2. 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 beaconBurstCount (on page 263) 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 dataPath Parameters (on page 209), network Parameters (on page 245), or radioSettings Parameters (on page 262) for additional information.

12.2. 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 170)
B. Configure using either:
   C. Hopping On: Gateway and Endpoint-Repeater Setup (on page 173)
   or
   Hopping Off: Gateway and Endpoint-Repeater Setup (on page 175)

12.2.1. Open a Terminal Emulator Application

Note: This procedure provides a Tera Term terminal connection to the Z9-P / Z9-PE / Z9-PE-GREY CLI. Other terminal emulators (e.g., HyperTerminal, PuTTY) may be used.
The images in this procedure are for Windows® 7 or Windows® 10 and/or Firefox®.
The dialog boxes and windows appear differently on each computer.

1. On the computer connected to the Z9-P / Z9-PE / Z9-PE-GREY device, open a terminal program (e.g., Tera Term http://ttssh2.osdn.jp/).
2. In Tera Term, click the **File** menu and select **New Connection**.

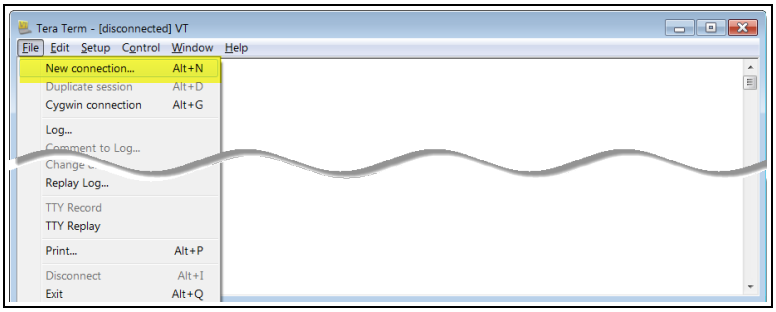


Figure 205: File menu > New Connection

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

3. Click the **Port** list box arrow and select the COM port the Z9-P / Z9-PE / Z9-PE-GREY is connected to.

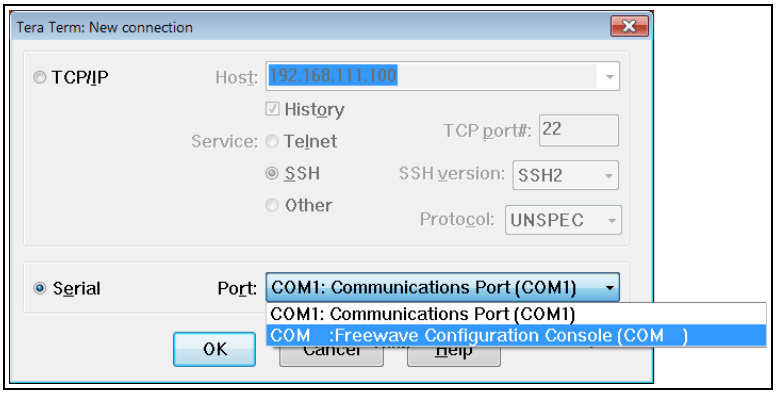


Figure 206: Select the ZumLink COM port

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**.

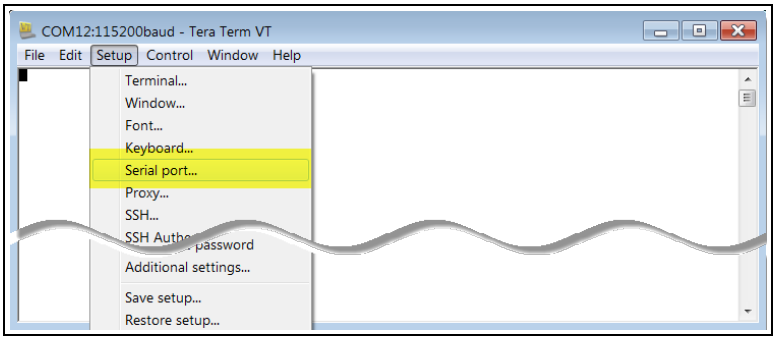


Figure 207: Serial menu > Setup Port

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

Note: The image shows the default Z9-P / Z9-PE / Z9-PE-GREY settings.

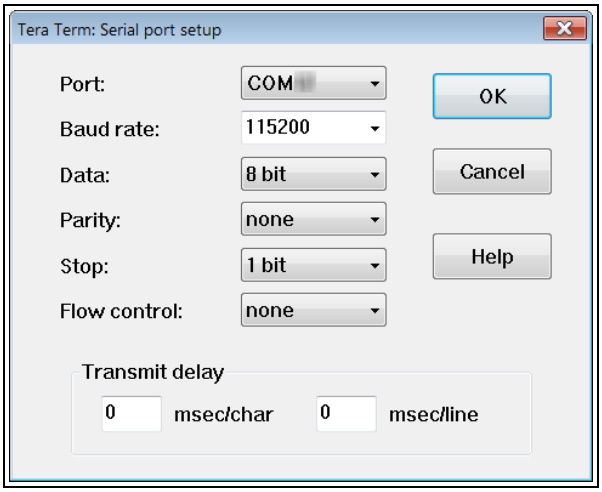


Figure 208: Tera Term: Serial Port Setup dialog box with default settings

6. **Important**: Verify, and change if required, the Tera Term serial port settings (except the **Port** setting) of the connected Z9-P / Z9-PE / Z9-PE-GREY so the settings are the same as the defaults shown in Figure 208.
7. Verify the COM port settings are:
   Baud Rate / **Baudrate**: 115200
   Data / **Databits**: 8 bit
   Parity: none
   Stop / **Stopbits**: 1 bit
8. Click **OK** to save the changes and close the dialog box.
9. In the Tera Term window, press <Enter>.
   The Z9-P / Z9-PE / Z9-PE-GREY CLI Login returns.
10. Login to the FreeWave CLI using the current **username** and **password**.

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.

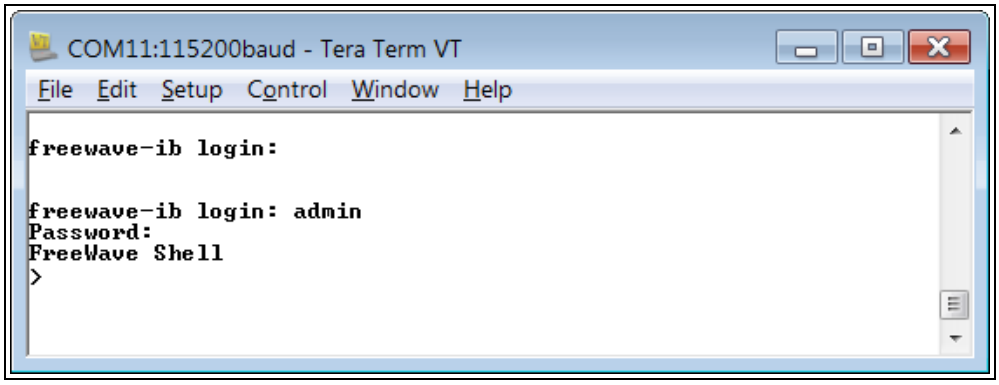


Figure 209: The FreeWave Shell returns.

Note: The login times out after 3600 seconds.
Repeat the login procedure if needed.

11. At the > prompt, type **radioSettings** and press <Enter>.
The current [Page=radioSettings] appears. (Figure 210)

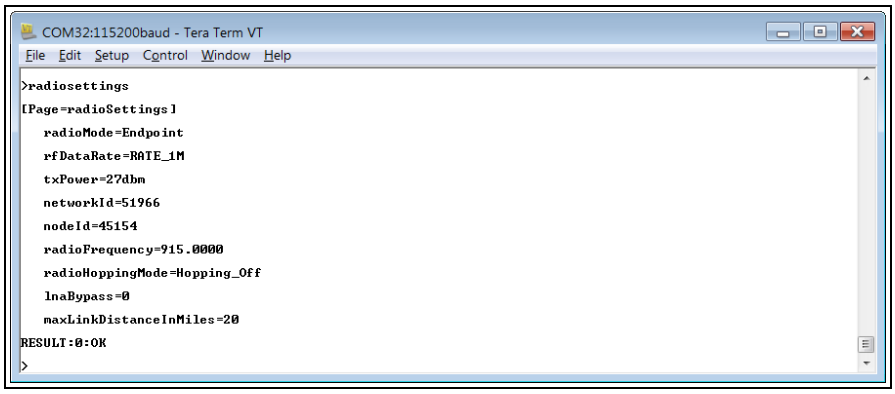


Figure 210: radioSettings Page

12. Continue with either:
    - Hopping On: Gateway and Endpoint-Repeater Setup (on page 173)
    - Hopping Off: Gateway and Endpoint-Repeater Setup (on page 175)

12.2.2. 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 175).

1. On the **Gateway ZumLink** device:
   a. Complete the Open a Terminal Emulator Application (on page 170) 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 rfDataRate (on page 282) 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 170) procedure.
   b. At the > prompt, type:
      i. `radioSettings.radioMode=Endpoint_Repeater` and press <Enter>.
      ii. `radioSettings.networkId=nnnnn` where nnnnn is the designated Network IDused 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 rfDataRate (on page 282) 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 170) 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 rfDataRate (on page 282) 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 435) for additional information.

See the Gateway-Repeater (on page 178) example.

12.2.3. 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 173).

1. On the **Gateway ZumLink** device:
   a. Complete the Open a Terminal Emulator Application (on page 170) 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 rfDataRate (on page 282) 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 **GatewayZumLink** 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 IDused 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 Megabytesused when configuring the Gateway **ZumLink** device and press <Enter>.

      Note: See rfDataRate (on page 282) 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 170) procedure.
   b. At the > prompt, type:
      i. `radioSettings.radioMode=Endpoint` and press <Enter>.
      ii. `radioSettings.networkId=nnnnn`where nnnnn is the designated Network IDused 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 Megabytesused when configuring the Gateway **ZumLink** device and press <Enter>.

      Note: See rfDataRate (on page 282) 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 435) for additional information.

See the Gateway-Repeater (on page 178) example.

12.3. 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.

12.3.1. Gateway-Repeater

Figure 211 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.

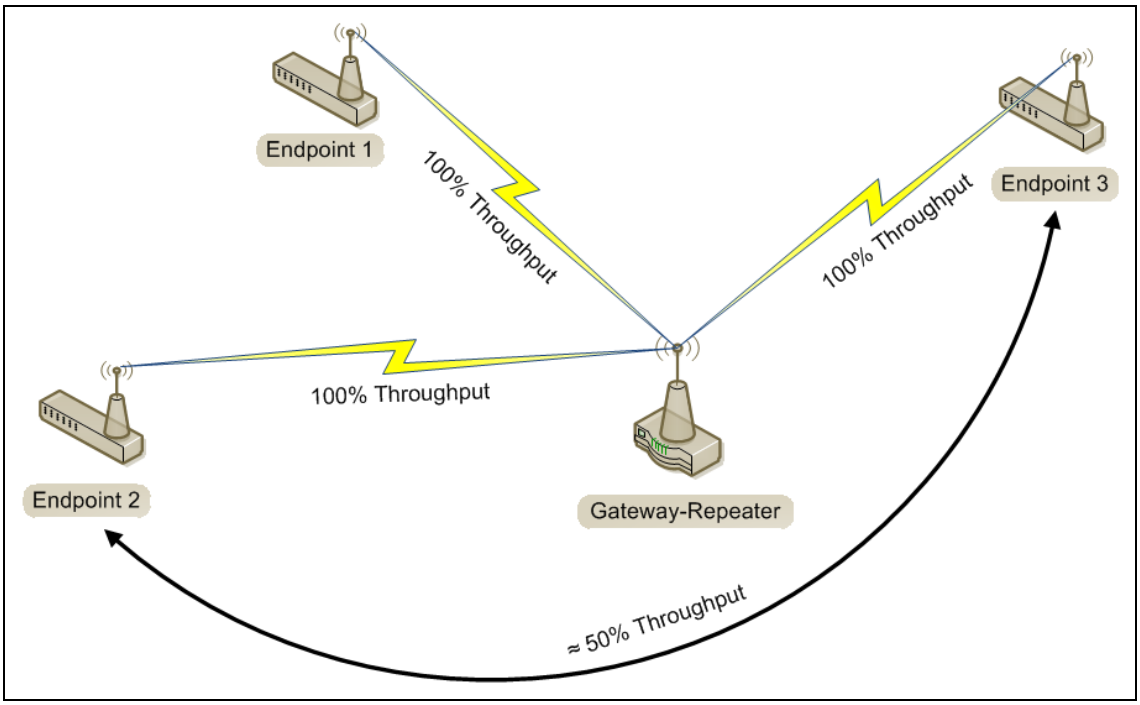


Figure 211: Gateway-Repeater

12.3.2. Endpoint-Repeater

Figure 212 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.

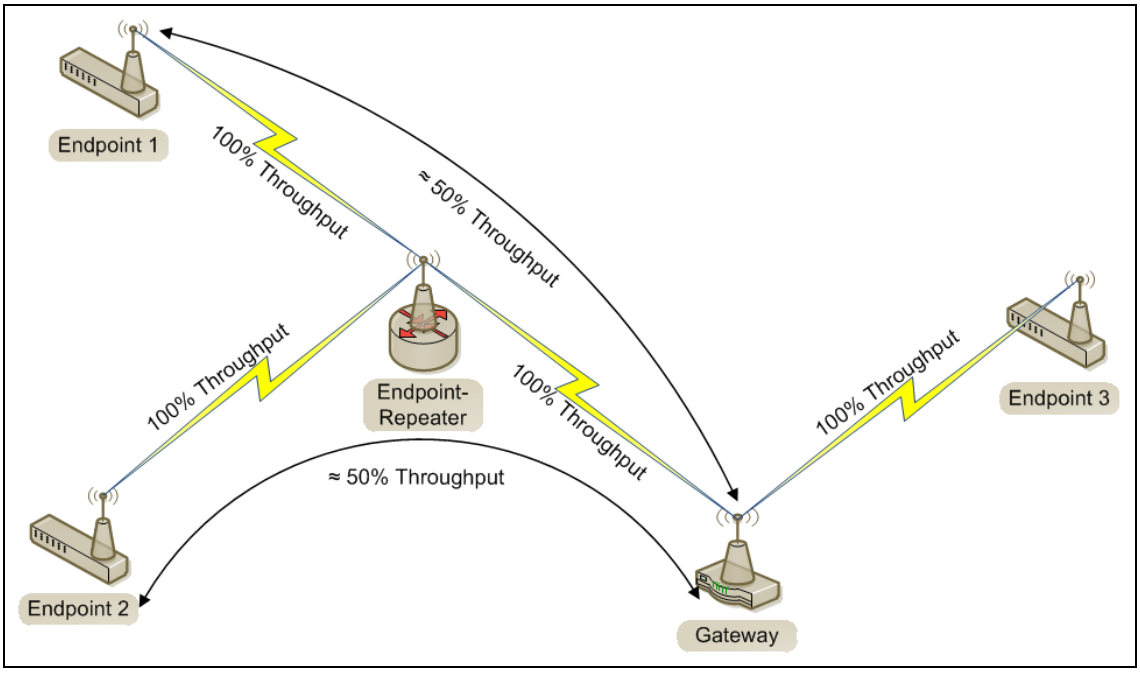


Figure 212: Endpoint-Repeater

12.3.3. Multiple Repeaters: Gateway-Repeater and Endpoint-Repeater

Figure 213 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 will increase.
  - When issuing pings of large packet sizes at the lower data rates, such as 115.2K, and a beaconInterval = **`TWENTY_FIVE_MS`**, the latency can increase causing the pings to fail.
  - Allowing appropriate delay between pings resolves this issue.

FREEWAVE Recommends: Set the **`beaconBurstCount=1`** or more and **`beaconInterval=ONE_HUNDRED_MS`** or more for optimal throughput when extended Repeater networks are used.

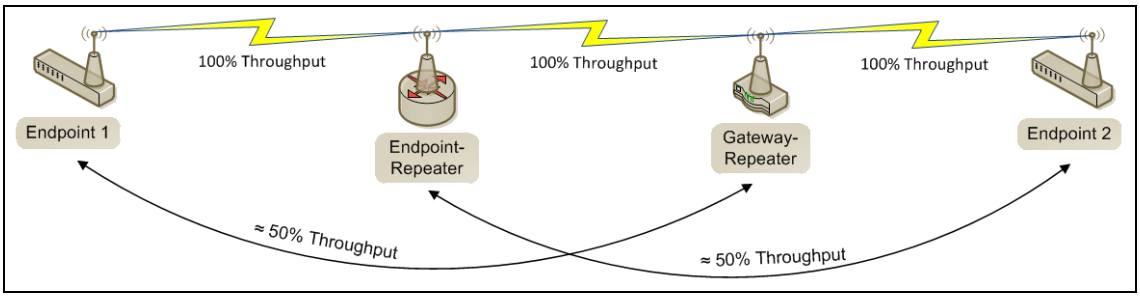


Figure 213: Repeater with Additional Endpoint to Enhance Connectivity

12.3.4. Multiple Repeaters: Four Endpoint-Repeaters

Figure 214 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.

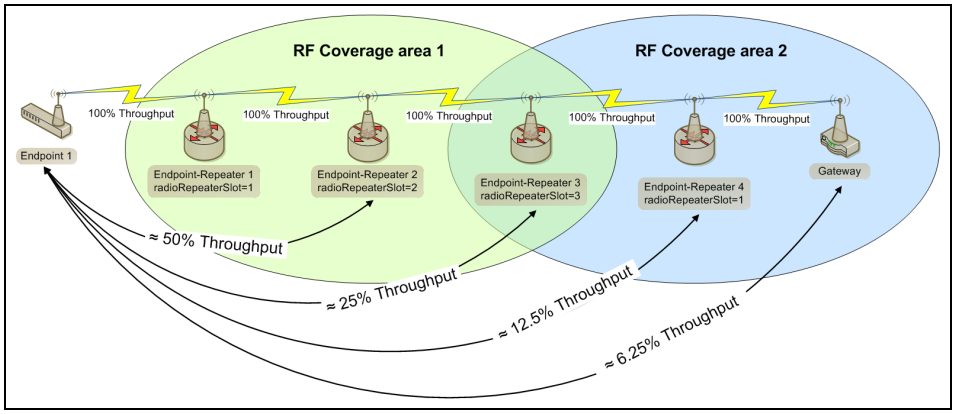


Figure 214: Multiple Repeaters: Four Endpoint-Repeaters

- As Repeaters are chained in the network, round trip delay will increase.
  - When issuing pings of large packet sizes at the lower data rates, such as 115.2K, and a beaconInterval = **`TWENTY_FIVE_MS`**, the latency can increase causing the pings to fail.
  - Allowing appropriate delay between pings resolves this issue.

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. Mounting the Z9-P / Z9-PE / Z9-PE-GREY

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 183)
- Z9-PE Mounting (on page 185)
- Z9-PE-GREY Mounting (on page 187)

13.1. Z9-P Mounting

13.1.1. Z9-P 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 **spring-loaded end on the bottom lip of the rail**.
3. Using Figure 215 as an example:
   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.

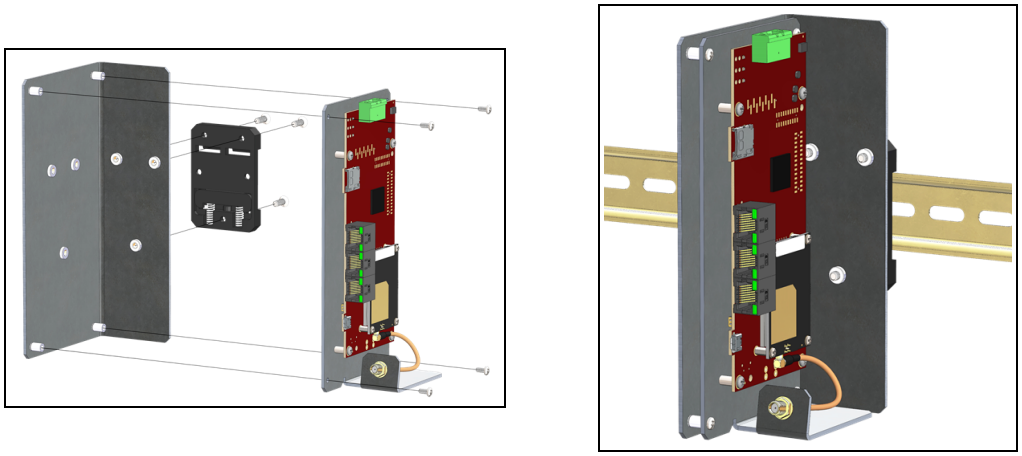


Figure 215: Z9-P Attached to a DIN Rail with the Power Connection on Top

13.2. Z9-PE Mounting

13.2.1. Z9-PE 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

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 **spring-loaded end on the bottom lip of the rail**.
3. Using either Figure 216 or Figure 217 as an example:
   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.

Figure 216: Z9-PE Attached to a DIN Rail with the Power Connection on Top

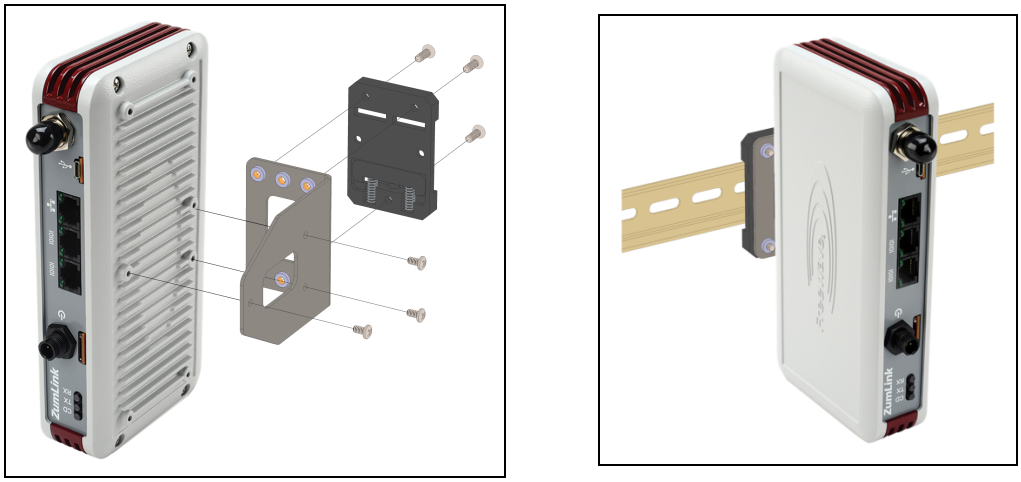


Figure 217: Z9-PE Attached to a DIN Rail with the Antenna Connection on Top

13.3. Z9-PE-GREY Mounting

13.3.1. Z9-PE-GREY Mounting Kit - Included Equipment

Z9-PE-GREY 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

1. Use the Pan-head machine screws to attach the DIN Rail Bracket to the Z9-PE-GREY.
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 **spring-loaded end on the bottom lip of the rail**.
3. Using Figure 218 as an example:
   a. Use the Flat-head machine screws to attach the DIN Rail Spring Clip to the DIN Rail Bracket.
   b. Mount the Z9-PE-GREY to the 35mm DIN rail using the rail slide on the enclosure.

Figure 218: Z9-PE-GREY Attached to a DIN Rail with the Power Connection on Top

13.4. Removing the Z9-P / Z9-PE / Z9-PE-GREY 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.

14. Approved Antennas

14.0.1. Omni-Directional Antennas

The 900MHz 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.

900MHz 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
-0.15	2.0	Mobile Mark	PSKN3-925S	EAN0900SR
-2.15	0.0	Mobile Mark	PSTG0-915SE	EAN0900SQ

14.0.2. Directional Antennas

The 900MHz is approved by the FCC for use with Yagi-directional antennas with a 16.08.6 dBi gain or less.

900MHz Directional Antennas				
Gain (dBd)	**Gain (dBi)**	**Manufacturer**	**Manufacturer Model Number**	**FreeWave Part Number**
6.45	8.6	WaveLink	PRO890-8-40F02N4	EAN0906YC

14.0.3. 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.

15. COM Parameters

Note: See the COM window (on page 337).
The parameters for **COM1** and **COM2** are the same except for the **TerminalServerPort** parameter setting.

- baudrate (on page 192)
- breakBeforeSendUs (on page 192)
- connectionDrops (on page 193)
- databits (on page 194)
- delayBeforeSendMs (on page 194)
- duplex (on page 195)
- flowControl (on page 196)
- handler (on page 197)
- mode (on page 198)
- parity (on page 199)
- RxBytes (on page 200)
- stopbits (on page 200)
- TerminalServerPort (on page 201)
- TerminalServerTimeOut (on page 201)
- TxBytes (on page 202)

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).

15.1. baudrate

baudrate	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.baudrate=nnnn` • `Com2.baudrate=nnnn` **Note**: Where `nnnn` is the baudrate value.
Web Interface window	Baudrate 1. Click the **Baudrate** list box arrow and select a COM port baud rate. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	115200
Options	**Rate Options** 1200 / 38400 2400 / 57600 4800 / 115200 9600 / 230400 14400 / 250000 19200
Description	The **Com1.baudrate** or **Com2.baudrate** setting designates the COM port baud rate for COM1 or COM2.

15.2. breakBeforeSendUs

breakBeforeSendUs	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.breakBeforeSendUs=nnnn` • `Com2.breakBeforeSendUs=nnnn` **Note**: Where nnnn is the break signal value.

breakBeforeSendUs	
Setting	**Description**
Web Interface window	Break Before Send Us 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. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	0 (zero)
Options	• The maximum value is0 (zero). • The minimum value is 1000.
Description	The **Com1.breakBeforeSendUs** or **Com2.breakBeforeSendUs** setting designates how long the COM port will send a break signal for at least the number of microseconds specified before sending the data. **Example**: For COM1, enter `Com1.breakBeforeSendUs=500` to have the COM1 port send a break signal for 500 microseconds.

15.3. connectionDrops

connectionDrops	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.connectionDrops` • `Com2.connectionDrops`
Web Interface window	Connection Drops **Note**: This parameter is read-only in the Web Interface. See the COM window (on page 337) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **Com1.connectionDrops** or **Com2.connectionDrops** command reports the number of terminal server connections dropped due to inactivity on the network socket. **Note**: This is a Read-only parameter.

15.4. databits

databits	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]

CLI Command	• `Com1.databits=7`
	  • `Com2.databits=7`
	• `Com1.databits=8`
	  • `Com2.databits=8`

Web Interface window	Databits 1. Click the **Databits** list box arrow and select the number of data bits in the frame for COM1 or COM2. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	8
Options	7 or 8
Description	The **Com1.databits** or **Com2.databits** setting designates the number of data bits in the frame for COM1 or COM2.

15.5. delayBeforeSendMs

delayBeforeSendMs	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.delayBeforeSendMs=nnnn` • `Com2.delayBeforeSendMs=nnnn` **Note**: Where `nnnn` is the amount of time delay in milliseconds.
Web Interface window	Delay Before Send MS 1. In the **Delay Before Send MS** text box, enter the milliseconds of time delay. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.

delayBeforeSendMs	
Setting	**Description**
Default Setting	0 (zero)
Options	• The maximum value is0 (zero). • The minimum value is 5000.
Description	The **Com1.delayBeforeSendMs** or **Com2.delayBeforeSendMs** setting designates the amount of time delay in milliseconds the Z9-P / Z9-PE / Z9-PE-GREY waits to allow the device connected to the COM port to switch from transmit (Tx) to receive (Rx) mode. **Example**: For COM1, enter `Com1.delayBeforeSendMs=100` for a 100 millisecond delay.  Increase this delay if the **ZumLink** is responding **before** a polling system is ready for a response.

15.6. duplex

duplex	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.duplex=Half` • `Com2.duplex=Half` • `Com1.duplex=Full` • `Com2.duplex=Full`
Web Interface window	Duplex 1. Click the **Duplex** list box arrow and select the duplex designation. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	Full
Options	Half or Full

duplex	
Setting	**Description**
Description	**Important!**: This setting **ONLY** applies to the RS485 mode. The **Com1.duplex** or **Com2.duplex** setting designates whether the COM port is Full or Half duplex. The command is: **Note**: See Ports and Pinouts for input and output information. **Note**: The default value is Full.

15.7. flowControl

flowControl	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	**For Com2**, the command is: • **Off**: `Com2.flowControl=Off` • **On**: `Com2.flowControl=Hardware`
Web Interface window	Flow Control 1. Click the **Flow Control** list box arrow and select **Hardware** to activate **flowControl** for COM2. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	Off
Options	• Off • Hardware
Description	**Important!**: The RTS and CTS signals are **ONLY** available for COM2. The RTS and CTS signals are **NOT supported for COM1**. The **Com2.flowControl** setting designates the hardware flow control as either on or off.

15.8. handler

handler	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	**CLI** The command is: • `Com1.handler=cli` • `Com2.handler=cli` **ModbusPassthru - Option is visible but is not active** **ModbusRTU - Option is visible but is not active** **Off - Option is visible but is not active** **Setup - Option is visible but is not active** **Terminal Server** The command is: • `Com1.handler=TerminalServer` • `Com2.handler=TerminalServer` **Trace** A configuration CLI with trace is on the COM port. • `Com1.handler=trace` • `Com2.handler=trace`
Web Interface window	Handler 1. Click the **Handler** list box arrow and select the designated protocol handler. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	TerminalServer
Options	• CLI (on page 197) • Terminal Server (on page 197) • Trace (on page 197) **Note**: ModbusRTU, ModbusPassthru, Setup, and Off are not active.

handler	
Setting	**Description**
Description	The **Com1.handler** or **Com2.handler** setting designates the protocol of the COM port as CLI, Terminal Server, or Trace. **Notes** • The COM port will act as a terminal server. • The TCP port number is determined by the COM **TerminalServerPort** setting. • The default port number for COM1 is 5041. • The default port number for COM2 is 5042. **Important!**: If using **Terminal Server Relay**, the TCP port numbers **MUST BE** be consistent across all involved radios. **FREEWAVE Recommends**: If using the **Terminal Server Relay** setting, keep the TCP port numbers as their defaults.

15.9. mode

mode	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.mode=RS232` • `Com2.mode=RS232` • `Com1.mode=RS485` • `Com2.mode=RS485`
Web Interface window	Mode 1. Click the **Mode** list box arrow and select the COM port mode. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	RS232
Options	• RS232 • RS485

mode	
Setting	**Description**
Description	The **Com1.mode** or **Com2.mode** setting designates the COM port mode as either RS232 or RS485. **Note**: When `Com1.mode=RS485` or `Com2.mode=RS485` AND `Com1.duplex=Full` or `Com2.duplex=Full`, the COM supports RS422.

15.10. parity

parity	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.parity=None` • `Com2.parity=None` • `Com1.parity=Even` • `Com2.parity=Even` • `Com1.parity=Odd` • `Com2.parity=Odd`
Web Interface window	Parity 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. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	None
Options	• None • Even • Odd
Description	The **Com1.parity** or **Com2.parity** setting designates the COM port parity bits for the system.

15.11. RxBytes

RxBytes	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.RxBytes` • `Com2.RxBytes`
Web Interface window	RX Bytes **Note**: This parameter is read-only in the Web Interface. See the COM window (on page 337) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **Com1.RxBytes** or **Com2.RxBytes** command reports the total bytes received from the COM port. **Note**: This is a Read-only parameter.

15.12. stopbits

stopbits	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.stopbits=1` • `Com2.stopbits=1` • `Com1.stopbits=2` • `Com2.stopbits=2`
Web Interface window	Stopbits 1. Click the **Stopbits** list box arrow and select the COM port number of stop bits. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	1

stopbits	
Setting	**Description**
Options	• 1 • 2
Description	The **Com1.stopbits** or **Com2.stopbits** setting designates the COM port number of stop bits.

15.13. TerminalServerPort

Note: See Examples - Terminal Server Relay (on page 326) for additional information.

TerminalServerPort	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.TerminalServerPort=nnnn` • `Com2.TerminalServerPort=nnnn` **Note**: Where `nnnn` is the TCP port number.
Web Interface window	Terminal Server Port 1. In the **Terminal Server Port** text box, enter the designated TCP port number. 2. Click the **Update** button to save the change. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	• The default port number for COM1 is 5041. • The default port number for COM2 is 5042.
Options	• The minimum value is0 (zero). • The maximum value is 65535.
Description	The **Com1.TerminalServerPort** or **Com2.TerminalServerPort** setting designates the TCP port number. **FREEWAVE Recommends**: If using the **Terminal Server Relay** setting, keep the TCP port numbers as their defaults.

15.14. TerminalServerTimeOut

Note: See Examples - Terminal Server Relay (on page 326) for additional information.

TerminalServerTimeOut	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.TerminalServerTimeOut=nnnn` • `Com2.TerminalServerTimeOut=nnnn` **Note**: Where `nnnn` is the amount of time, in seconds, the Terminal Server remains open.
Web Interface window	Terminal Server Time Out 1. In the **Terminal Server Time Out** text box, enter the number of seconds the Terminal Server remains open without receiving data from the network. 2. Click the **Update** button to save the change. 3. Reboot the Z9-P / Z9-PE / Z9-PE-GREY for the change to take effect. **Note**: See the COM window (on page 337) for the parameter location.
Default Setting	300
Options	• The minimum value is 5. • The maximum value is 3600.
Description	The **Com1.TerminalServerTimeOut** or **Com2.TerminalServerTimeOut** setting designates the amount of time, in seconds, the Terminal Server remains open if data is sent or received. **Note**: This can prevent an idle socket from remaining open indefinitely and preventing new connections. **Important!**: The **Com1.TerminalServerTimeOut** or **Com2.TerminalServerTimeOut** connection remains open if data is sent or received.

15.15. TxBytes

TxBytes	
Setting	**Description**
CLI / Web Page	[Page=Com1] [Page=Com2]
CLI Command	• `Com1.TxBytes` • `Com2.TxBytes`

TxBytes	
Setting	**Description**
Web Interface window	TX Bytes **Note**: This parameter is read-only in the Web Interface. See the COM window (on page 337) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **Com1.TxBytes** or **Com2.TxBytes** command reports the total bytes sent out of the COM port. **Note**: This is a Read-only parameter.

16. config Parameters

Note: See the Config window (on page 339).

- addTraceMask (on page 205)
- factoryDefaults (on page 205)
- getCurrentConfig (on page 205)
- handleDragDrop (on page 205)
- licenseState (on page 205)
- loadConfig (on page 206)
- removeTraceMask (on page 206)
- reset (on page 206)
- restore (on page 207)
- save (on page 208)

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. addTraceMask

Important!: FreeWave internal use only.

16.2. factoryDefaults

factoryDefaults	
Setting	**Description**
CLI / Web Page	[Page=config]
CLI Command	`config.factoryDefaults=set`
Web Interface window	Factory Defaults **Note**: See the Config window (on page 339) for the parameter location. **Important!**: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	Idle
Description	The **config.factoryDefaults** command restores the Z9-P / Z9-PE / Z9-PE-GREY to its factory default configuration.

16.3. getCurrentConfig

Important!: FreeWave internal use only.

16.4. handleDragDrop

Important!: FreeWave internal use only.

16.5. licenseState

licenseState	
Setting	**Description**
CLI / Web Page	[Page=config]
CLI Command	`config.licenseState`

licenseState	
Setting	**Description**
Web Interface window	License State **Note**: See the Config window (on page 339) for the parameter location. **Important!**: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **config.licenseState** command reports the extra feature licenses in the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

16.6. loadConfig

Important!: FreeWave internal use only.

16.7. removeTraceMask

Important!: FreeWave internal use only.

16.8. reset

reset	
Setting	**Description**
CLI / Web Page	[Page=config]

CLI Command	• **Reboot** the entire **ZumLink** device:
	  • `config.reset=now`
	  • `config.reset=reboot`
	• **Reset** to restart the main application:
	  • `config.reset=reset`

reset	
Setting	**Description**
Web Interface window	Reset **Note**: See the Config window (on page 339) for the parameter location. **Important!**: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **config.reset** command restarts or reboots the Z9-P / Z9-PE / Z9-PE-GREY.

16.9. restore

restore	
Setting	**Description**
CLI / Web Page	[Page=config]
CLI Command	• `config.restore=now` • `config.restore` • `restore`
Web Interface window	Restore **Note**: See the Config window (on page 339) for the parameter location. **Important!**: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **config.restore** command reloads a previously saved setting configuration of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: Restore happens automatically when the Z9-P / Z9-PE / Z9-PE-GREY starts.

16.10. save

save	
Setting	**Description**
CLI / Web Page	[Page=config]
CLI Command	• `config.save=now` • `config.save` • `save`
Web Interface window	Save **Note**: See the Config window (on page 339) for the parameter location. **Important!**: This parameter is read-only in the Web Interface. The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **config.save** command saves changes made to the Z9-P / Z9-PE / Z9-PE-GREY configuration.

17. dataPath Parameters

Note: See the Data Path window (on page 341).

- aggregateEnabled (on page 210)
- compressionEnabled (on page 211)
- fecRate (on page 212)
- MacTableEntryAgeTimeout (on page 214)
- otaMaxFragmentSize (on page 215)
- routeMinSignalMarginThresh (on page 215)

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. aggregateEnabled

aggregateEnabled	
Setting	**Description**
CLI / Web Page	[Page=dataPath]

CLI Command	• **Enable**:
	  • `dataPath.aggregateEnabled=true`
	• **Disable**:
	  • `dataPath.aggregateEnabled=false`

Web Interface window	Aggregate Enabled 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. **Note**: By default, the **Aggregate Enabled** is NOT enabled (set to False). See the Data Path window (on page 341) for the parameter location.
Default Setting	False
Options	• True • False

Description	The aggregateEnabled (on page 210) setting increases throughput of small packets by combining multiple packets into a single packet minimizing the number of packets required for transmission.
	Notes
	• Increases latency by 20msec and reduces poll rates.
	  • 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.
	Important!: All radios have the ability to de-aggregate received packets, regardless of the aggregation setting.
	FREEWAVE Recommends: Enable this setting on individual radios that send a high percentage of network data packets that are smaller than 900 bytes.

17.2. compressionEnabled

compressionEnabled	
Setting	**Description**
CLI / Web Page	[Page=dataPath]

CLI Command	• **Enable**:
	  • `dataPath.compressionEnabled=true`
	• **Disable**:
	  • `dataPath.compressionEnabled=false`

Web Interface window	Compression Enabled 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. **Note**: By default, the **Compression Enabled** is enabled (set to True). See the Data Path window (on page 341) for the parameter location.
Default Setting	True
Options	• True • False
Description	When the compressionEnabled (on page 211) 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. **Important!**: The compression ratio varies depending on the type of data being transmitted. **Example**: Text data is easily compressible, while video data is not. **Notes** • When enabled, the **Packet Compression** setting increases latency by a maximum of 10msec. • 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. **FREEWAVE Recommends**: Enable Packet Compression on all **ZumLink** networks.

17.3. fecRate

fecRate	
Setting	**Description**
CLI / Web Page	[Page=dataPath]

CLI Command	• **Enable**:
	  • `dataPath.fecRate=RATE_7_8`
	• **Disable**:
	  • `dataPath.fecRate=RATE_1_1`

Web Interface window	FEC Rate 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. **Note**: See the Data Path window (on page 341) for the parameter location.
Default Setting	RATE_1_1
Options	• RATE_1_1 • RATE_7_8

fecRate	
Setting	**Description**
Description	The **dataPath.fecRate** setting enables the Forward Error Correction (FEC) rate. **Note**: The fecRate (on page 212) increases the reliability of the data transferred over the air at the cost of some transmission throughput. **Notes** • 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 range and 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. • However, in noisy environments, net throughput may increase due to reduced errors and retries. **Caution**: When enabling FEC, start with the farthest Endpoints, then any Repeaters, then lastly the Gateway. 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. **FREEWAVE Recommends**: When viewing local diagnostics, if the RadioBadCRC (on page 234) count is more than 15-20% of the total transmitted packets (the RadioLLTx (on page 236) count), enabling the FEC setting is beneficial. **FREEWAVE Recommends**: When viewing local diagnostics, if the RadioBadCRC (on page 234) count is more than 15% of the total transmitted packets (the RadioLLTx (on page 236) count), enabling the fecRate (on page 212) setting is beneficial.

17.4. MacTableEntryAgeTimeout

MacTableEntryAgeTimeout	
Setting	**Description**
CLI / Web Page	[Page=dataPath]
CLI Command	`MacTableEntryAgeTimeout=nnnn` **Note**: Where `nnnn` is the number of seconds.
Web Interface window	MAC Table Entry Age Timeout 1. 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. 2. Click the **Update** button to save the change. **Note**: See the Data Path window (on page 341) for the parameter location.
Default Setting	120
Options	• The minimum value is 30. • The maximum value is 86400.
Description	The **dataPath.MacTableEntryAgeTimeout** setting designates the number of seconds before an inactive entry in the MAC Table ages out and expires. • 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. **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 transfer. **Note**: See MacTableShow (on page 231) to view the MAC to **nodeId** mapping table.

17.5. otaMaxFragmentSize

otaMaxFragmentSize	
Setting	**Description**
CLI / Web Page	[Page=dataPath]
CLI Command	`dataPath.otaMaxFragmentSize=nnnn` **Note**: Where `nnnn` is the maximum fragment size.
Web Interface window	OTA Max Fragment Size 1. In the **OTA Max Fragment Size** text box, enter the maximum fragment size, in bytes, sent over the air. 2. Click the **Update** button to save the change. **Note**: See the Data Path window (on page 341) for the parameter location.
Default Setting	1000
Options	• The minimum value is 64. • The maximum value is 1000.

Description	The **dataPath.otaMaxFragmentSize** setting designates the maximum fragment size, in bytes, sent over the air.
	Notes
	• This setting does NOT need to match on all radios.
	• A **smaller Max Fragment Size** may increase RF link reliability in highly noisy environments.
	  • A **smaller Max Fragment Size** may reduce data throughput.
	• A **larger Max Fragment Size** may increase data throughput.
	  • A **larger Max Fragment Size** may reduce RF link reliability in noisy environments.

17.6. routeMinSignalMarginThresh

routeMinSignalMarginThresh	
Setting	**Description**
CLI / Web Page	[Page=dataPath]
CLI Command	`dataPath.routeMinSignalMarginThresh=nnnn` **Note**: Where `nnnn` is the minimum signal margin in dB.

routeMinSignalMarginThresh	
Setting	**Description**
Web Interface window	Route Min Signal Margin Thresh 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. **Note**: See the Data Path window (on page 341) for the parameter location.
Default Setting	• 10
Options	• The minimum value is -5. • The maximum value is 60.
Description	The **dataPath.routeMinSignalMarginThresh** setting designates the minimum (threshold) signal margin, in dB, the next hop **must be** considered part of the packet route. **Notes** • 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. **FREEWAVE Recommends**: This value should be at least 4 dB lower than the reported link margin to the next hop. **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.

18. date Parameters

Note: See the Date window (on page 343).

- dcAppStartTime (on page 218)
- dcAppUptime (on page 218)
- time (on page 219)
- timeString (on page 219)
- upTime (on page 220)
- upTimeString (on page 220)

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. dcAppStartTime

Important!: Time zones **do not** apply to the Z9-P / Z9-PE / Z9-PE-GREY.

dcAppStartTime	
Setting	**Description**
CLI / Web Page	[Page=date]
CLI Command	• `date.dcAppStartTime` • `dcAppStartTime`
Web Interface window	DC App Start Time **Note**: This parameter is read-only in the Web Interface. See the Date window (on page 343) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **date.dcAppStartTime** command reports the time stamp of when the main app started. **Note**: This is a Read-only parameter.

18.2. dcAppUptime

Important!: Time zones **do not** apply to the Z9-P / Z9-PE / Z9-PE-GREY.

dcAppUptime	
Setting	**Description**
CLI / Web Page	[Page=date]
CLI Command	• `date.dcAppUptime` • `dcAppUptime`
Web Interface window	DC App Uptime **Note**: This parameter is read-only in the Web Interface. See the Date window (on page 343) for the parameter location.
Default Setting	N/A
Options	N/A

dcAppUptime	
Setting	**Description**
Description	The **date.dcAppUptime** command reports the number of seconds since the main app started. **Note**: This is a Read-only parameter.

18.3. time

Important!: Time zones **do not** apply to the Z9-P / Z9-PE / Z9-PE-GREY.

time	
Setting	**Description**
CLI / Web Page	[Page=date]
CLI Command	• `date.time` • `time`
Web Interface window	Time **Note**: This parameter is read-only in the Web Interface. See the Date window (on page 343) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **date.time** command reports the current time in Unix time stamp format. **Note**: This is a Read-only parameter.

18.4. timeString

Important!: Time zones **do not** apply to the Z9-P / Z9-PE / Z9-PE-GREY.

timeString	
Setting	**Description**
CLI / Web Page	[Page=date]
CLI Command	`date.timeString=MM/DD/YYYY HH.MM.SS`

timeString	
Setting	**Description**
Web Interface window	Time String **Note**: This parameter is read-only in the Web Interface. See the Date window (on page 343) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **date.timeString** setting changes the time ONLY if the ntpReference (on page 260) is set to **REFCLK_LOCALCLOCK**. **Important!**: If the Z9-P / Z9-PE / Z9-PE-GREY loses power, the time must be manually reset.

18.5. upTime

Important!: Time zones **do not** apply to the Z9-P / Z9-PE / Z9-PE-GREY.

upTime	
Setting	**Description**
CLI / Web Page	[Page=date]
CLI Command	• `date.upTime` • `upTime`
Web Interface window	Up Time **Note**: This parameter is read-only in the Web Interface. See the Date window (on page 343) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **date.upTime** command reports the number of seconds since the **ZumLink** restarted. **Note**: This is a Read-only parameter.

18.6. upTimeString

Important!: Time zones **do not** apply to the Z9-P / Z9-PE / Z9-PE-GREY.

upTimeString	
Setting	**Description**
CLI / Web Page	[Page=date]
CLI Command	• `date.upTimeString` • `upTimeString` **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.
Web Interface window	Up Time String **Note**: This parameter is read-only in the Web Interface. See the Date window (on page 343) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **date.upTimeString** command reports the amount of time in Days, Hours, Minutes, and Seconds the Z9-P / Z9-PE / Z9-PE-GREY has been powered on without a reboot. **Note**: This is a Read-only parameter.

19. encryption Parameters

Note: See the Encryption window (on page 345).

- activeKey (on page 223)
- encryptionMode (on page 223)
- getKey (on page 224)
- remoteRestore (on page 225)
- remoteSave (on page 225)
- setKey (on page 225)

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. activeKey

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.

activeKey	
Setting	**Description**
CLI / Web Page	[Page=encryption]
CLI Command	• `encryption.activeKey=Off` • `encryption.activeKey=Key1 to Key16` **Example**: `encryption.activeKey=Key10`.
Web Interface window	Active Key **Note**: This parameter is read-only in the Web Interface. See the Encryption window (on page 345) for the parameter location.
Default Setting	Off
Options	• Off • Key1 to Key16
Description	The **encryption.activeKey** setting designates the active key. **Important!**: Assigning the **activeKey** to a key that is NOT set will **NOT** allow communication across the link. Keys **MUST BE** set before they can become active keys.

19.2. encryptionMode

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.

encryptionMode	
Setting	**Description**
CLI / Web Page	[Page=encryption]

CLI Command	• **AES Counter Mode**:
	  • `encryption.encryptionMode=AES_CTR`
	• **AES Counter Mode with MIC** (Message Integrity Check):
	  • `encryption.encryptionMode=AES_CCM`

Web Interface window	Encryption Mode 1. Click the **Encryption Mode** list box arrow and select the designated encryption mode. 2. Click the **Update** button to save the change. **Note**: See the Encryption window (on page 345) for the parameter location.
Default Setting	AES_CTR
Options	• AES_CCM • AES_CTR
Description	The **encryption.encryptionMode** setting designates the encryption mode. **Important!**: Use of encryption may affect latency and user throughput.

19.3. getKey

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.

getKey	
Setting	**Description**
CLI / Web Page	[Page=encryption]
CLI Command	`encryption.getKey=Key1 to Key16` **Example**: `encryption.getKey=key8`.

getKey	
Setting	**Description**
Web Interface window	Get Key **Note**: This parameter is read-only in the Web Interface. See the Encryption window (on page 345) for the parameter location.
Default Setting	Off
Options	• Off • Key1 to Key16
Description	The **encryption.getKey** command reports this information about the key: • Whether the key is 128- or 256-bit key. • If the key is empty. **Note**: This is a Read-only parameter.

19.4. remoteRestore

Important!: FreeWave internal use only.

19.5. remoteSave

Important!: FreeWave internal use only.

19.6. setKey

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.

setKey	
Setting	**Description**
CLI / Web Page	[Page=encryption]

setKey	
Setting	**Description**
CLI Command	The format of this setting is: setKey [key] [128 or 256 key in hex] **Example**: 128 bit key: encryption.setKey=key1 1234567890abcdef1234567890abcdef **Example**: 256 bit key: encryption.setKey=key2 1234567890abcdef1234567890abcdef1234567890abcdef1234567890abcdef
Web Interface window	Set Key **Note**: This parameter is read-only in the Web Interface. See the Encryption window (on page 345) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **encryption.setKey** setting loads the key. Tip Enter `encryption.setKey=` WITHOUT an actual key to erase or clear the existing key.

20. localDiagnostics Parameters

Note: See the Local Diagnostics window (on page 352).

20.1. signalLevel

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

signalLevel	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.signalLevel` • `signalLevel`
Web Interface window	Signal Level **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	-128.00
Options	N/A
Description	The **localDiagnostics.signalLevel** command reports the Signal Level of the radio in dBm of the last received packet. **Note**: This setting shows -128.00 if no packet has been received since the stats were cleared.

20.2. signalMargin

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

signalMargin	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.signalMargin` • `signalMargin`

signalMargin	
Setting	**Description**
Web Interface window	Signal Margin **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.signalMargin** command reports the amount of signal margin in dB the last received packet experienced. **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.

20.3. cntBadBCC

Important!: FreeWave internal use only.

20.4. cntBadSync

Important!: FreeWave internal use only.

20.5. cntETX

Important!: FreeWave internal use only.

20.6. cntSTX

Important!: FreeWave internal use only.

20.7. getStats

getStats	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]

getStats	
Setting	**Description**
CLI Command	• `localDiagnostics.getStats` • `getStats`
Web Interface window	Get Stats **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.getStats** command reports the localDiagnostics from the radio immediately. **Important!**: A refresh of the **localDiagnostics** page is required to see the updates.

20.8. interfaceBytesRx

Important!: FreeWave internal use only.

20.9. interfaceBytesTx

Important!: FreeWave internal use only.

20.10. interfaceDataRx

Important!: FreeWave internal use only.

20.11. interfaceDataTx

Important!: FreeWave internal use only.

20.12. MacTableClear

MacTableClear	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.MacTableClear=Now` • `localDiagnostics.MacTableClear=` • `MacTableClear=Now` • `MacTableClear=`
Web Interface window	Mac Table Clear **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	Now
Description	The **localDiagnostics.MacTableClear** command clears the MAC to the **nodeID** mapping table and forces routes to be relearned.

20.13. MacTableShow

MacTableShow	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.MacTableShow` • `MacTableShow`
Web Interface window	Mac Table Show **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.MacTableShow** command reports the MAC addresses of the devices connected to the Z9-P / Z9-PE / Z9-PE-GREY in a **nodeID** table format.

20.14. monitoredNode

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

monitoredNode	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.monitoredNode=<Node ID here>` • `monitoredNode=<Node ID here>`
Web Interface window	Monitored Node 1. In the **Monitored Node** text box, enter the nodeId (on page 272) to monitor. 2. Click the **Update** button to save the change. **Note**: See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.monitoredNode** setting designates the nodeId (on page 272) to be monitored and reported back by the **localDiagnostics.showNodeDiags** command. Tip Use the **showNodeDiags** to view the received signal level (RSSI) of this node.

20.15. noiseLevel

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

noiseLevel	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.noiseLevel` • `noiseLevel`

noiseLevel	
Setting	**Description**
Web Interface window	Noise Level **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	0.000000
Options	N/A
Description	The **localDiagnostics.noiseLevel** command reports the amount of link noise measured in dB before the last packet was transmitted.

20.16. RadioAckTx

Important!: FreeWave internal use only.

20.17. RadioBadAckRx

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioBadAckRx	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioBadAckRx` • `RadioBadAckRx`
Web Interface window	Radio Bad Ack RX **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.RadioBadAckRx** command reports the number of received ACKs missed in unicast transmissions.

20.18. RadioBadCRC

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioBadCRC	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioBadCRC` • `RadioBadCRC`
Web Interface window	Radio Bad CRC **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the 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 RadioBadCRC (on page 234) count is more than 15% of the total transmitted packets (the RadioLLTx (on page 236) count), enabling the fecRate (on page 212) setting is beneficial.

20.19. RadioBadSync

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioBadSync	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioBadSync` • `RadioBadSync`

RadioBadSync	
Setting	**Description**
Web Interface window	Radio Bad Sync **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the 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`.

20.20. RadioContentionDrop

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioContentionDrop	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioContentionDrop` • `RadioContentionDrop`
Web Interface window	Radio Contention Drop **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
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.

20.21. RadioLLRx

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioLLRx	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioLLRx` • `RadioLLRx`
Web Interface window	Radio LL RX **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.RadioLLRx** command reports the number of packets received over the air without data corruption.

20.22. RadioLLTx

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioLLTx	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioLLTx` • `RadioLLTx`
Web Interface window	Radio LL TX **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A

RadioLLTx	
Setting	**Description**
Description	The **localDiagnostics.RadioLLTx** command reports the number of packets transmitted over the air. **FREEWAVE Recommends**: When viewing local diagnostics, if the RadioBadCRC (on page 234) count is more than 15% of the total transmitted packets (the RadioLLTx (on page 236) count), enabling the fecRate (on page 212) setting is beneficial.

20.23. RadioNoAckTx

Important!: FreeWave internal use only.

20.24. RadioReliableRx

Important!: FreeWave internal use only.

20.25. RadioReliableTx

Important!: FreeWave internal use only.

20.26. RadioRexmit

Important!: FreeWave internal use only.

20.27. RadioRx

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioRx	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RadioRx` • `RadioRx`

RadioRx	
Setting	**Description**
Web Interface window	Radio RX **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
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 node.

20.28. RadioSendingDrop

Important!: FreeWave internal use only.

20.29. RadioTimedOut

Important!: FreeWave internal use only.

20.30. RadioTooLong

Important!: FreeWave internal use only.

20.31. RadioTooShort

Important!: FreeWave internal use only.

20.32. RadioTx

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RadioTx	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]

RadioTx	
Setting	**Description**
CLI Command	• `localDiagnostics.RadioTx` • `RadioTx`
Web Interface window	Radio TX **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.RadioTx** command reports the number of data packets scheduled to be transmitted.

20.33. resetsDetected

Important!: FreeWave internal use only.

20.34. resetSent

Important!: FreeWave internal use only.

20.35. resetStats

resetStats	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]

CLI Command	• `localDiagnostics.resetStats=Now`
	  • `localDiagnostics.resetStats=`
	• `resetStats=Now`
	  • `resetStats=`

Web Interface window	Reset Stats **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.

resetStats	
Setting	**Description**
Default Setting	N/A
Options	Now
Description	The **localDiagnostics.resetStats** command resets the local diagnostics.

20.36. RxSuccess

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

RxSuccess	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.RxSuccess=` • `RxSuccess=`
Web Interface window	Rx Success **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	100
Options	N/A
Description	The **localDiagnostics.RxSuccess** command reports the percentage of packets correctly received for this node.

20.37. showChannelDiags

showChannelDiags	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.showChannelDiags` • `showChannelDiags`

showChannelDiags	
Setting	**Description**
Web Interface window	Show Channel Diags **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.showChannelDiags** command reports the received signal level (RSSI) and node ID of the last packet received on the displayed frequencies.

20.38. showNodeDiags

showNodeDiags	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.showNodeDiags` • `showNodeDiags`
Web Interface window	Show Node Diags **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
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 **localDiagnostics.monitoredNode** parameter.

20.39. timestamp

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

timestamp	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.timestamp` • `timestamp`
Web Interface window	Timestamp **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **localDiagnostics.timestamp** command reports the time the Diagnostics Information was collected by the device.

20.40. TxAvailability

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

TxAvailability	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.TxAvailability=` • `TxAvailability=`
Web Interface window	Tx Availability **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	100
Options	N/A
Description	The **localDiagnostics.TxAvailability** command reports the percentage of packets that were transmitted without back-off.

20.41. TxSuccess

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

TxSuccess	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.TxSuccess=` • `TxSuccess=`
Web Interface window	Tx Success **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	100
Options	N/A
Description	The **localDiagnostics.TxSuccess** command reports the percentage of packets that were transmitted with a successful ACK received.

20.42. VSWR

Important!: Most of the **localDiagnostics** parameters are read-only. The information reported is dependent upon the connected Z9-P / Z9-PE / Z9-PE-GREY device.

VSWR	
Setting	**Description**
CLI / Web Page	[Page=localDiagnostics]
CLI Command	• `localDiagnostics.VSWR=` • `VSWR=` **Example**:

VSWR	
Setting	**Description**
Web Interface window	Signal Level **Note**: This parameter is read-only in the Web Interface. See the Local Diagnostics window (on page 352) for the parameter location.
Default Setting	0 (zero)
Options	N/A

Description	The **localDiagnostics.VSWR** command reports the value proportional to the VSWR (Voltage Standing Wave Ratio) measured from the last packet transmitted.
	• For the antenna port, the value can range from:
	  • 1 to 2 for an excellent match,
	  • 2 to 10 for a good match, or
	  • > 100 for a poor match.
	Notes
	• VSWR is less accurate at higher power levels (>20dBm).
	• 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 / Z9-PE / Z9-PE-GREY models manufactured prior to September, 2018. If the Z9-P / Z9-PE / Z9-PE-GREY reports a VSWR value of 0 (zero), VSWR is **not** supported.

21. network Parameters

Note: See the Network window (on page 355).

- gateway (on page 246)
- ip_address (on page 246)
- mac_address (on page 247)
- MTU (on page 247)
- nameserver_address1 (on page 248)
- nameserver_address2 (on page 249)
- netmask (on page 249)
- netmaskFilterEnabled (on page 250)
- stpEnabled (on page 251)
- txqueuelen (on page 252)

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).

21.1. gateway

gateway	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	`network.gateway=nnn.nnn.nnn.nnn`
Web Interface window	Gateway 1. In the **Gateway** text box, enter the Gateway IP address for the network. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	192.168.111.1
Options	N/A
Description	The **network.gateway** setting designates the Gateway IP address for the network when DHCP is disabled. **Important!**: The use of a Gateway here is **NOT** related to the **radioSettings.radioMode=Gateway** or **radioSettings.radioMode=Endpoint**.

21.2. ip_address

ip_address	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	`network.ip_address=nnn.nnn.nnn.nnn` **Important!**: Where `nnn.nnn.nnn.nnn` is the IP address assigned by the IT department for the Z9-P / Z9-PE / Z9-PE-GREY network.
Web Interface window	IP Address 1. In the **IP Address** text box, enter the IP address of the Z9-P / Z9-PE / Z9-PE-GREY assigned by the IT department for the network. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	192.168.111.100
Options	N/A

ip_address	
Setting	**Description**
Description	The **network.ip_address** setting designates the IP address of the Z9-P / Z9-PE / Z9-PE-GREY when DHCP is disabled.

21.3. mac_address

mac_address	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	• `network.mac_address` • `mac_address`
Web Interface window	MAC Address **Note**: This parameter is read-only in the Web Interface. See the Network window (on page 355) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **network.mac_address** command reports the MAC Address of the Z9-P / Z9-PE / Z9-PE-GREY. **Important!**: This parameter is read-only and is unique for each radio.

21.4. MTU

mtu	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	• `network.mtu=nnnn` • `mtu=nnnn` **Note**: Where `nnnn` is the maximum transmission unit.

mtu	
Setting	**Description**
Web Interface window	MTU 1. In the **MTU** text box, enter the maximum transmission unit. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	1500
Options	• The minimum value is 100. • The maximum value is 65521.
Description	The **network.mtu** setting designates the maximum transmission unit (MTU) frame size for the Z9-P / Z9-PE / Z9-PE-GREY. **Notes** • 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. **Important!**: The value MUST BE increased to support jumbo size frames that exceed the normal 1500 byte MTU.

21.5. nameserver_address1

nameserver_address1	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	`network.nameserver_address1=nnn.nnn.nnn.nnn` **Note**: Where `nnn.nnn.nnn.nnn` is a user-defined DNS IP address.
Web Interface window	Nameserver Address 1 1. Optional: In the **Nameserver Address 1** text box, enter a user-defined DNS IP address. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	8.8.8.8 **Note**: This is a Google Public DNS.

nameserver_address1	
Setting	**Description**
Options	User-defined DNS IP address.
Description	The **network.nameserver_address1** setting designates the DNS for name-to-address resolution.

21.6. nameserver_address2

nameserver_address2	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	`network.nameserver_address2=nnn.nnn.nnn.nnn.` **Note**: Where `nnn.nnn.nnn.nnn` is a user-defined DNS IP address.
Web Interface window	Nameserver Address 2 1. Optional: In the **Nameserver Address 2** text box, enter a user-defined DNS IP address.. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	8.8.4.4 **Note**: This is a Google Public DNS.
Options	User-defined DNS IP address.
Description	The **network.nameserver_address2** setting designates the DNS for name-to-address resolution.

21.7. netmask

netmask	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	• `network.netmask=nnn.nnn.nnn.nnn` • `netmask=nnn.nnn.nnn.nnn`

netmask	
Setting	**Description**
Web Interface window	Netmask 1. In the **Netmask** text box, enter the Netmask of the Z9-P / Z9-PE / Z9-PE-GREY. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	255.255.255.0
Options	N/A
Description	The **network.netmask** setting designates the Netmask of the Z9-P / Z9-PE / Z9-PE-GREY when DHCP is disabled.

21.8. netmaskFilterEnabled

netmaskFilterEnabled	
Setting	**Description**
CLI / Web Page	[Page=network]

CLI Command	• **Enable**:
	  • `network.netmaskFilterEnabled=true`
	• **Disable**:
	  • `network.netmaskFilterEnabled=false`

Web Interface window	Netmask Filter Enabled 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. **Note**: By default, the **Netmask Filter Enabled** is enabled (set to False). See the Network window (on page 355) for the parameter location.
Default Setting	False
Options	• True • False

netmaskFilterEnabled	
Setting	**Description**
Description	The **network.netmaskFilterEnabled** enables a bridge firewall to restrict network communication to current IPv4 subnet. **Notes** • 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. **Important!**: ZumLink acts as a layer 2 switch. ALL Ethernet and Multicast packets are passed when IP Netmask Filter is NOT enabled.

21.9. stpEnabled

stpEnabled	
Setting	**Description**
CLI / Web Page	[Page=network]

CLI Command	• **Enable**:
	  • `network.stpEnabled=true`
	• **Disable**:
	  • `network.stpEnabled=false`

Web Interface window	STP Enabled 1. Click the **STP Enabled** list box arrow and select **True** to enable the Spanning Tree Protocol. 2. Click the **Update** button to save the change. **Note**: By default, the **STP Enabled** is NOT enabled (set to False). See the Network window (on page 355) for the parameter location.
Default Setting	False
Options	• True • False
Description	The **network.stpEnabled** setting enables the Spanning Tree Protocol.

21.10. txqueuelen

txqueuelen	
Setting	**Description**
CLI / Web Page	[Page=network]
CLI Command	`network.txqueuelen=nnnn` **Note**: Where `nnnn` is the maximum number of packets to hold in the transmit queue.
Web Interface window	Txqueuelen 1. In the **Txqueuelen** text box, enter the maximum number of packets to hold in the transmit queue. 2. Click the **Update** button to save the change. **Note**: See the Network window (on page 355) for the parameter location.
Default Setting	25
Options	• The minimum value is 1. • The maximum value is 1000.
Description	The **network.txqueuelen** setting designates the maximum number of packets that can be buffered before they are rejected by the radio. **Notes** • 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. **Example**: `network.txqueuelen=750` allows 750 Ethernet packets buffered in the transmit queue.

22. networkStats Parameters

Note: See the Network Stats window (on page 359).

- rx_bytes (on page 254)
- rx_dropped (on page 254)
- rx_errors (on page 255)
- rx_packets (on page 255)
- tx_bytes (on page 256)
- tx_dropped (on page 256)
- tx_errors (on page 257)
- tx_packets (on page 257)

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).

22.1. rx_bytes

rx_bytes	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• `networkStats.rx_bytes` • `rx_bytes`
Web Interface window	RX Bytes **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **networkStats.rx_bytes** command reports the number of bytes received from the radio network. **Note**: This is a Read-only parameter.

22.2. rx_dropped

rx_dropped	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• `networkStats.rx_dropped` • `rx_dropped`
Web Interface window	RX Dropped **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
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. **Note**: This is a Read-only parameter.

22.3. rx_errors

rx_errors	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• networkStats.rx_errors • rx_errors
Web Interface window	RX Errors **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
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. **Note**: This is a Read-only parameter.

22.4. rx_packets

rx_packets	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• networkStats.rx_packets • rx_packets
Web Interface window	RX Packets **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **networkStats.rx_packets** command reports the number of Ethernet packets received from the radio network. **Note**: This is a Read-only parameter.

22.5. tx_bytes

tx_bytes	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• `networkStats.tx_bytes` • `tx_bytes`
Web Interface window	TX Bytes **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
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. **Note**: This is a Read-only parameter.

22.6. tx_dropped

tx_dropped	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• `networkStats.tx_dropped` • `tx_dropped`
Web Interface window	TX Dropped **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **networkStats.tx_dropped** command reports the number of Ethernet packets received from the Ethernet port but dropped because the transmit queue is full. **Note**: An increase of this counter may indicate that increasing the **txqueuelen** parameter may improve overall network performance. **Note**: This is a Read-only parameter.

22.7. tx_errors

tx_errors	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• `networkStats.tx_errors` • `tx_errors`
Web Interface window	TX Errors **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **networkStats.tx_errors** command reports the number of Ethernet packets received from the Ethernet port that were in error. **Note**: This is a Read-only parameter.

22.8. tx_packets

tx_packets	
Setting	**Description**
CLI / Web Page	[Page=networkStats]
CLI Command	• `networkStats.tx_packets` • `tx_packets`
Web Interface window	TX Packets **Note**: This parameter is read-only in the Web Interface. See the Network Stats window (on page 359) for the parameter location.
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. **Note**: This is a Read-only parameter.

23. NTP Parameters

Note: See the NTP window (on page 361).

- ntp_address (on page 259)
- ntpDate (on page 260)
- ntpReference (on page 260)
- ntpRestart (on page 261)

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. ntp_address

ntp_address	
Setting	**Description**
CLI / Web Page	[Page=ntp]
CLI Command	• `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` **Note**: Where `nnn.nnn.nnn.nnn` is the IP address of the servers used for synchronizing time.
Web Interface window	NTP Address 1 NTP Address 2 NTP Address 3 NTP Address 4 NTP Address 5 1. In the **NTP Address 2 to 5** text boxes, enter the IP address of the servers used for synchronizing time. 2. Click the **Update** button to save the change. **Note**: By default, the **NTP Address 1** is time.nist.gov. See the NTP window (on page 361) for the parameter location.
Default Setting	• **ntp_address1**: time.nist.gov • **ntp_address2-5**: 0.0.0.0
Options	N/A
Description	The **ntp.ntp_address1-5** setting designates the IP address of the servers used for synchronizing time. **Notes** • A maximum of five NTP servers are allowed. • Use `0.0.0.0` to skip a specific server. **Example**: Enter `ntp.ntp_address2=0.0.0.0` to skip a second server, if it's available.

23.2. ntpDate

ntpDate	
Setting	**Description**
CLI / Web Page	[Page=ntp]
CLI Command	• `ntp.ntpDate=now` • `ntpDate=now`
Web Interface window	NTP Date 1. 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 (on page 259) settings. 2. Click the **Update** button to save the change. **Note**: See the NTP window (on page 361) for the parameter location.
Default Setting	N/A
Options	Now
Description	The **ntp.ntpDate** setting synchronizes the local clock with the time from the NTP servers specified in the **ntp.ntp_address1 to 5** settings. **Note**: The server with the best clock, as defined by the NTP protocol, is used.

23.3. ntpReference

ntpReference	
Setting	**Description**
CLI / Web Page	[Page=ntp]

CLI Command	• `ntp.ntpReference=NETWORK_TIME_SERVER`
	  • The reference is from other systems on the network.
	• `ntp.ntpReference=REFCLK_LOCALCLOCK`
	  • The reference is generated by the local clock.

Web Interface window	NTP Reference 1. Click the **NTP Reference** list box arrow and select either **NETWORK_TIME_SERVER** or **REFCLK_LOCALCLOCK**. 2. Click the **Update** button to save the change. **Note**: See the NTP window (on page 361) for the parameter location.

ntpReference	
Setting	**Description**
Default Setting	NETWORK_TIME_SERVER
Options	• NETWORK_TIME_SERVER • REFCLK_LOCALCLOCK
Description	The **ntp.ntpReference** setting designates the clock reference for NTP.

23.4. ntpRestart

ntpRestart	
Setting	**Description**
CLI / Web Page	[Page=ntp]
CLI Command	`ntp.ntpRestart=now`
Web Interface window	NTP Restart **Note**: This parameter is read-only in the Web Interface. See the NTP window (on page 361) for the parameter location.
Default Setting	N/A
Options	Now
Description	The **ntp.ntpRestart** setting restarts the NTP system.

24. radioSettings Parameters

Note: See the Radio Settings window (on page 363).

- beaconBurstCount (on page 263)
- beaconInterval (on page 264)
- frequencyKey (on page 265)
- frequencyMasks (on page 267)
- lnaBypass (on page 269)
- maxLinkDistanceinMiles (on page 270)
- networkId (on page 271)
- nodeId (on page 272)
- radioFrequency (on page 273)
- radioHoppingMode (on page 275)
- radioMaxRepeaters (on page 277)
- radioMode (on page 280)
- radioRepeaterSlot (on page 281)
- rfDataRate (on page 282)
- txPower (on page 285)

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. beaconBurstCount

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

beaconBurstCount	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.beaconBurstCount=n` • `beaconBurstCount=n` **Note**: Where `n` is any number between 1 and 7.
Web Interface window	Beacon Burst Count 1. In the **Beacon Burst Count** text box, enter the number of consecutive beacons to send per beaconInterval time. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	3
Options	Any number between 1 and 7.
Description	The **radioSettings.beaconBurstCount** setting designates the number of consecutive beacons to send per beaconInterval time. **Notes** • The **radioSettings.beaconBurstCount** is set 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. **FREEWAVE Recommends**: Set the beaconBurstCount (on page 263) 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.

24.2. beaconInterval

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

beaconInterval	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.beaconInterval=TWENTY_FIVE_MS` • `radioSettings.beaconInterval=FIFTY_MS` • `radioSettings.beaconInterval=ONE_HUNDRED_MS` • `radioSettings.beaconInterval=TWO_HUNDRED_MS` • `radioSettings.beaconInterval=FOUR_HUNDRED_MS`
Web Interface window	Beacon Interval 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. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	ONE_HUNDRED_MS
Options	• TWENTY_FIVE_MS • FIFTY_MS • ONE_HUNDRED_MS • TWO_HUNDRED_MS • FOUR_HUNDRED_MS

beaconInterval	
Setting	**Description**
Description	The **radioSettings.beaconInterval** controls how often a Gateway radio sends out a beacon packet and changes to the next radio frequency in the hopping pattern. **Notes** • The **radioSettings.beaconInterval** is set 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**. • A **shorter Beacon Interval** may improve the RF link reliability in noisy environments. Tip A **longer Beacon Interval** may improve throughput in environments where interference is minimal.

24.3. frequencyKey

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

frequencyKey	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.frequencyKey=Key0` • `radioSettings.frequencyKey=Key1 to Key16`
Web Interface window	Frequency Key 1. Click the **Frequency Key** list box arrow and select the Key number used as an index to select a hopping table. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	Key0 (zero)

frequencyKey	
Setting	**Description**
Options	• Key0 (zero) • Key1 to Key16 **Valid frequencyKey Values**

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.

frequencyKey	
Setting	**Description**

Description	The **radioSettings.frequencyKey** setting designates the Key number used as an index to select a hopping table.
	Notes
	• 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`.
	  • 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.
	  • If an invalid frequency key setting is found, the **radioSettings.frequencyKey** is NOT changed.
	  • The frequency key setting being larger than the number of hopping tables configured for a specific **rfDataRate**.
	  • In this instance, the **radioSettings.frequencyKey** is set to Key0 (zero).
	Important!: The Endpoint radios obtain this value from a Gateway with the same **networkId** via the beacon frame.
	After communications are established, any change of this value are picked up by the Endpoints.
	Tip: When using different hop patterns on each network, interference caused by neighboring **ZumLink** networks can be minimized.

24.4. frequencyMasks

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

frequencyMasks	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]

frequencyMasks	
Setting	**Description**
CLI Command	`radioSettings.frequencyMasks=nnnn` **Note**: Where `nnnn` is the specified format of the frequency range to mask shown in: A. Single Channel Format, B. Range of Channels Format, or C. Combination of Channels Format. **Important!**: Hop table frequency masking masks the channels that fall within the range plus or minus one-half (½) the channel bandwidth.
Web Interface window	Frequency Masks 1. In the **Frequency Masks** text box, enter the exact specified format of the frequency range to mask. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	Blank
Options	**Caution**: ONLY A comma MUST separate the values - NOT a comma with a space. **Use this information in examples A to C:** • xxx is a value between 902-927 MHz. • yyyy is a value between .0000-.9999 MHz. **A. Single Channel Format** • A single entry masks the specified frequency plus the bandwidth on each side of the center frequency as a function of the **rfDataRate**. • `frequencyMasks=xxx.yyyy,xxx.yyyy,xxx.yyyy` **B. Range of Channels Format** **Important!**: If a radio channel intersects with the mask limits, it will be masked and not used. • `frequencyMasks=xxx.yyyy-xxx.yyyy,xxx.yyyy-xxx.yyyy` **C. Combination of Channels Format** • `frequencyMasks=xxx.yyyy-xxx.yyyy,xxx.yyyy`

frequencyMasks	
Setting	**Description**
Description	The **radioSettings.frequencyMasks** setting designates specific frequencies or a set of frequencies in the hopping pattern to remove from usage. **Caution**: **radioSettings.frequencyMasks** entries MUST BE less than 128 bytes. ONLY A comma MUST separate the values - NOT a comma with a space. **Notes** • This setting is **only** used when `radiosettings.radioHoppingMode=Hopping_On`. • All radios in the network **MUST** use the same value for this setting. • 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. • .9, .09, .009 are valid entries as well as .9000, .0900, .0090. Type `frequencyMasks=` and press <Enter> to clear all **Frequency Mask** entries.

24.5. lnaBypass

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

lnaBypass	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]

CLI Command	• **Enable LNA**:
	  • `radioSettings.lnaBypass=0`
	  • `lnaBypass=0`
	• **Bypass LNA**:
	  • `radioSettings.lnaBypass=1`
	  • `lnaBypass=1`

InaBypass	
Setting	**Description**
Web Interface window	LNA Bypass 1. In the **LNA Bypass** text box, enter **1** to bypass the Low Noise Amplifier (LNA) and reduce the radio module receive signal by 10dB. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	0 (zero)
Options	• 0 • 1
Description	The **radioSettings.InaBypass** setting enables the Low Noise Amplifier (LNA) used to boost the radio module receive signal by 10dB. 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.

24.6. maxLinkDistanceinMiles

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

maxLinkDistanceinMiles	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.maxLinkDistanceinMiles=nnn` • `maxLinkDistanceinMiles=nnn` **Note**: Where `nnn` is the maximum one-way distance (in miles) between any nodes in the network.

maxLinkDistanceinMiles	
Setting	**Description**
Web Interface window	Max Link Distance in Miles 1. In the **Max Link Distance in Miles** text box, enter the maximum one-way distance (in miles) between any nodes in the network. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	20 miles
Options	• The minimum value is 5 miles. • The maximum value is 120 miles.
Description	The **radioSettings.maxLinkDistanceinMiles** setting designates the maximum one-way distance (in miles) between any nodes in the network. **FREEWAVE Recommends**: All nodes in the network that communicate with each other should use the same distance value.

24.7. networkId

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

networkId	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.networkId=nnnn` • `networkId=nnnn` **Note**: Where `nnnn` is the network identifier which subdivides traffic on radio units.

networkId	
Setting	**Description**
Web Interface window	Network ID 1. In the **Network ID** text box, enter the network identifier that subdivides traffic on radio units. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	51966
Options	• The minimum value is 2. • The maximum value is 65535.
Description	The **radioSettings.networkId** setting designates the network identifier which subdivides traffic on radio units. **Notes** • Radio units can **only** communicate with other units that have the same **radioSettings.networkId** setting. **Important!**: If radios are on the same frequency, they still receive data from radios of a different **networkId**, but the data is dropped.

24.8. nodeId

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

nodeId	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.nodeId=nnnn` • `nodeId=nnnn` **Note**: Where `nnnn` is a user-designated nodeId instead of the auto-generated nodeId.

nodeId	
Setting	**Description**
Web Interface window	Node ID 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. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	Predetermined by the Z9-P / Z9-PE / Z9-PE-GREY, this is an auto-generated, unique number from 2 through 65533.
Options	N/A
Description	The **radioSettings.nodeId** setting designates the unique ID of the device. **Notes** • 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.

24.9. radioFrequency

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

radioFrequency	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.radioFrequency=nnn.nnnn` • `radioFrequency=nnn.nnnn` **Note**: Where `nnn.nnnn` is the operating center frequency.

<table>
<tr><th colspan="2">radioFrequency</th></tr>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>Web Interface window</td><td>Radio Frequency
1. In the Radio Frequency text box, enter the operating center frequency.
2. Click the Update button to save the change.
Note: See the Radio Settings window (on page 363) for the parameter location.</td></tr>
<tr><td>Default Setting</td><td>915.0000 for the Standard Hop Set - ZumLink 900MHz Channels (on page 399)</td></tr>
<tr><td>Options</td><td>
<table>
<tr><th colspan="2">Valid Ranges</th></tr>
<tr><th>Data Rate</th><th>MHz Range</th></tr>
<tr><td>4 Mbps</td><td>904.5504 - 925.7472</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>
</table>
</td></tr>
</table>

radioFrequency	
Setting	**Description**
Description	The **radioSettings.radioFrequency** setting designates the operating center frequency in MHz. **Notes** • All radios in the network **MUST** use the same value for this setting. • This setting is **only** used when **radiosettings.radioHoppingMode=Hopping_Off**. • The range of this setting is dependent on the rfDataRate (on page 282) setting. • The frequency interval is 100 Hz. • The minimum value increases and the maximum value decreases as the **radioSettings.rfDataRate** increases. • The increase in channel bandwidth affects these ranges. • If the **radioSettings.radioFrequency** setting 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**. **FREEWAVE Recommends**: Use a single **radioSettings.radioFrequency** if **radiosettings.radioHoppingMode=Hopping_Off**. **Important!**: A few seconds are needed to apply the change; allow some time prior to reading back this value. Tip: Read back this value after setting it to determine if it was accepted by the Z9-P / Z9-PE / Z9-PE-GREY.

24.10. radioHoppingMode

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

radioHoppingMode	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]

radioHoppingMode	
Setting	**Description**

CLI Command	• **Enable**:
	  • `radiosettings.radioHoppingMode=Hopping_On`
	• **Disable**:
	  • `radiosettings.radioHoppingMode=Hopping_Off`

Web Interface window	Radio Hopping Mode 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. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	Hopping_On
Options	• Hopping_Off • Hopping_On

radioHoppingMode	
Setting	**Description**

Description	The **radioSettings.radioHoppingMode** setting enables frequency hopping.
	Notes
	• All radios in the network **MUST** use the same value for this setting.
	• For **rfDataRate** values of 115.2 and 250 kbps, the **radioSettings.radioHoppingMode** is forced **On** and CANNOT be set to `radiosettings.radioHoppingMode=Hopping_Off`.
	• For **rfDataRate** 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 `radiosettings.radioHoppingMode=Hopping_On`.
	• A Gateway **is NOT required** when the `radiosettings.radioHoppingMode=Hopping_Off`.
	Important!: Special rules must be applied for the 115.2 and 250 kbps data rates to enforce regulatory rules.
	• If the `radioSettings.rfDataRate=RATE_250K`:
	  • If the number of hopping channels in the hop table is:
	  • **>=50**, the maximum **txPower** is 30dBm and the **txPower** is NOT automatically changed.
	  • **>=25 and <=49**, the maximum **txPower** is 24dBm and the **txPower** is automatically reduced to 24dBm.
	  • **<25**, all masking is removed. All channels contained in the hop table are re-enabled. **txPower** is NOT automatically changed.
	• If the `radioSettings.rfDataRate=RATE_115.2K`:
	  • If the number of hopping channels in the hop table is:
	  • **>=50**, the maximum **txPower** is 30dBm and the **txPower** is NOT automatically changed.
	  • **<50**, all masking is removed. All channels are re-enabled. **txPower** is NOT automatically changed.

24.11. radioMaxRepeaters

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

radioMaxRepeaters	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.radioMaxRepeaters=n` **Note**: Where `n` is the number of Repeater slots in the network.
Web Interface window	Radio Max Repeaters 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. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	0 (zero)
Options	• 0 (zero) • 1 • 2 • 3

radioMaxRepeaters	
Setting	**Description**

Description	The **radioSettings.radioMaxRepeaters** setting designates the maximum Repeater slots in the network when the `radiosettings.radioHoppingMode=Hopping_On`.
	
	Note: The Endpoint radios obtain this value from a Gateway with the same **networkId** via the beacon frame.
	
	• The **radioSettings.radioMaxRepeaters** is set on the network Gateway device and the Gateway beacon carries this information.
	• If `radioSettings.radioMaxRepeaters=0`:
	  • Set the value to `0 (zero)` when there are no Endpoint-Repeaters or when `radiosettings.radioHoppingMode=Hopping_Off`.
	• If `radioSettings.radioMaxRepeaters=n`:
	  • 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 `radiosettings.radioHoppingMode=Hopping_On`.
	
	Note: Setting this value too high adds unnecessary latency to the network.
	
	Communication Method
	
	ZumLink uses Listen Before Talk (LBT) and Carrier Sense Multiple Access (CSMA) where there are no assigned slots. The radios transmit when the channel is clear.
	
	• The Gateway broadcasts packets to all Endpoints within range.
	• The Endpoints unicast packets back to the Gateway.
	• The Gateway acknowledges the Endpoint 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.

24.12. radioMode

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

radioMode	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.radioMode=Gateway` • `radioSettings.radioMode=Endpoint` • `radioSettings.radioMode=Gateway_Repeater` • `radioSettings.radioMode=Endpoint_Repeater`
Web Interface window	Radio Mode 1. Click the **Radio Mode** list box arrow and select the device type to designate the Z9-P / Z9-PE / Z9-PE-GREY as. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	Endpoint
Options	• Endpoint • Endpoint-Repeater • Gateway • Gateway-Repeater

radioMode	
Setting	**Description**

Description	The **radioSettings.radioMode** setting designates the device type.
	Notes
	• Each network can have only ONE Gateway or Gateway-Repeater device.
	  • See Repeaters (on page 164) for additional information.
	• The remaining devices MUST BE configured as Endpoints or Endpoint-Repeaters.
	• The Gateway or Gateway-Repeater device **ALWAYS** has a **nodeId** of value 1. It cannot be changed.
	• The Endpoint or Endpoint-Repeater **nodeId** values are 2 through 65535.
	• A Gateway **is required** when the `radiosettings.radioHoppingMode=Hopping_On`.
	• A Gateway **is NOT required** when the `radiosettings.radioHoppingMode=Hopping_Off`.
	• The Gateway-Repeater repeats packets.
	• The Endpoint-Repeater has a unique **nodeId** and repeats packets and master beacons.
	  • See Repeaters (on page 164) for additional information.

24.13. radioRepeaterSlot

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

radioRepeaterSlot	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	`radioSettings.radioRepeaterSlot=n` **Note**: Where `n` is the Repeater slot.

radioRepeaterSlot	
Setting	**Description**
Web Interface window	Radio Repeater Slot 1. In the **Radio Repeater Slot** text box, enter which repeater slot the Endpoint-Repeater uses. 2. Click the **Update** button to save the change. **Note**: The **Radio Repeater Slot** parameter is only visible when the Z9-P / Z9-PE / Z9-PE-GREY is designated as an Endpoint-Repeater. See the Radio Settings window (on page 363) for the parameter location.
Default Setting	1
Options	• 1 • 2 • 3
Description	The **radioSettings.radioRepeaterSlot** setting designates which repeater slot, up to the radioMaxRepeaters setting, the Endpoint-Repeater uses. **Important!**: This setting is only available when `radioSettings.radioMode=Endpoint_Repeater`. **Notes** • 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 radioMaxRepeaters (on page 277) setting.

24.14. rfDataRate

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

rfDataRate	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]

rfDataRate	
Setting	**Description**
CLI Command	• `radioSettings.rfDataRate=RATE_4M` • `radioSettings.rfDataRate=RATE_1M` • `radioSettings.rfDataRate=RATE_1.5M_BETA_FEATURE` • `radioSettings.rfDataRate=RATE_500K` • `radioSettings.rfDataRate=RATE_250K` • `radioSettings.rfDataRate=RATE_115.2K`
Web Interface window	RF Data Rate 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. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	RATE_500K
Options	• RATE_4M (4Mbps mode) • RATE_1M (1Mbps mode) • RATE_1.5M_BETA_FEATURE (1.5Mbps mode) • RATE_500K (500 kbps mode) • RATE_250K (250 kbps mode) • RATE_115.2K (115.2 kbps mode)

rfDataRate	
Setting	**Description**

Description	The **radioSettings.rfDataRate** setting designates the RF link data rate in bits per second.
	Notes
	• All radios in the network **MUST** use the same value for this setting.
	• 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.,`rfDataRate=RATE_115.2K` to `rfDataRate=RATE_1M`), the radioFrequency (on page 273) may be set back to the default if the frequency would have been out of band.
	• When selecting data rates of either `rfDataRate=RATE_115.2K` or `rfDataRate=RATE_250K`, **radioSettings.radioHoppingMode** is automatically forced to `radiosettings.radioHoppingMode=Hopping_On` and **cannot** be turned off.
	• For all other data rates, the **radioSettings.radioHoppingMode** remains at its current setting.
	Important!: Special rules must be applied for the 115.2 and 250 kbps data rates to enforce regulatory rules.
	• If the `radioSettings.rfDataRate=RATE_250K`:
	  • If the number of hopping channels in the hop table is:
	  • **>=50**, the maximum **txPower** is 30dBm and the **txPower** is NOT automatically changed.
	  • **>=25 and <=49**, the maximum **txPower** is 24dBm and the **txPower** is automatically reduced to 24dBm.
	  • **<25**, all masking is removed. All channels contained in the hop table are re-enabled. **txPower** is NOT automatically changed.
	• If the `radioSettings.rfDataRate=RATE_115.2K`:
	  • If the number of hopping channels in the hop table is:
	  • **>=50**, the maximum **txPower** is 30dBm and the **txPower** is NOT automatically changed.
	  • **<50**, all masking is removed. All channels are re-enabled. **txPower** is NOT automatically changed.
	• A minimum of 3 hopping channels are supported when **radioSettings.rfDataRate** =`RATE_4M`, `RATE_1M`, and `RATE_500K`.

rfDataRate	
Setting	**Description**
	FREEWAVE Recommends: Use a single **radioSettings.radioFrequency** if **radiosettings.radioHoppingMode=Hopping_Off**. **Caution**: The **RATE_1.5M_BETA_FEATURE** data rate is a Beta feature NOT recommended for production deployment.

24.15. txPower

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

txPower	
Setting	**Description**
CLI / Web Page	[Page=radioSettings]
CLI Command	• `radioSettings.txPower=nn` • `txPower=nn` **Note**: Where `nn` is the RF output transmit power. **Important!**: Entering a decimal value changes the **txpower** to 0 (zero). **FREEWAVE Recommends**: Use whole numbers only.
Web Interface window	TX Power 1. Click the **Tx Power** list box arrow and select the dB RF output transmit power level for the Z9-P / Z9-PE / Z9-PE-GREY. 2. Click the **Update** button to save the change. **Note**: See the Radio Settings window (on page 363) for the parameter location.
Default Setting	• 30
Options	• The minimum value is 10. • The maximum value is 30.

txPower	
Setting	**Description**
Description	The **radioSettings.txPower** setting designates the dB RF output transmit power for the Z9-P / Z9-PE / Z9-PE-GREY. **Notes** • 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`. • See frequencyMasks (on page 267) for additional details.  Entering **txpower=0** or **radiosettings.txpower=0** changes the output power to the minimum or 10 dB.

25. radioSettingsHelpers Parameters

Note: See the Radio Settings Helpers window (on page 366).

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. frequencyMasksErrors

frequencyMasksErrors	
Setting	**Description**
CLI / Web Page	[Page=radioSettingsHelpers]
CLI Command	• `radioSettingsHelpers.frequencyMasksErrors` • `frequencyMasksErrors`
Web Interface window	Frequency Masks Errors **Note**: This parameter is read-only in the Web Interface. See the Radio Settings Helpers window (on page 366) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **radioSettingsHelpers.frequencyMasksErrors** command reports the results of any errors in the frequency mask. **Note**: This is a Read-only parameter.

25.2. rCli

Important!: FreeWave internal use only.

25.3. resetRadio

Important!: FreeWave internal use only.

25.4. setAllRadioSettings

Important!: FreeWave internal use only.

25.5. syncSettingsFromRadio

Important!: FreeWave internal use only.

26. runtimeEnvironment Parameters

Note: See the Runtime Environment window (on page 368).

- rteInstalledByAppsVersion (on page 290)
- rteReset (on page 290)
- rteTemplateVersion (on page 291)
- rteVersion (on page 292)

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. rteInstalledByAppsVersion

rteInstalledByAppsVersion	
Setting	**Description**
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	• `runtimeEnvironment.rteInstalledByAppsVersion` • `rteInstalledByAppsVersion`
Web Interface window	Rte Installed by Apps Version **Note**: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 368) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **runtimeEnvironment.rteInstalledByAppsVersion** command reports the version number of the firmware used to install the ZumIQ runtime application environment. **Important!**: The firmware that installed the ZumIQ runtime application environment may have a different version than the application environment itself. **Note**: This is a Read-only parameter.

26.2. rteReset

rteReset	
Setting	**Description**
CLI / Web Page	[Page=runtimeEnvironment]

CLI Command	• `runtimeEnvironment.rteReset=Cancel`
	  • `rteReset=Cancel`
	• `runtimeEnvironment.rteReset=Hard`
	  • `rteReset=Hard`
	• `runtimeEnvironment.rteReset=Now`
	  • `rteReset=Now`

rteReset	
Setting	**Description**
Web Interface window	Rte Reset **Note**: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 368) for the parameter location.
Default Setting	N/A
Options	• Cancel • Hard • Now

Description	The **runtimeEnvironment.rteReset** setting designates the upgrade or reset of the ZumIQ runtime application environment.
	• `runtimeEnvironment.rteReset=Cancel` is used to REMOVE the `rteReset=Hard` command BEFORE the next boot of the Z9-P / Z9-PE / Z9-PE-GREY.
	• `runtimeEnvironment.rteReset=Hard` is used to completely reset the file system of the runtime application environment to match the latest installed developer user package.
	• 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.
	Warning! ALL User-generated content and settings in ZumIQ ARE DELETED after the next reboot!
	• `runtimeEnvironment.rteReset=Now`
	  • This reboots the Z9-P / Z9-PE / Z9-PE-GREY and copies the Linux application environment into the runtime location.
	  This will take ~3-4 minutes to complete.

26.3. rteTemplateVersion

rteTemplateVersion	
Setting	**Description**
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	• `runtimeEnvironment.rteTemplateVersion` • `rteTemplateVersion`

rteTemplateVersion	
Setting	**Description**
Web Interface window	Rte Template Version **Note**: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 368) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **runtimeEnvironment.rteTemplateVersion** command reports the version number for the template ZumIQ application environment. This is the application environment applied when executing the **rteReset=hard** command. **Note**: See rteReset (on page 290) for additional information. **Note**: This is a Read-only parameter.

26.4. rteVersion

rteVersion	
Setting	**Description**
CLI / Web Page	[Page=runtimeEnvironment]
CLI Command	• runtimeEnvironment.rteVersion • rteVersion
Web Interface window	Rte Version **Note**: This parameter is read-only in the Web Interface. See the Runtime Environment window (on page 368) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **runtimeEnvironment.rteVersion** command reports the version number for the active ZumIQ application environment **Note**: If this setting is blank, the application environment has not yet been initialized. **Note**: This is a Read-only parameter.

27. security Parameters

Note: See the Security window (on page 370).

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. enableEthernetLogin

enableEthernetLogin	
Setting	**Description**
CLI / Web Page	[Page=security]

CLI Command	• **Enable**:
	  • `security.enableEthernetLogin=true`
	• **Disable**:
	  • `security.enableEthernetLogin=false`

Web Interface window	Enable Ethernet Login 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. **Note**: By default, the **Enable Ethernet Login** is enabled (set to True). See the Security window (on page 370) for the parameter location.
Default Setting	True
Options	• True • False
Description	The **security.enableEthernetLogin** setting enables SSH logins. • When **Disabled**, the device no longer responds to SSH connection requests. • This setting also disables any SSH-based services, such as SCP. **Important!**: This parameter does NOT affect website logins. This setting **requires** a reboot to apply the changes, either by executing the **`config.reset=now`** CLI command or power cycling the Z9-P / Z9-PE / Z9-PE-GREY. See reset (on page 206) for additional information.

27.2. enablePtpInterface

enablePtpInterface	
Setting	**Description**
CLI / Web Page	[Page=security]

enablePtpInterface	
Setting	**Description**

CLI Command	• **Enable**:
	  • `security.enablePtpInterface=true`
	• **Disable**:
	  • `security.enablePtpInterface=false`

Web Interface window	Ethernet PTP Interface 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. **Note**: By default, the **Ethernet PTP Interface** is enabled (set to True). See the Security window (on page 370) for the parameter location.
Default Setting	True
Options	• True • False
Description	The **security.enablePtpInterface** setting enables the PTP (drag-and-drop) interface. When **Disabled**, the Z9-P / Z9-PE / Z9-PE-GREY no longer appears in Windows® Explorer as **ZumLink <serialnumber>** when connected to a computer using the Micro-USB cable. **Important!**: The **security.enablePtpInterface** setting does NOT disable serial connections through the Micro-USB cable. This setting **requires** a reboot to apply the changes, either by executing the **`config.reset=now`** CLI command or power cycling the Z9-P / Z9-PE / Z9-PE-GREY. See reset (on page 206) for additional information.

28. services Parameters

Note: See the Services window (on page 372).

- timeOutCli (on page 297)

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. timeOutCli

timeOutCli	
Setting	**Description**
CLI / Web Page	[Page=services]
CLI Command	• `services.timeOutCli=nnnn` • `timeOutCli=nnnn` **Note**: Where `nnnn` is the number of seconds of idle time.
Web Interface window	Time Out CLI 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. **Note**: See the Services window (on page 372) for the parameter location.
Default Setting	900
Options	**FREEWAVE Recommends**: Enter any number between 60 and 3600.
Description	The **services.timeOutCli** setting designates the number of seconds of idle time before the CLI connection is closed. **Warning!** DO NOT enter 0 (zero). 0 disables the timeout.

29. SNMP Parameters

Note: See the SNMP window (on page 374).

- roCommunityName (on page 299)
- rwCommunityName (on page 299)
- snmpUser (on page 300)
- v1Enabled (on page 301)
- v2cEnabled (on page 302)
- v3Enabled (on page 302)

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. roCommunityName

roCommunityName	
Setting	**Description**
CLI / Web Page	[Page=SNMP]
CLI Command	• `snmp.roCommunityName=enter_unique_name_here` • `roCommunityName=enter_unique_name_here` **Note**: Where `enter_unique_name_here` is a user-designated name.
Web Interface window	RO Community Name 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. **Note**: See the SNMP window (on page 374) for the parameter location.
Default Setting	public
Options	Maximum of 31 characters.
Description	The **snmp.roCommunityName** setting designates the user-designated name for SNMP V1/V2C read-only access. **Important!**: Special characters are allowed EXCEPT # but they **may not** be compatible with 3rd-party SNMP managers.

29.2. rwCommunityName

rwCommunityName	
Setting	**Description**
CLI / Web Page	[Page=SNMP]
CLI Command	• `snmp.rwCommunityName=enter_unique_name_here` • `rwCommunityName=enter_unique_name_here` **Note**: Where `enter_unique_name_here` is a user-designated name.

rwCommunityName	
Setting	**Description**
Web Interface window	RW Community Name 1. In the **RW Community Name** text box, enter the user-designated name for SNMP V1/V2C Read-Write access. 2. Click the **Update** button to save the change. **Note**: See the SNMP window (on page 374) for the parameter location.
Default Setting	private
Options	Maximum of 31 characters.
Description	The **snmp.rwCommunityName** setting designates the user-designated name for SNMP V1/V2C Read-Write access. **Important!**: Special characters are allowed EXCEPT # but they **may not** be compatible with 3rd-party SNMP managers.

29.3. snmpUser

snmpUser	
Setting	**Description**
CLI / Web Page	[Page=SNMP]

CLI Command	• **View All Users**:
	  • `snmpUser=show`
	• **Remove User**:
	  • `snmpUser=remove <username>`
	• **Add User****:
	  • `snmpUser=add <username>`
	• **Modify User****:
	  • `snmpUser=modify <username>`

Web Interface window	SNMP User **Note**: This parameter is read-only in the Web Interface. See the SNMP window (on page 374) for the parameter location.
Default Setting	Blank

snmpUser	
Setting	**Description**
Options	**Add or **Modify** access authorization options are: • <AES> <Encryption Passphrase> • <DES> <Encryption Passphrase> • <MD5> <Authentication Passphrase> • <ReadOnly> • <ReadWrite> • <SHA> <Authentication Passphrase>
Description	The **snmp.snmpUser** setting manages the SNMP V3 users. **Example**: `snmpUser=add <username> <AES> <Encryption Passphrase>`. `snmpUser=modify <username> <ReadWrite>` **Important!**: The Passphrase requires a minimum of 8 characters.

29.4. v1Enabled

v1Enabled	
Setting	**Description**
CLI / Web Page	[Page=SNMP]

CLI Command	• **Enable SNMP V1**:
	  • `snmp.v1Enabled=true`
	• **Disable SNMP V1**:
	  • `snmp.v1Enabled=false`

Web Interface window	V1 Enabled 1. Click the **V1 Enabled** list box arrow and select **True** to enable SNMP V1. 2. Click the **Update** button to save the change. **Note**: By default, the **v1 Enabled** is NOT enabled (set to False). See the SNMP window (on page 374) for the parameter location.
Default Setting	False
Options	• True • False
Description	The **snmp.v1Enabled** setting enables SNMP V1.

29.5. v2cEnabled

v2cEnabled	
Setting	**Description**
CLI / Web Page	[Page=SNMP]

CLI Command	• **Enable SNMP V2C**:
	  • `snmp.v2cEnabled=true`
	• **Disable SNMP V2C**:
	  • `snmp.v2cEnabled=false`

Web Interface window	V2C Enabled 1. Click the **V2C Enabled** list box arrow and select **True** to enable SNMP V2C. 2. Click the **Update** button to save the change. **Note**: By default, the **v2c Enabled** is NOT enabled (set to False). See the SNMP window (on page 374) for the parameter location.
Default Setting	False
Options	• True • False
Description	The **snmp.v2cEnabled** setting enables SNMP V2C.

29.6. v3Enabled

v3Enabled	
Setting	**Description**
CLI / Web Page	[Page=SNMP]

CLI Command	• **Enable SNMP V3**:
	  • `snmp.v3Enabled=true`
	• **Disable SNMP V3**:
	  • `snmp.v3Enabled=false`

Web Interface window	V3 Enabled 1. Click the **V3 Enabled** list box arrow and select **True** to enable SNMP V3. 2. Click the **Update** button to save the change. **Note**: By default, the **v3 Enabled** is NOT enabled (set to False). See the SNMP window (on page 374) for the parameter location.

v3Enabled	
Setting	**Description**
Default Setting	False
Options	• True • False
Description	The **snmp.v3Enabled** setting enables SNMP V3.

30. system Parameters

Important!: The [Page=system] parameters are only available in the CLI window.
See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.

Note: See the System Info window (on page 376).

- dump (on page 305)
- dumpConfig
- dumpFormat (on page 305)
- dumpPage (on page 306)
- dumpTag (on page 307)
- filter (on page 307)
- help (on page 308)
- login (on page 308)
- logout (on page 308)
- modbusLayout (on page 309)
- pages (on page 309)
- password (on page 309)
- passwordRestoreDefaults (on page 310)
- showLayout (on page 311)
- tags (on page 311)
- whoami (on page 311)

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. dump

dump	
Setting	**Description**
CLI / Web Page	[Page=system]
CLI Command	• system.dump • dump
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **system.dump** command reports all of the device configuration and status values using the format specified in dumpFormat (on page 305). **Note**: This is a Read-only parameter.

30.2. dumpFormat

dumpFormat	
Setting	**Description**
CLI / Web Page	[Page=system]

CLI Command	• 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	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A

Description	The **system.dumpFormat** setting designates the format of the output of commands and setting changes.
	• **dumpFormat Short**
	  • The **Short** setting shows the page name in a header row, then each setting indented with its value.
	  • This is the default format.
	• **dumpFormat Full**
	  • The **Long** setting shows each setting with its fully-qualified name and value (page.setting=value).
	• **dumpFormat Verbose**
	  • The **Verbose** setting shows:
	  the fully-quailifed name and value (the same as the **dumpFormat Long**) and
	  the header row (the same as the **dumpFormat Short**).
	• **dumpFormat Result**
	  • The Result setting is identical to "dumpFormat Full".
	• **dumpFormat Json**
	  • The Json setting shows the output results in JavaScript Object Notation (Json).
	Example: Enter `dumpPage=SNMP` to show the SNMP settings.

30.3. dumpPage

dumpPage	
Setting	**Description**
CLI / Web Page	[Page=system]

dumpPage	
Setting	**Description**
CLI Command	• `system.dumpPage=enter_page_name_here` • `dumpPage=enter_page_name_here` **Note**: Where `enter_page_name_here` is a CLI page.
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **system.dumpPage** command reports all device configuration and status values for the specified page, using the format specified in dumpFormat (on page 305). **Example**: Enter **`dumpPage=SNMP`** to show the SNMP settings. **Note**: This is a Read-only parameter.

30.4. dumpTag

Important!: FreeWave internal use only.

30.5. dumpTopic

Important!: FreeWave internal use only.

30.6. filter

Important!: FreeWave internal use only.

30.7. help

help	
Setting	**Description**
CLI / Web Page	[Page=system]
CLI Command	• `system.help` • `help` • `help <parameter>` • to see help for a specific parameter
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **system.help** command lists the **help.txt** file. **Important!**: Help information is only available for active parameters. **Example**: If the **ZumLink** is designated as a gateway, the Help information for **radioSettings.nodeId** is not provided since the **nodeId** parameter cannot be changed.

30.8. login

Important!: FreeWave internal use only.

30.9. logout

logout	
Setting	**Description**
CLI / Web Page	[Page=system]
CLI Command	`logout` **Note**: Where `enter_page_name_here` is a CLI page.

logout	
Setting	**Description**
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **logout** command logs out of the CLI session.

30.10. modbusLayout

Important!: FreeWave internal use only.

30.11. pages

pages	
Setting	**Description**
CLI / Web Page	[Page=system]
CLI Command	• `system.pages` • `pages`
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
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 / Z9-PE / Z9-PE-GREY.

30.12. password

password	
Setting	**Description**
CLI / Web Page	[Page=system]

password	
Setting	**Description**
CLI Command	`system.password=[oldpassword],[newpassword],[newpassword]`
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **system.password** setting designates the password. **Important!**: Must be logged in to the Z9-P / Z9-PE / Z9-PE-GREY. **Example**: The default password is **admin**. The CLI to change this is: **system.password=admin,NewPasswrd123,NewPasswrd123**. **Note**: An error message appears when there is an error in typing the new password command.

30.13. passwordRestoreDefaults

passwordRestoreDefaults	
Setting	**Description**
CLI / Web Page	[Page=system]
CLI Command	• `system.passwordRestoreDefaults=now` • `passwordRestoreDefaults=now`
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	Now

passwordRestoreDefaults	
Setting	**Description**

Description	The **system.passwordRestoreDefaults** command restores all passwords back the factory default of **admin**.
	• The **system.passwordRestoreDefaults** resets both the **admin** and **devuser** account passwords to factory defaults.
	• After executing this command, the Z9-P / Z9-PE / Z9-PE-GREY must be rebooted by either:
	  • executing the **reset now** command (see reset (on page 206)) or
	  • power-cycling the Z9-P / Z9-PE / Z9-PE-GREY.

30.14. showLayout

Important!: FreeWave internal use only.

30.15. tags

Important!: FreeWave internal use only.

30.16. whoami

whoami	
Setting	**Description**
CLI / Web Page	[Page=system]
CLI Command	• `system.whoami` • `whoami`
Web Interface window	**Important!**: The [Page=system] parameters are only available in the CLI window. See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
Default Setting	N/A
Options	N/A
Description	The **system.whoami** command reports the user currently logged in. **Note**: This is a Read-only parameter.

31. systemInfo Parameters

Note: See the System Info window (on page 376).

- deviceConfiguration (on page 313)
- deviceFirmwareVersion (on page 313)
- deviceId (on page 314)
- deviceModel (on page 314)
- deviceName (on page 315)
- hopTableVersion (on page 315)
- layoutHash (on page 316)
- licenses (on page 316)
- modelCode (on page 317)
- radioFirmwareVersion (on page 318)
- radioModel (on page 318)
- radioModelCode (on page 319)
- radioSerialNumber (on page 319)
- resetInfo (on page 320)
- rteTemplateVersion (on page 320)
- rteVersion (on page 320)
- serialNumber (on page 321)

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. deviceConfiguration

deviceConfiguration	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.deviceConfiguration` • `deviceConfiguration`
Web Interface window	Device Configuration **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.deviceConfiguration** command reports the device configuration of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.2. deviceFirmwareVersion

deviceFirmwareVersion	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.deviceFirmwareVersion` • `deviceFirmwareVersion`
Web Interface window	Device Firmware Version **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.deviceFirmwareVersion** command reports the device firmware version of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.3. deviceId

deviceId	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.deviceId=nnnn` • `deviceId` **Note**: Where `nnnn` is a user-designated device ID.
Web Interface window	Device ID 1. In the **Device ID** text box, enter the user-defined Device ID identifier for the Z9-P / Z9-PE / Z9-PE-GREY. 2. Click the **Update** button to save the change. **Note**: See the System Info window (on page 376) for the parameter location.
Default Setting	1
Options	N/A
Description	• The **systemInfo.deviceId** setting designates the Device Identifier selected for the Z9-P / Z9-PE / Z9-PE-GREY. • The **`systemInfo.deviceId=nnnn`** setting designates the device ID. • Where **`nnnn`** is a user-designated device ID.

31.4. deviceModel

deviceModel	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.deviceModel` • `deviceModel`
Web Interface window	Device Model **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A

deviceModel	
Setting	**Description**
Description	The **systemInfo.deviceModel** command reports the device model. **Note**: This is a Read-only parameter.

31.5. deviceName

deviceName	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.deviceName=nnnn` • `deviceName` **Note**: Where `nnnn` is the user-defined name for the Z9-P / Z9-PE / Z9-PE-GREY.
Web Interface window	Device Name 1. In the **Device Name** text box, enter the user-defined name for the Z9-P / Z9-PE / Z9-PE-GREY. 2. Click the **Update** button to save the change. **Note**: See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.deviceName** setting designates the user-defined name for the Z9-P / Z9-PE / Z9-PE-GREY.

31.6. hopTableVersion

hopTableVersion	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.hopTableVersion` • `hopTableVersion`

hopTableVersion	
Setting	**Description**
Web Interface window	Hop Table Version **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.hopTableVersion** command reports the radio Hop Table Version of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.7. layoutHash

layoutHash	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.layoutHash` • `layoutHash`
Web Interface window	Layout Hash **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.layoutHash** command reports the Unique Layout Identifier. **Note**: This is a Read-only parameter.

31.8. licenses

licenses	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]

licenses	
Setting	**Description**
CLI Command	• `systemInfo.licenses` • `licenses`
Web Interface window	Licenses **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	None
Options	N/A
Description	The **systemInfo.licenses** command reports all of the license information. **Note**: This is a Read-only parameter.

31.9. modelCode

modelCode	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.modelCode` • `modelCode`
Web Interface window	Model Code **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.modelCode** command reports the model code of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.10. radioFirmwareVersion

radioFirmwareVersion	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.radioFirmwareVersion` • `radioFirmwareVersion`
Web Interface window	Radio Firmware Version **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.radioFirmwareVersion** command reports the radio firmware version of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.11. radioModel

radioModel	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.radioModel` • `radioModel`
Web Interface window	Radio Model **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	AMT0100AA
Options	N/A
Description	The **systemInfo.radioModel** command reports the radio model of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.12. radioModelCode

radioModelCode	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.radioModelCode` • `radioModelCode`
Web Interface window	Radio Model Code **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.radioModelCode** command reports the radio model code of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.13. radioSerialNumber

radioSerialNumber	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.radioSerialNumber` • `radioSerialNumber`
Web Interface window	Radio Serial Number **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.radioSerialNumber** command reports the radio serial number of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

31.14. resetInfo

Important!: FreeWave internal use only.

31.15. rteTemplateVersion

rteTemplateVersion	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systeminfo.rteTemplateVersion` • `rteTemplateVersion`
Web Interface window	N/A **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systeminfo.rteTemplateVersion** command reports the version number for the template ZumIQ application environment. This is the application environment applied when executing the **`rteReset=hard`** command. **Notes** • See rteReset (on page 290) for additional information. • This is a Read-only parameter.

31.16. rteVersion

rteVersion	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systeminfo.rteVersion` • `rteVersion`
Web Interface window	N/A **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A

rteVersion	
Setting	**Description**
Options	N/A
Description	The **systeminfo.rteVersion** command reports the version number for the active ZumIQ application environment. **Note**: If this setting is blank, the application environment has not yet been initialized. **Note**: This is a Read-only parameter.

31.17. serialNumber

serialNumber	
Setting	**Description**
CLI / Web Page	[Page=systemInfo]
CLI Command	• `systemInfo.serialNumber` • `serialNumber`
Web Interface window	Serial Number **Note**: This parameter is read-only in the Web Interface. See the System Info window (on page 376) for the parameter location.
Default Setting	N/A
Options	N/A
Description	The **systemInfo.serialNumber** command reports the serial number of the Z9-P / Z9-PE / Z9-PE-GREY. **Note**: This is a Read-only parameter.

32. TerminalServerRelay Parameters

Note: See the Terminal Server Relay window (on page 378).

- remote_termserv_ip_address (on page 323)
- termserv_relay_mapping (on page 323)

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. remote_termserv_ip_address

remote_termserv_ip_address	
Setting	**Description**
CLI / Web Page	[Page=TerminalServerRelay]
CLI Command	`TerminalServerRelay.remote_termserv_ip_address=nnn.nnn.nnn.nnn` **Note**: Where `nnn.nnn.nnn.nnn` is the IP address for the remote terminal server.
Web Interface window	Remote Termserv IP Address 1. In the **Remote Termserv IP Address** text box, enter the IP address for the remote terminal server. 2. Click the **Update** button to save the change. **Note**: See the Terminal Server Relay window (on page 378) for the parameter location.
Default Setting	0.0.0.0
Options	N/A
Description	• The **TerminalServerRelay.remote_termserv_ip_address=** command reports 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.

32.2. termserv_relay_mapping

termserv_relay_mapping	
Setting	**Description**
CLI / Web Page	[Page=TerminalServerRelay]

termserv_relay_mapping	
Setting	**Description**
CLI Command	• `TerminalServerRelay.termserv_relay_mapping=TERMSERV_RELAY_DISABLED` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_COM1_TO_REMOTE_COM1` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_COM2_TO_REMOTE_COM2` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_COM1` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_BOTH_COM_TO_REMOTE_COM2` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_COM1_TO_REMOTE_BOTH_COM` • `TerminalServerRelay.termserv_relay_mapping=LOCAL_COM2_TO_REMOTE_BOTH_COM`
Web Interface window	Termserv Relay Mapping 1. 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. 2. Click the **Update** button to save the change. **Note**: See the Terminal Server Relay window (on page 378) for the parameter location.
Default Setting	TERMSERV_RELAY_DISABLED

termserv_relay_mapping	
Setting	**Description**

Options	• TERMSERV_RELAY_DISABLED
	  • Data forwarding between local and remote COM ports is disabled.
	• LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM (on page 328).
	  • Data is forwarded between the local COM1 and remote COM1 or local COM2 and remote COM2 ports.
	• LOCAL_COM1_TO_REMOTE_COM1 (on page 329).
	  • Data is forwarded between the local COM1 and remote COM1 ports.
	• LOCAL_COM2_TO_REMOTE_COM2 (on page 330).
	  • Data is forwarded between the local COM2 and remote COM2 ports.
	• LOCAL_BOTH_COM_TO_REMOTE_COM1 (on page 331).
	  • Data is forwarded between the local COM1 and COM2 and remote COM1 ports.
	• LOCAL_BOTH_COM_TO_REMOTE_COM2 (on page 332).
	  • Data is forwarded between the local COM1 and COM2 and remote COM2 ports.
	• LOCAL_COM1_TO_REMOTE_BOTH_COM (on page 333).
	  • Data is forwarded between the local COM1, remote COM1, and COM2 ports.
	• LOCAL_COM2_TO_REMOTE_BOTH_COM (on page 334).
	  • Data is forwarded between the local COM2, remote COM1, and COM2 ports.

Description	The **TerminalServerRelay.termserv_relay_mapping** setting is used for the transfer of a bi-directional byte stream between two serial device servers. **Notes** • If using **Terminal Server Relay**, the TCP port numbers **must be** consistent across all involved radios. • The data relay is only supported between the terminal server on this Z9-P / Z9-PE / Z9-PE-GREY radio and the terminal server on a separate Z9-P / Z9-PE / Z9-PE-GREY radio in the same IP network. See Examples - Terminal Server Relay (on page 326). **Important!**: The **TerminalServerRelay.termserv_relay_mapping** should only be enabled on one side of the connection. **FREEWAVE Recommends**: If using the **Terminal Server Relay** setting, keep the TCP port numbers as their defaults.

33. Examples - Terminal Server Relay

33.1. Connected Terminal Servers and Terminal Server Relay

Figure 219 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.

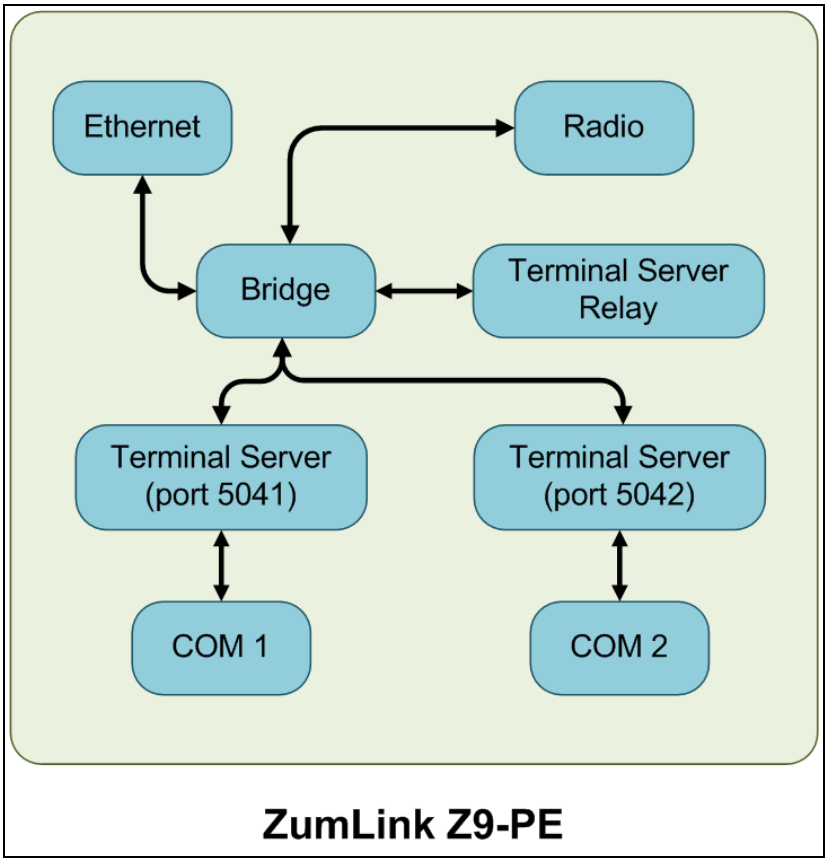


Figure 219: Terminal Servers and Terminal Server Relay (Client) Connected Together through the Bridge

33.2. LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM

Figure 220 illustrates the Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM.

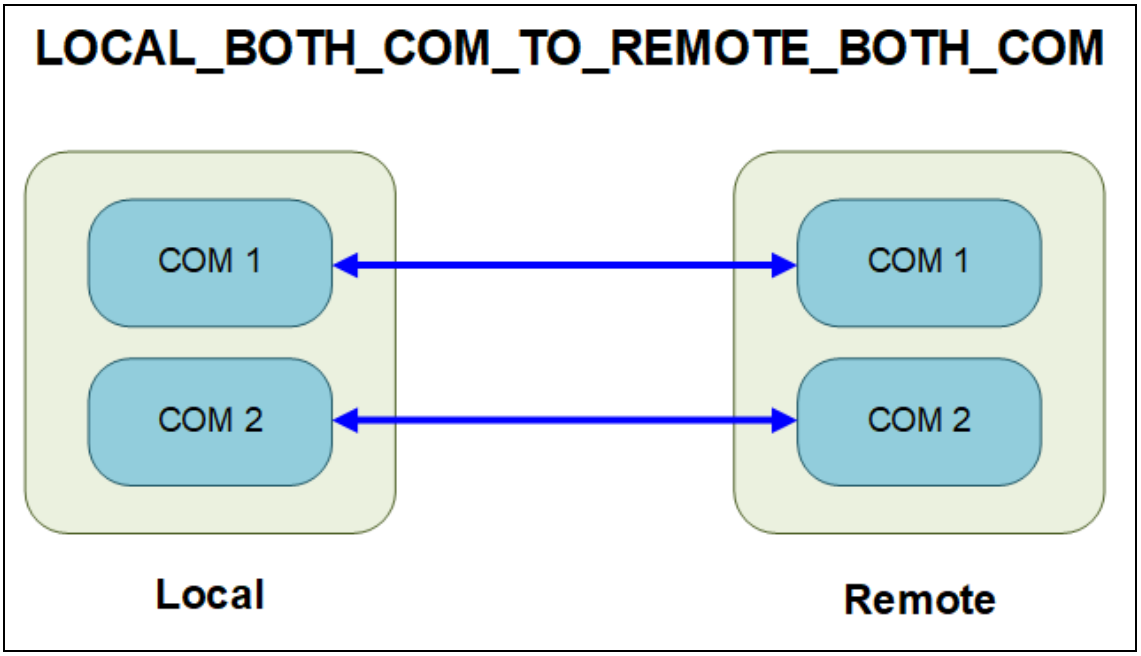


Figure 220: Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_BOTH_COM

33.3. LOCAL_COM1_TO_REMOTE_COM1

Figure 220 illustrates the Terminal Server Relay command: **LOCAL_COM1_TO_REMOTE_COM1**.

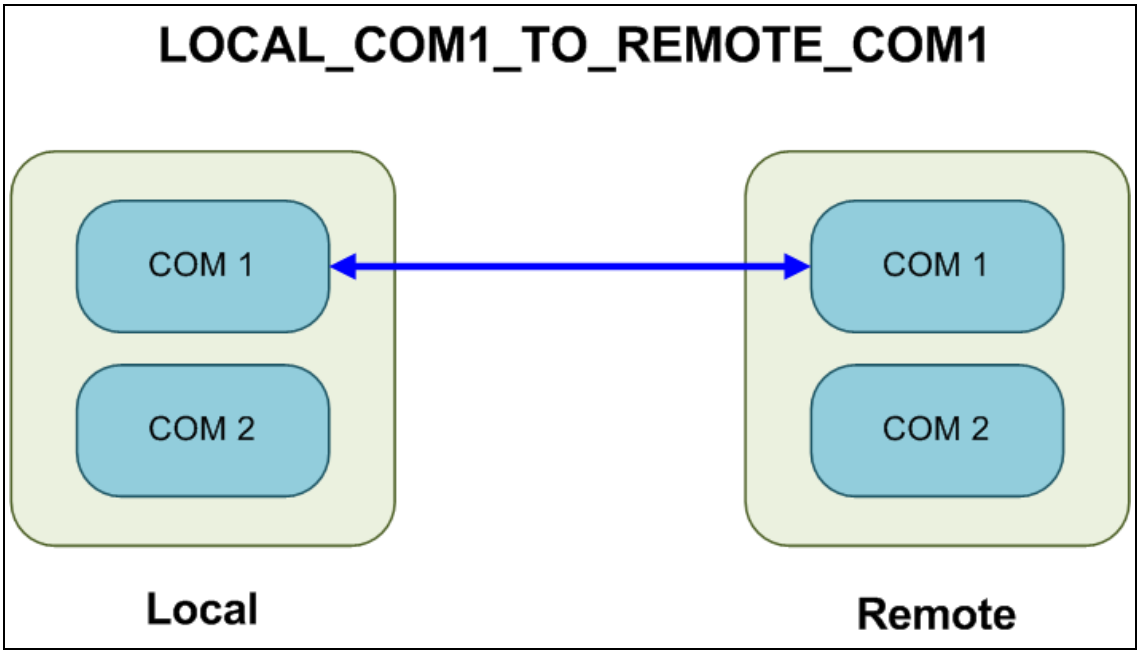


Figure 221: Terminal Server Relay command: LOCAL_COM1_TO_REMOTE_COM1

33.4. LOCAL_COM2_TO_REMOTE_COM2

Figure 220 illustrates the Terminal Server Relay command: **LOCAL_COM2_TO_REMOTE_COM2**.

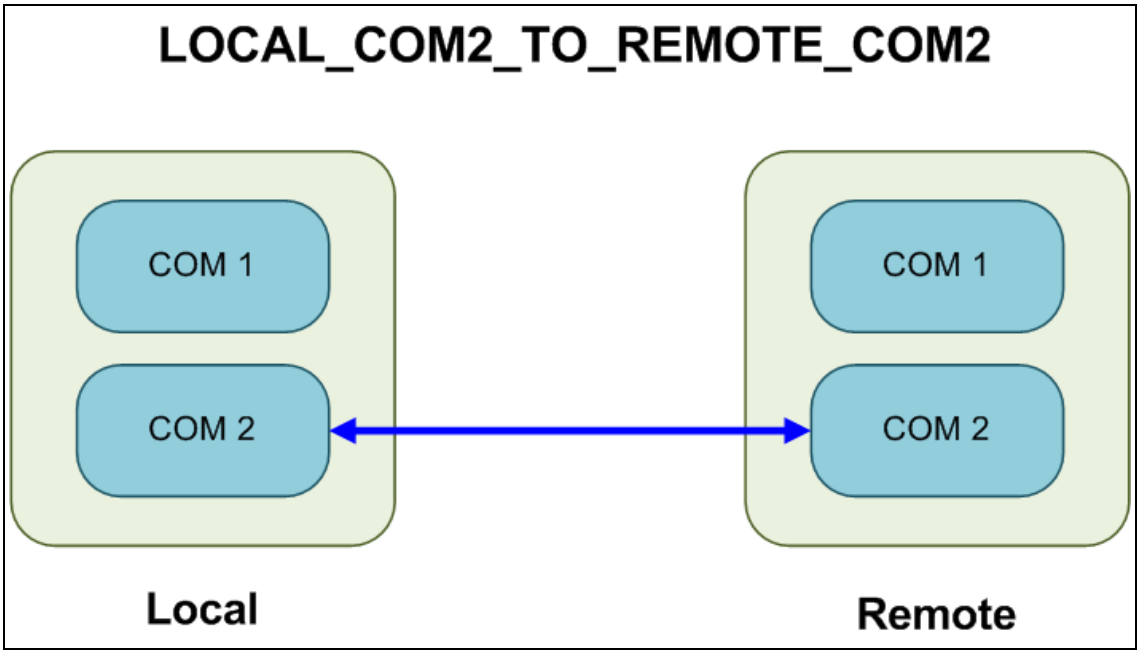


Figure 222: Terminal Server Relay command: LOCAL_COM2_TO_REMOTE_COM2

33.5. LOCAL_BOTH_COM_TO_REMOTE_COM1

Figure 220 illustrates the Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_COM1.

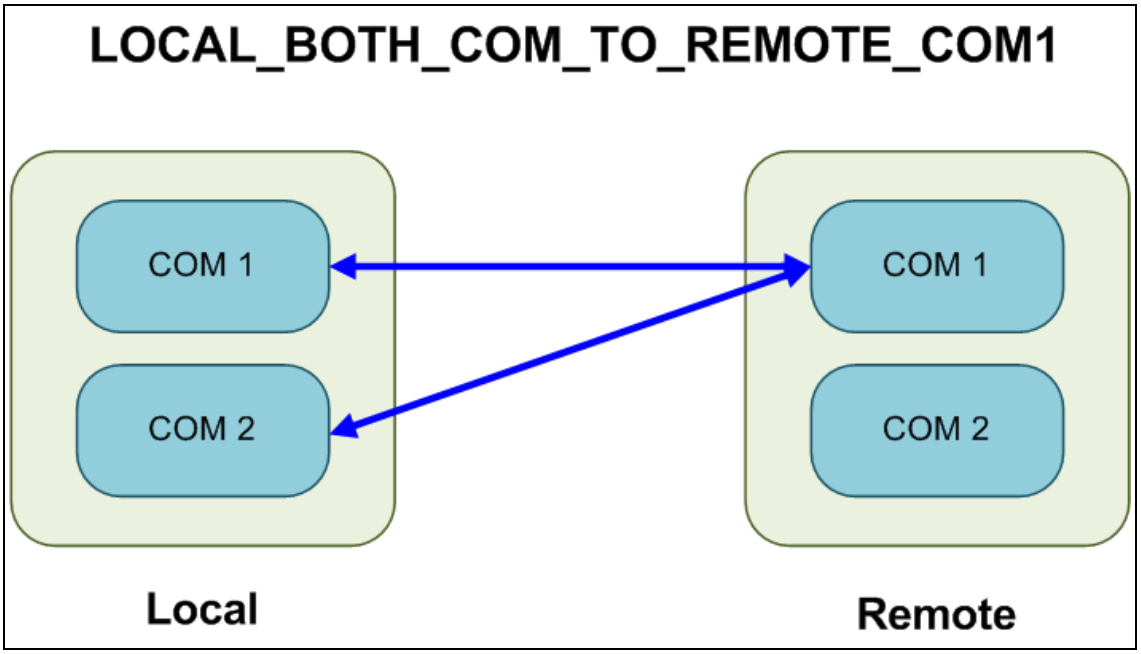


Figure 223: Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_COM1

33.6. LOCAL_BOTH_COM_TO_REMOTE_COM2

Figure 220 illustrates the Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_COM2.

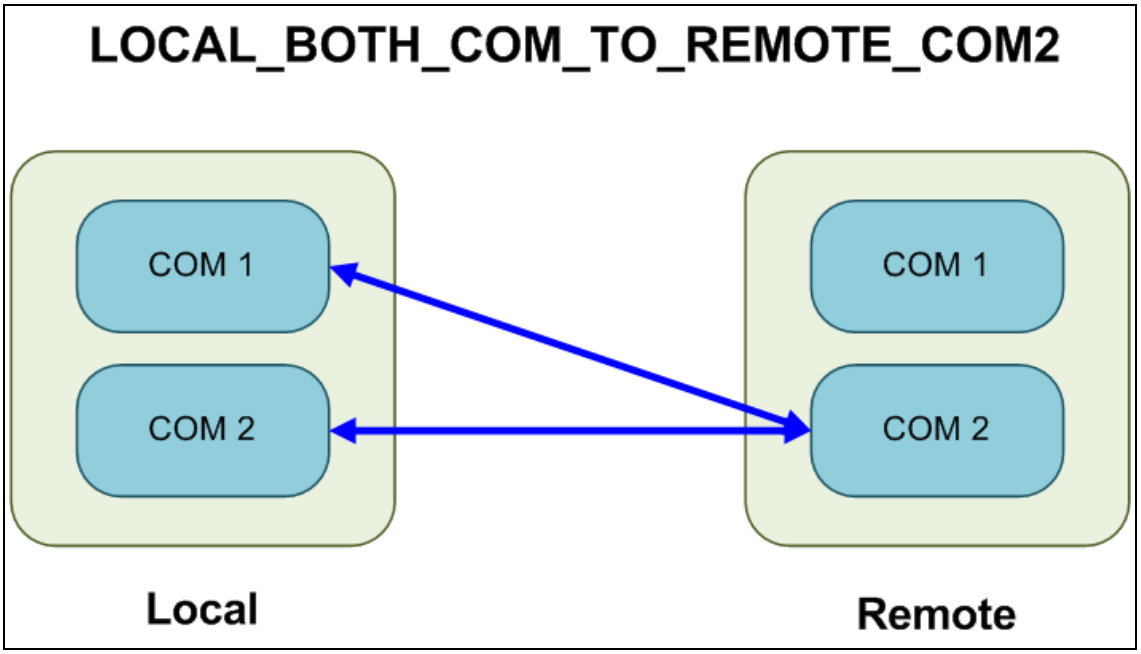


Figure 224: Terminal Server Relay command:
LOCAL_BOTH_COM_TO_REMOTE_COM2

33.7. LOCAL_COM1_TO_REMOTE_BOTH_COM

Figure 220 illustrates the Terminal Server Relay command:
LOCAL_COM1_TO_REMOTE_BOTH_COM.

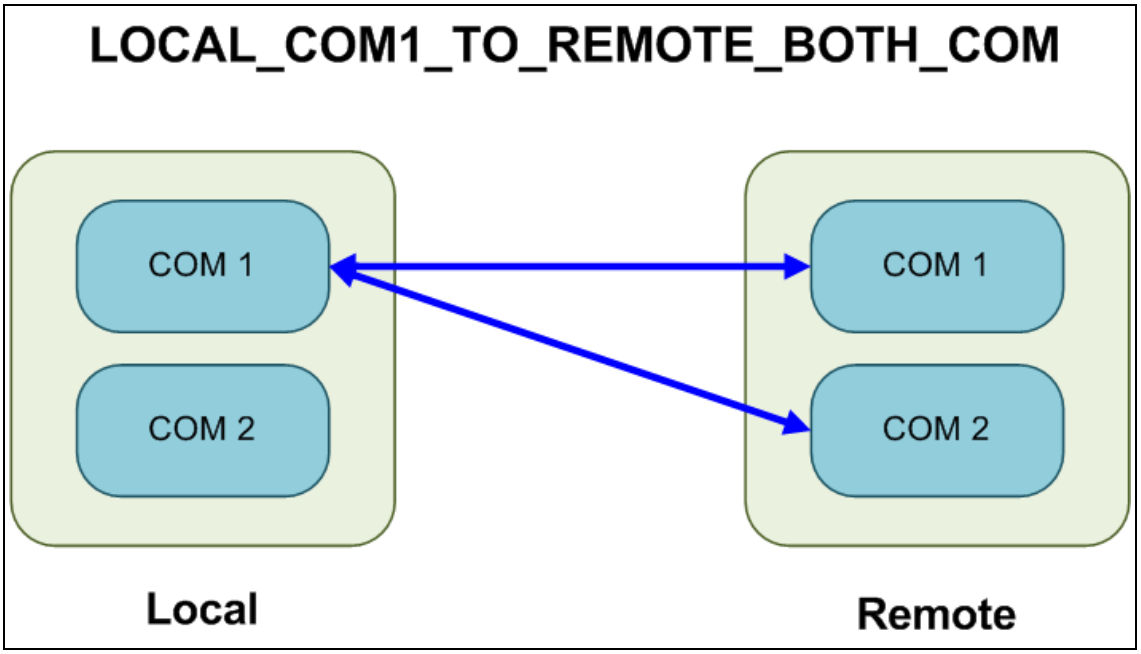


Figure 225: Terminal Server Relay command:
LOCAL_COM1_TO_REMOTE_BOTH_COM

33.8. LOCAL_COM2_TO_REMOTE_BOTH_COM

Figure 220 illustrates the Terminal Server Relay command:
LOCAL_COM2_TO_REMOTE_BOTH_COM.

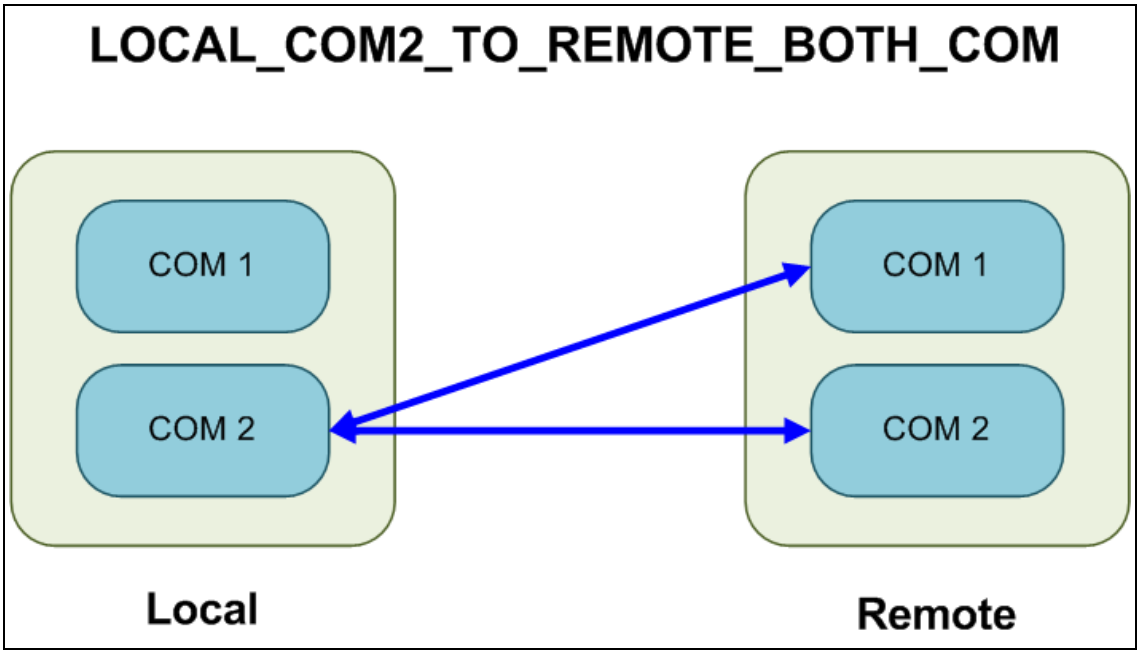


Figure 226: Terminal Server Relay command:
LOCAL_COM2_TO_REMOTE_BOTH_COM

33.9. Example: Multicast

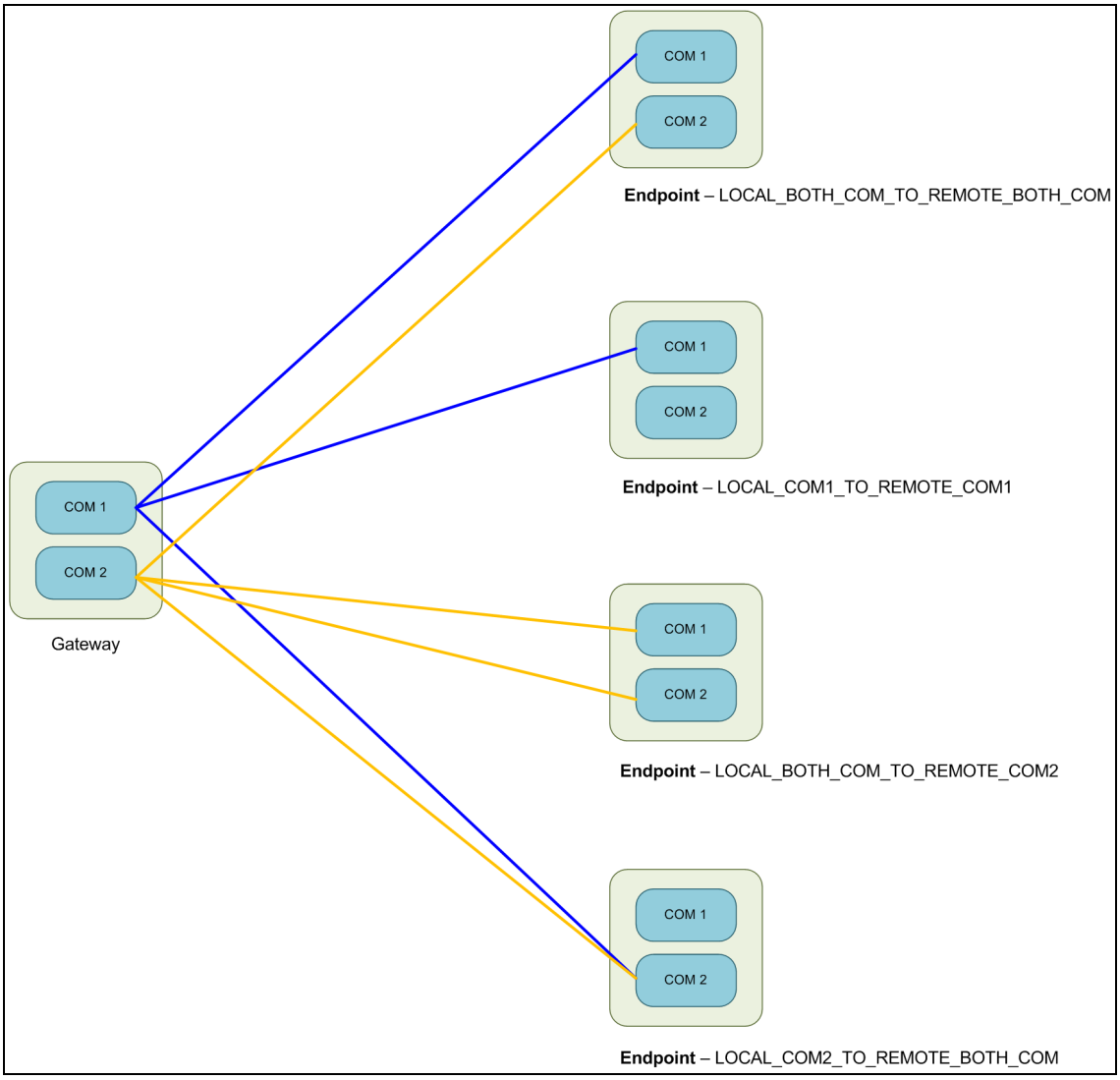


Figure 227: Example: Multicast

34. Web Interface

The available windows are:

34.1. COM window

The **COM** windows are used to read and change information about the communication settings of the Z9-P / Z9-PE / Z9-PE-GREY.

Note: See the COM Parameters (on page 191) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 228)

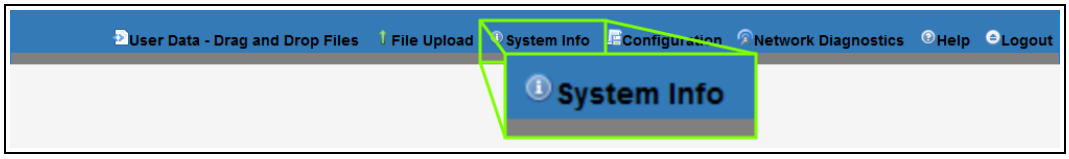


Figure 228: System Info link

   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 either the **COM1** or **COM2** tab.
   The selected COM window opens. (Figure 229)

   Note: The parameters for **COM1** and **COM2** are the same except for the **TerminalServerPort** parameter setting.
   The information in this window is read-only.
   See the COM Parameters (on page 191) for detailed information about the parameters.

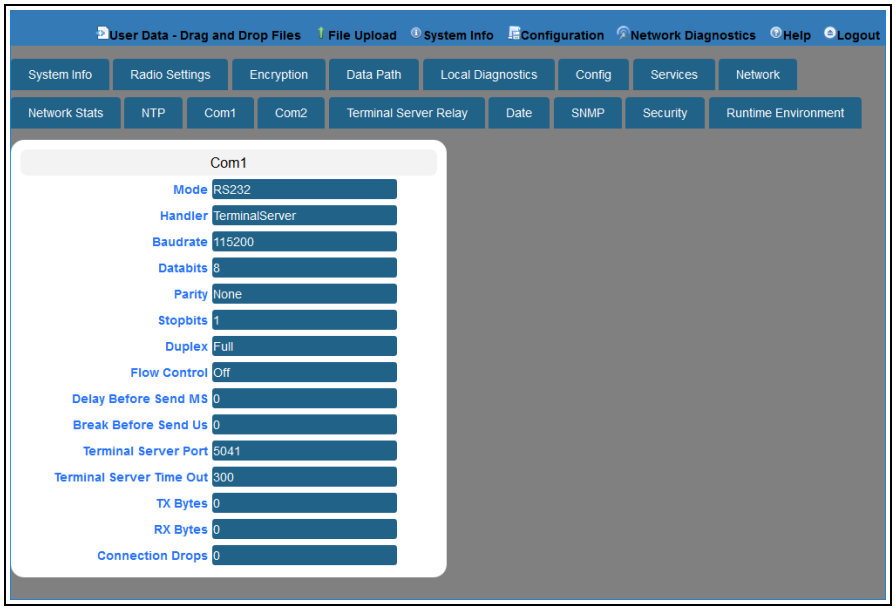


Figure 229: COM1 window

7. On the Menu bar, click the **Configuration** link to Change the COM Parameters (on page 107).

34.2. Config window

Note: See the config Parameters (on page 204) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 230)

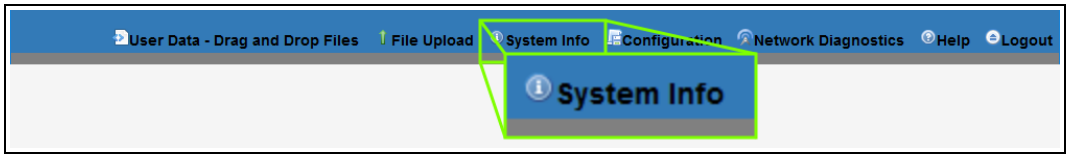


Figure 230: System Info link

   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.
   The **Config** window opens. (Figure 231)

   Important!: The information in this window is read-only.
   The parameters in this window can only be changed in the CLI.
   See the Tera Term Activation and ZumLink Setup (on page 66) procedure for CLI access.
   See the config Parameters (on page 204) for detailed information about the parameters.

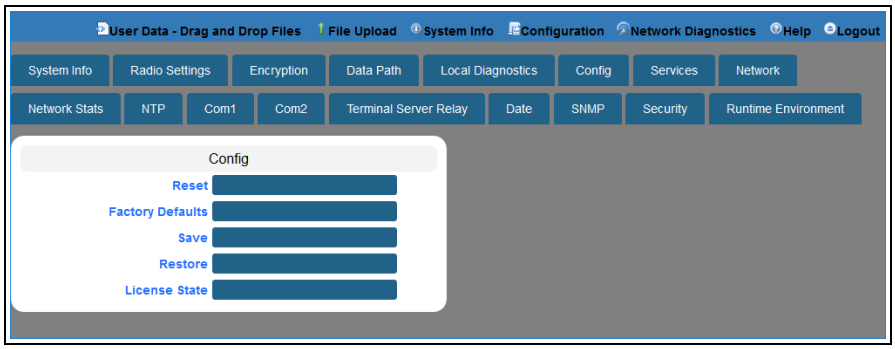


Figure 231: Config window

34.3. Data Path window

Note: See the dataPath Parameters (on page 209) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 232)

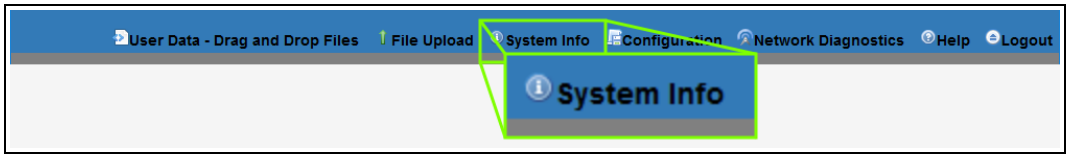


Figure 232: System Info link

   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 **Data Path** tab.
   The **Data Path** window opens. (Figure 233)

   Note: The information in this window is read-only.
   See the dataPath Parameters (on page 209) for detailed information about the parameters.

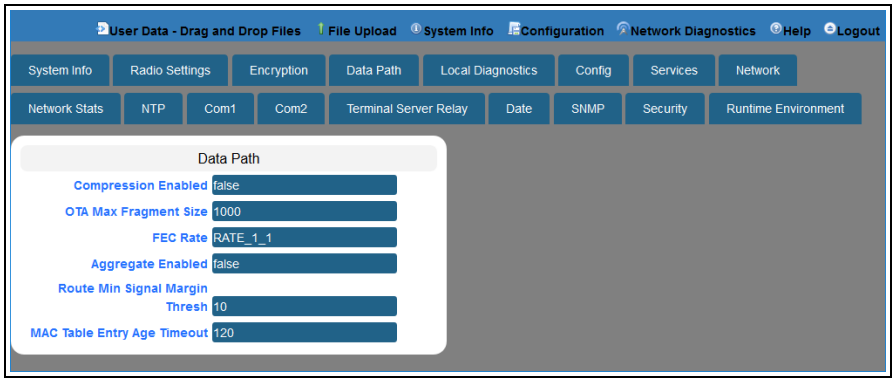


Figure 233: Data Path window

7. On the Menu bar, click the **Configuration** link to Change the Data Path Parameters (on page 111).

34.4. Date window

Note: See the date Parameters (on page 217) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 234)

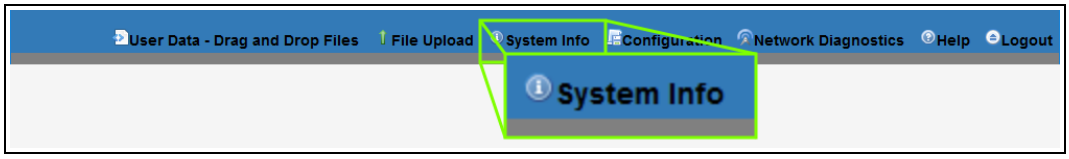


Figure 234: System Info link

   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 **Date** tab.
   The **Date** window opens. (Figure 235)

   Note: The information in this window is read-only.
   See the date Parameters (on page 217) for detailed information about the parameters.

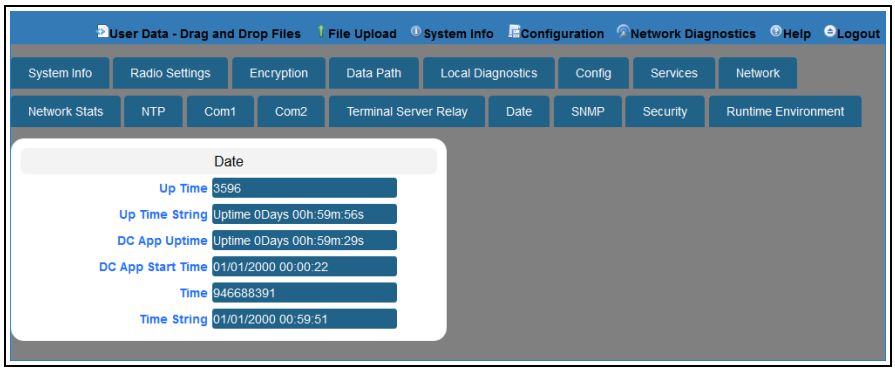


Figure 235: Date window

34.5. Encryption window

Note: See the encryption Parameters (on page 222) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 236)

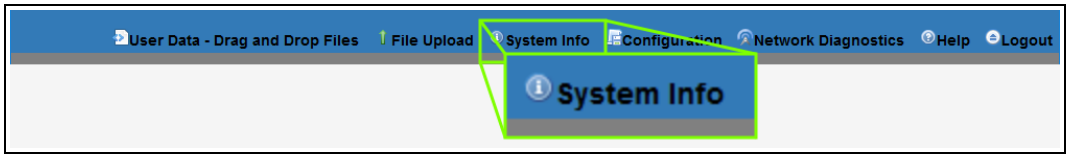


Figure 236: System Info link

   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 **Encryption** tab.
   The **Encryption** window opens. (Figure 237)

   Note: The information in this window is read-only.
   See the encryption Parameters (on page 222) for detailed information about the parameters.

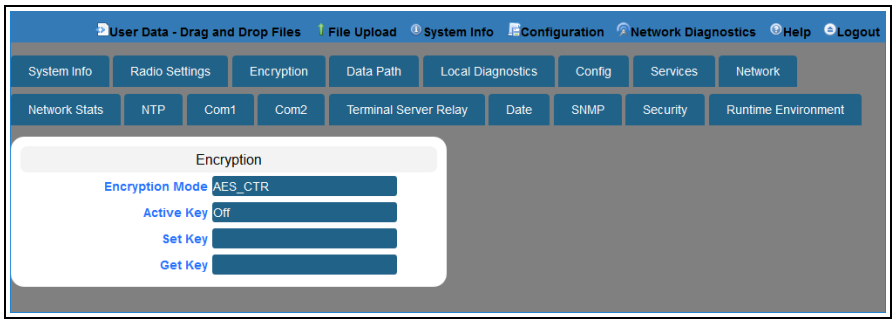


Figure 237: Encryption window

7. On the Menu bar, click the **Configuration** link to Change the Encryption Parameters (on page 114).

34.6. File Upload window

The **File Upload** window is used to search for and upload these file types into the Z9-P / Z9-PE / Z9-PE-GREY:

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 or Windows® 10 and/or Firefox®. The dialog boxes and windows appear differently on each computer.

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. On the Menu bar, click the **File Upload** link. (Figure 238)

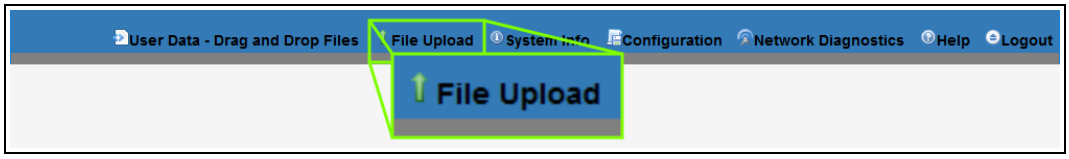


Figure 238: File Upload link

   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 239)

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

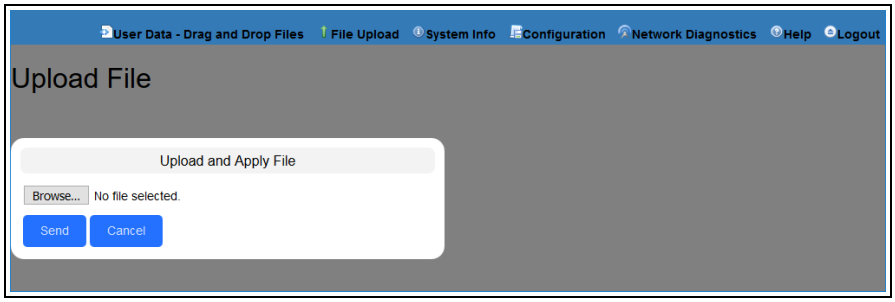


Figure 239: File Upload window

File Upload window	
Control Title	**Control Description**
Browse button	Click to open the Microsoft® **File Upload** dialog box. **Note**: The **Browse** button title is dependent on the chosen browser.
Send button	Click to start the upgrade process on the Z9-P / Z9-PE / Z9-PE-GREY.
Cancel button	Click to cancel the file transfer if already started or refresh the window and clear the selected file.

34.7. Help window

The **Help** window is used to read information about the settings of the Z9-P / Z9-PE / Z9-PE-GREY.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. On the Menu bar, click the **Help** link. (Figure 240)

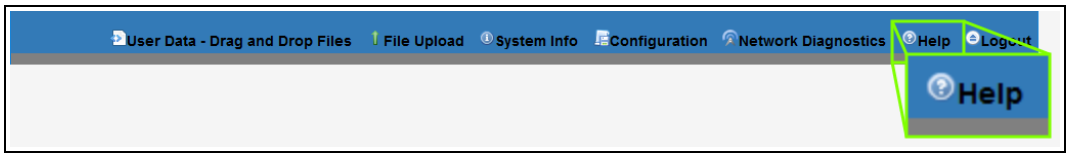


Figure 240: Help link

   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 241)

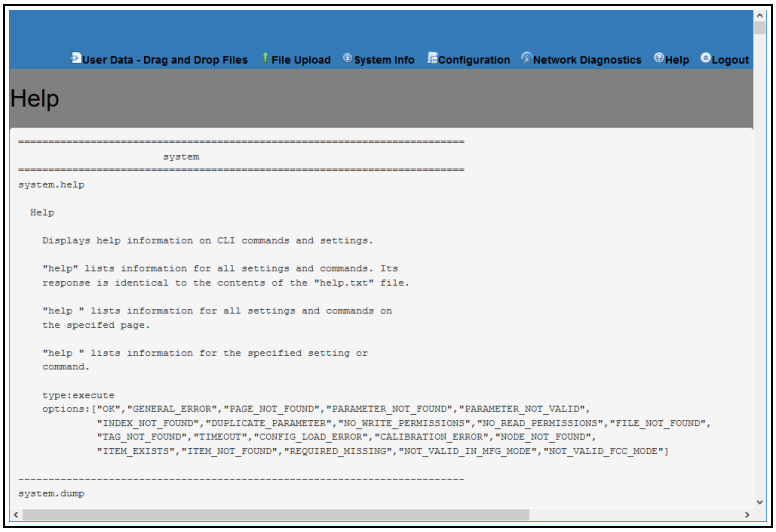


Figure 241: Help window

Note: The information in this window is read-only.

34.8. Home window

The **Home** window is the default window when the Web Interface is used.

It is used to:

- View basic System information of the connected Z9-P / Z9-PE / Z9-PE-GREY.
- Provide links to other windows of the Z9-P / Z9-PE / Z9-PE-GREY.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

3. Refresh the browser window (press <Enter> or <F5>).
   The Z9-P / Z9-PE / Z9-PE-GREY **Home** window opens.

> **Note**: See the systemInfo Parameters (on page 312) for detailed information about the parameters.

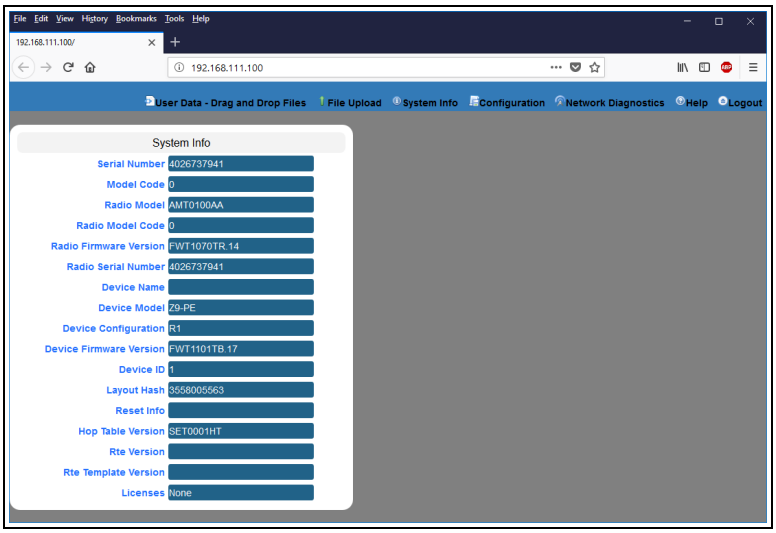


Figure 242: Home window

> **Note**: The information in this window is read-only.

34.9. Local Diagnostics window

Note: See the localDiagnostics Parameters (on page 227) for detailed information about the parameters.

- Upper Half (on page 353)
- Lower Half (on page 354)

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 243)

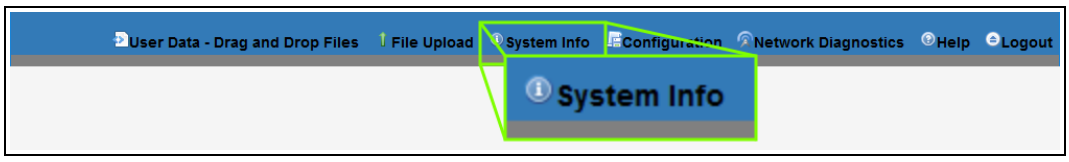


Figure 243: System Info link

   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 **Local Diagnostics** tab.
   The **Local Diagnostics** window opens. (Figure 244 and Figure 245)

   Note: The information in this window is read-only.
   See the localDiagnostics Parameters (on page 227) for detailed information about the parameters.

   See:

   - Upper Half (on page 353)
   - Lower Half (on page 354)

7. On the Menu bar, click the **Configuration** link to Change the Local Diagnostics (on page 117).

34.9.1. Upper Half

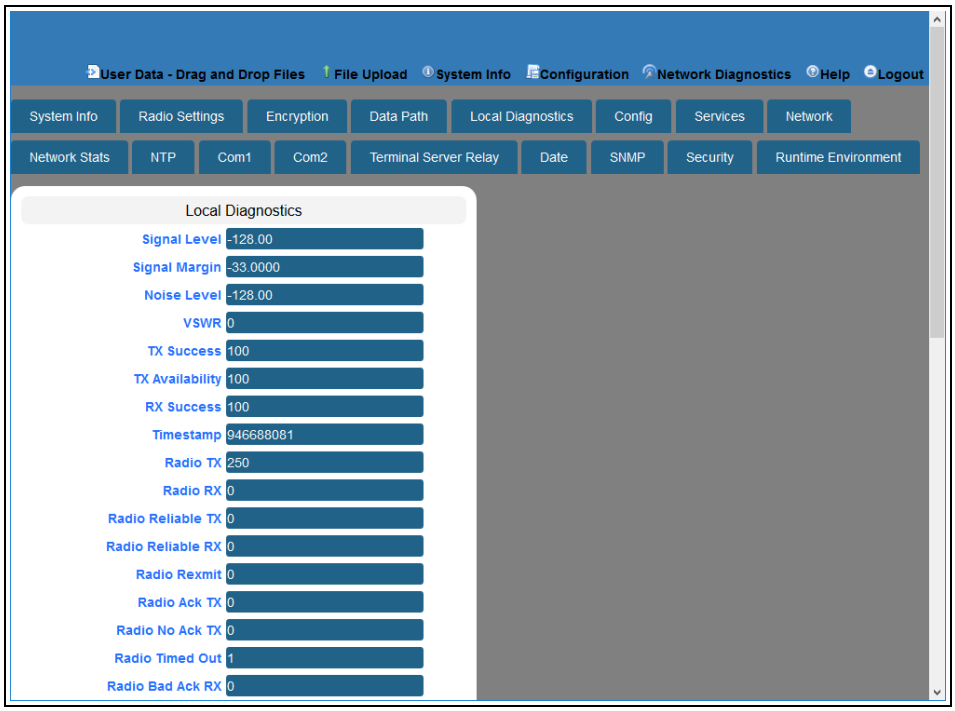


Figure 244: Local Diagnostics window - Upper Half

34.9.2. Lower Half

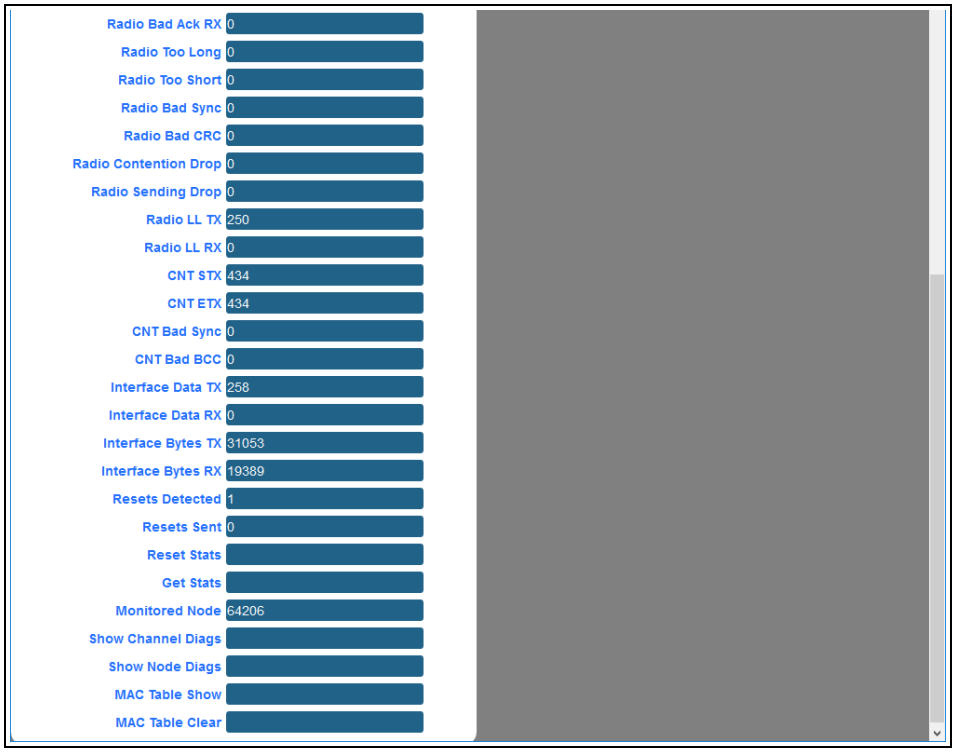


Figure 245: Local Diagnostics window - Lower Half

34.10. Network window

The **Network** window is used to provide network information for the Z9-P / Z9-PE / Z9-PE-GREY.

Note: See the network Parameters (on page 245) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 246)

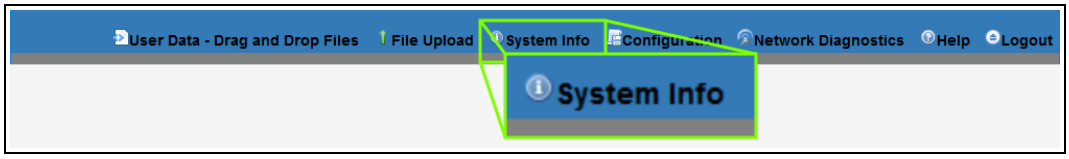


Figure 246: System Info link

   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 **Network** tab.
   The **Network** window opens. (Figure 247)

   Note: The information in this window is read-only.
   See the network Parameters (on page 245) for detailed information about the parameters.

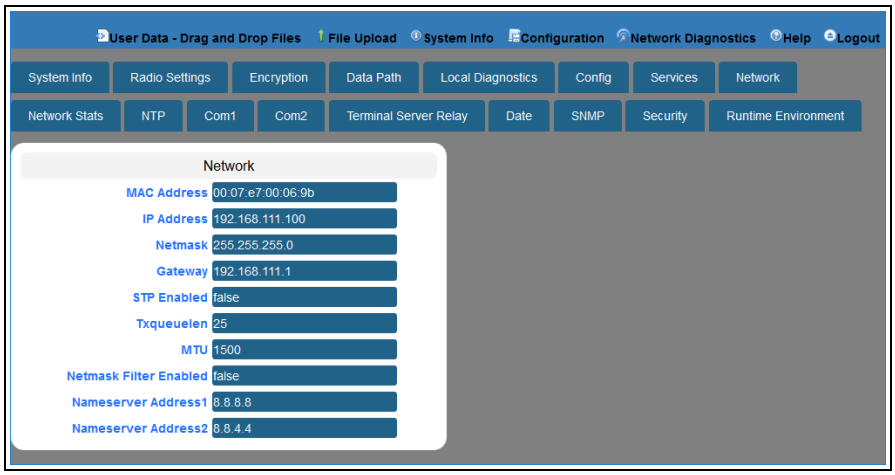


Figure 247: Network window

7. On the Menu bar, click the **Configuration** link to Change the Network Parameters (on page 120).

34.11. 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. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. On the Menu bar, click the **Network Diagnostics** link. (Figure 248)

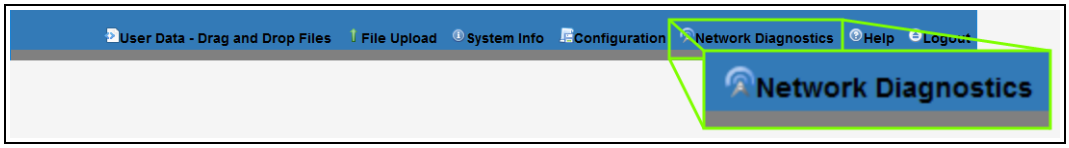


Figure 248: Network Diagnostics link

The **Network Diagnostics** window opens. (Figure 249)

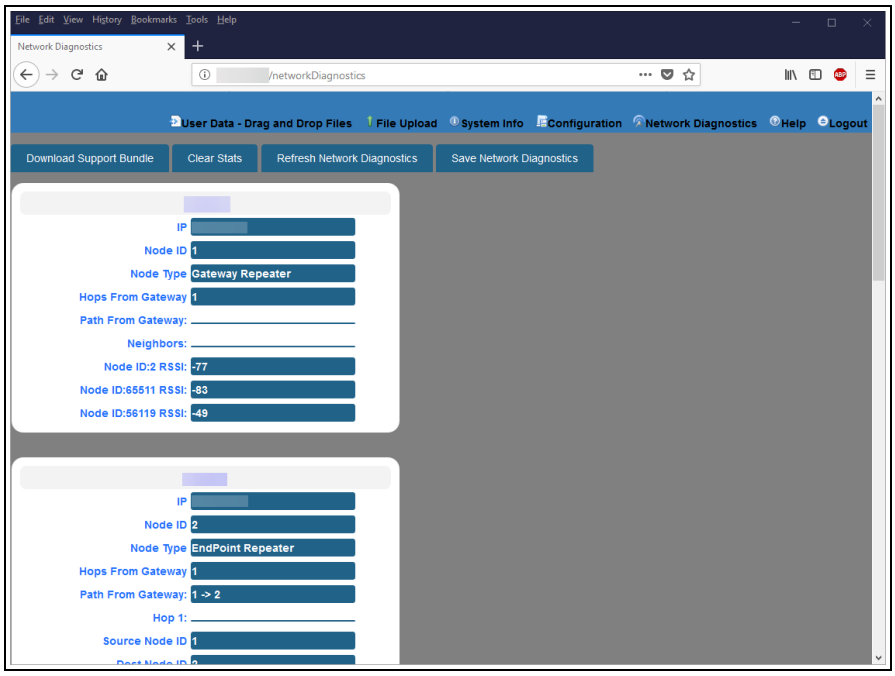


Figure 249: Network Diagnostics window

To update the Network Diagnostics window (on page 357), refresh the browser to clear the browser cache.

Network Diagnostics window	
Control Title	**Control Description**
Download Support Bundle button	Click the **Download Support Bundle** button to open the **Opening support_bundle_xxx.xxx.xxx.xxx.zip** dialog box. Use this dialog box to save the current network performance reading to send to FreeWave Technical Support for faster issue resolution.
Clear Status button	Click the **Clear Status** button to reset the network diagnostics.
Refresh Network Diagnostics button	Click the **Refresh Network Diagnostics** button to updated the current network performance reading.
Save Network Diagnostics button	Click the **Save Network Diagnostics** button to open the **Opening network_diag.json** dialog box. Use this dialog box to save the current network performance reading for later review and to monitor network performance over time.

34.12. Network Stats window

Note: See the networkStats Parameters (on page 253) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 250)

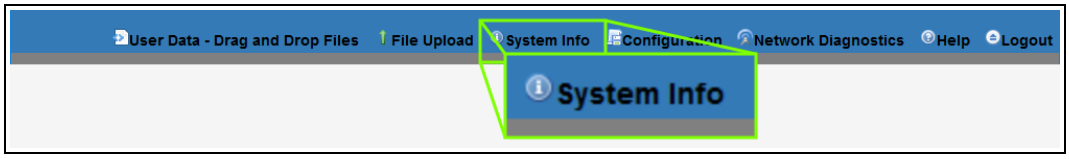


Figure 250: System Info link

   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 **Network Stats** tab.
   The **Network Stats** window opens. (Figure 251)

   Note: The information in this window is read-only.
   See the networkStats Parameters (on page 253) for detailed information about the parameters.

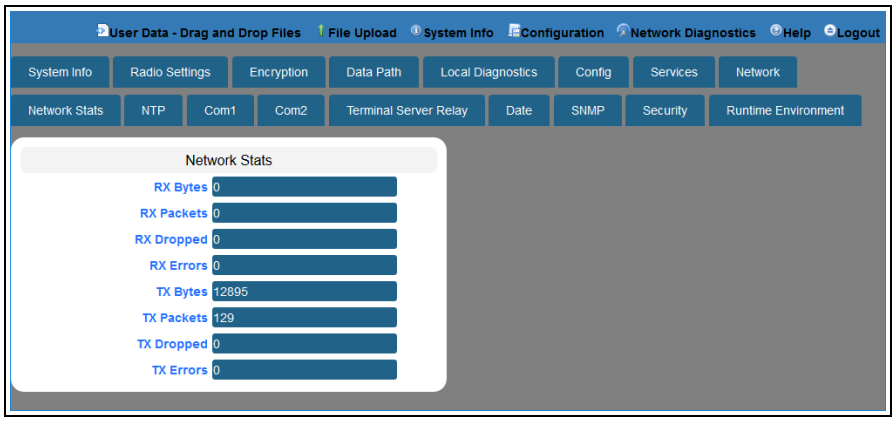


Figure 251: Network Stats window

34.13. NTP window

The **NTP** window is used to designate the date and time used on the Z9-P / Z9-PE / Z9-PE-GREY.

Note: See the NTP Parameters (on page 258) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 252)

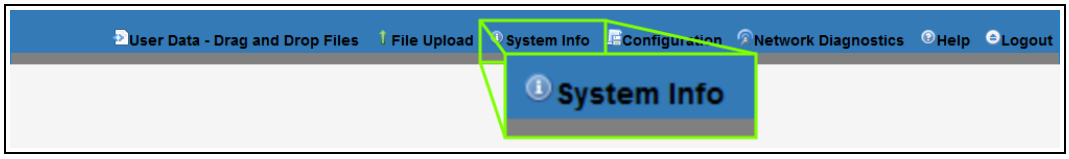


Figure 252: System Info link

   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 **NTP** tab.
   The **NTP** window opens. (Figure 253)

   Note: The information in this window is read-only.
   See the NTP Parameters (on page 258) for detailed information about the parameters.

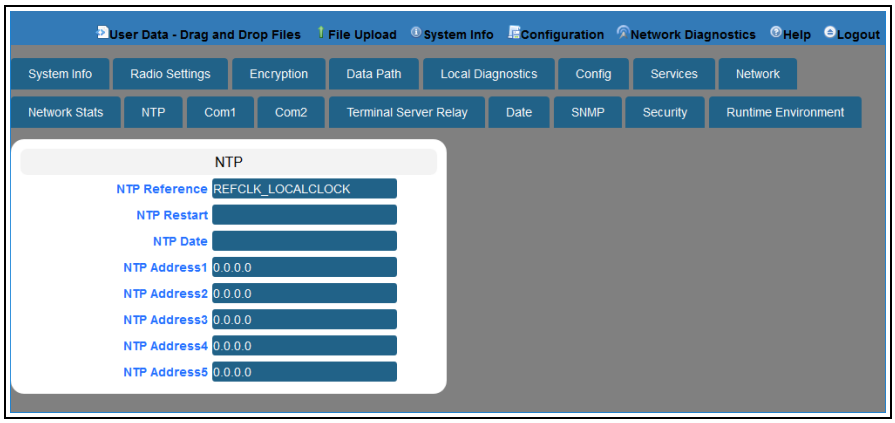


Figure 253: NTP window

7. On the Menu bar, click the **Configuration** link to Change the NTP Parameters (on page 123).

34.14. Radio Settings window

Note: See the radioSettings Parameters (on page 262) for detailed information about the parameters.

- Gateway Radio Mode (on page 364)
- Endpoint Radio Mode (on page 365)

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 254)

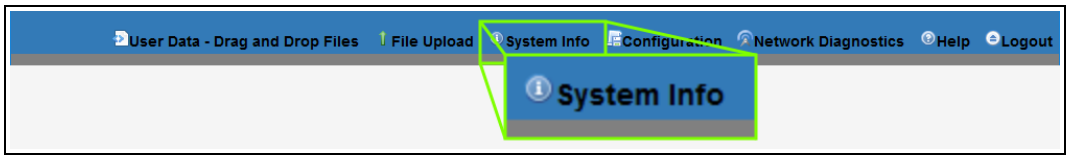


Figure 254: System Info link

   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 **Radio Settings** tab.
   The **Radio Settings** window opens. (Figure 255 or Figure 256)

   Note: The information in this window is read-only.
   See the radioSettings Parameters (on page 262) for detailed information about the parameters.

   See:
   - Gateway Radio Mode (on page 364)
   - Endpoint Radio Mode (on page 365)

7. On the Menu bar, click the **Configuration** link to Change the Radio Settings Parameters - Endpoints (on page 126).

34.14.1. Gateway Radio Mode

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

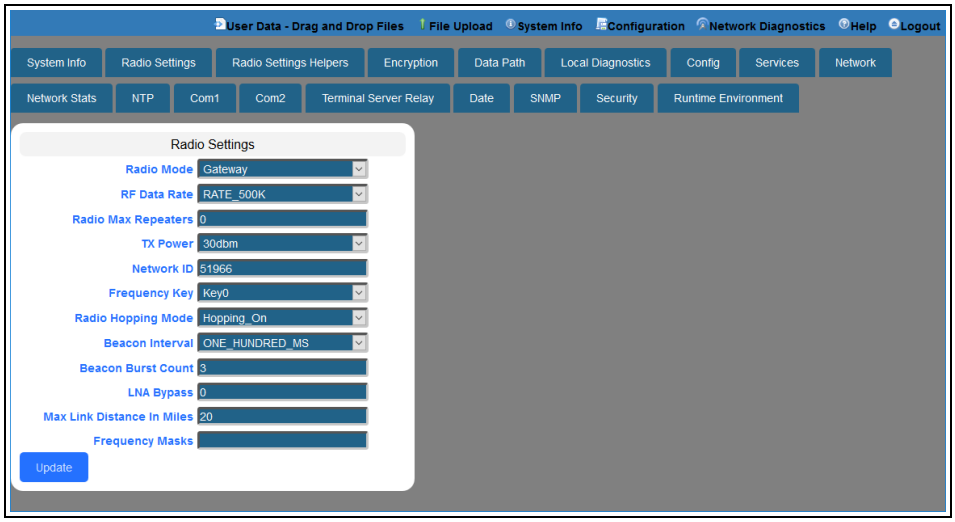


Figure 255: Radio Settings window - Gateway Radio Mode

34.14.2. Endpoint Radio Mode

Important!: Only **radioSettings** that apply to the current **radioMode**, **rfDataRate**, and **radioHoppingMode**, and are visible in the CLI and the Web Interface and can be changed.

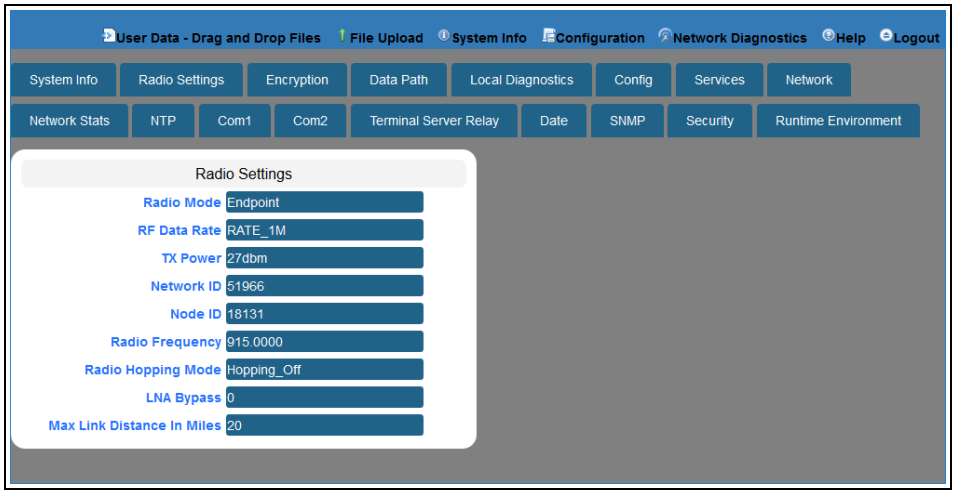


Figure 256: Radio Settings window - Endpoint Radio Mode

34.15. Radio Settings Helpers window

Note: This window is only available if the radioHoppingMode (on page 275) parameter is set to **Hopping_On**.
See the radioSettingsHelpers Parameters (on page 287) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 257)

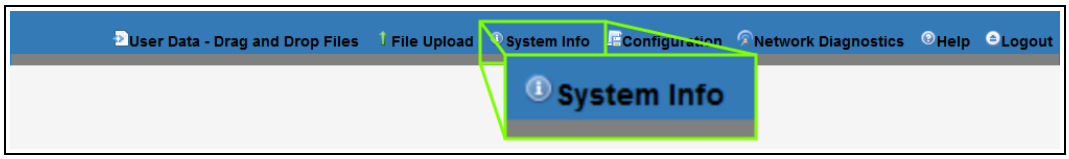


Figure 257: System Info link

   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 **Radio Settings Helpers** tab.

   Note: The information in this window is read-only.
   See the radioSettingsHelpers Parameters (on page 287) for detailed information about the parameters.

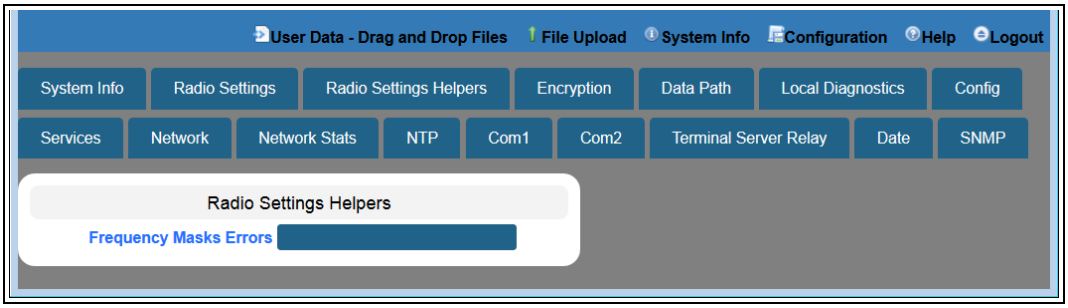


Figure 258: Radio Settings Helpers window

34.16. Runtime Environment window

The **Runtime Environment** window is used to provide information specific to the Linux Runtime Environment.

> **Note**: See the runtimeEnvironment Parameters (on page 289) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   > **Example**: For the first time, enter `192.168.111.100/config`.

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 259)

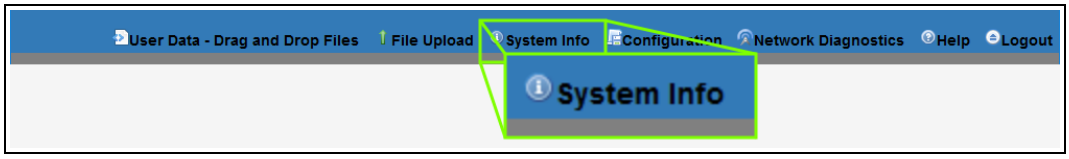


Figure 259: System Info link

   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 **Runtime Environment** tab.
   The **Runtime Environment** window opens. (Figure 260)

   > **Note**: The information in this window is read-only.
   > See the runtimeEnvironment Parameters (on page 289) for detailed information about the parameters.

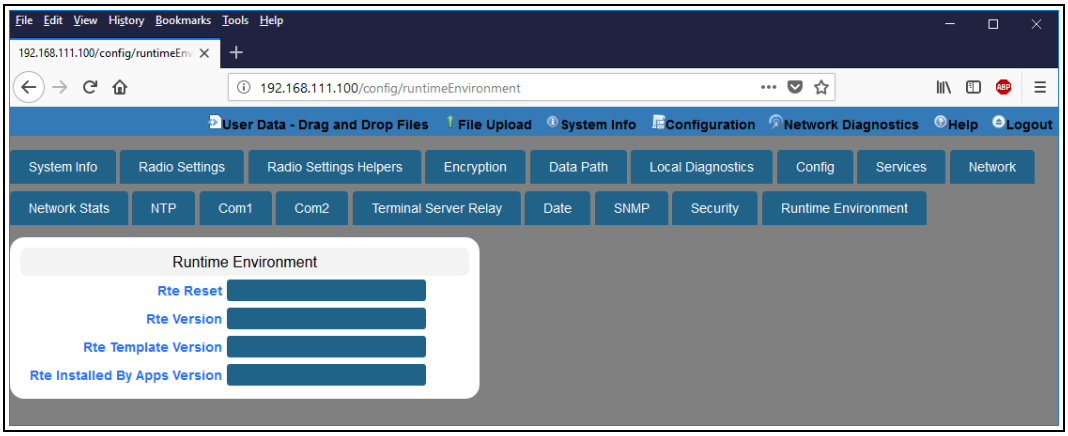


Figure 260: Runtime Environment window

34.17. Security window

Note: See the security Parameters (on page 293) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 261)

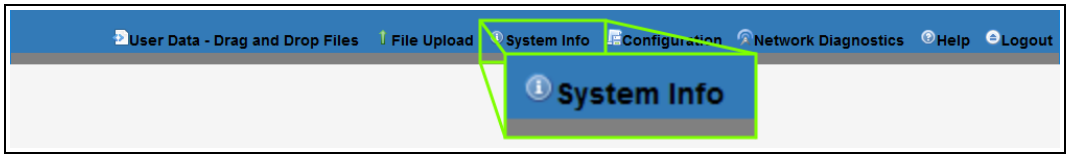


Figure 261: System Info link

   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 **Security** tab.
   The **Security** window opens. (Figure 262)

   Note: The information in this window is read-only.
   See the security Parameters (on page 293) for detailed information about the parameters.

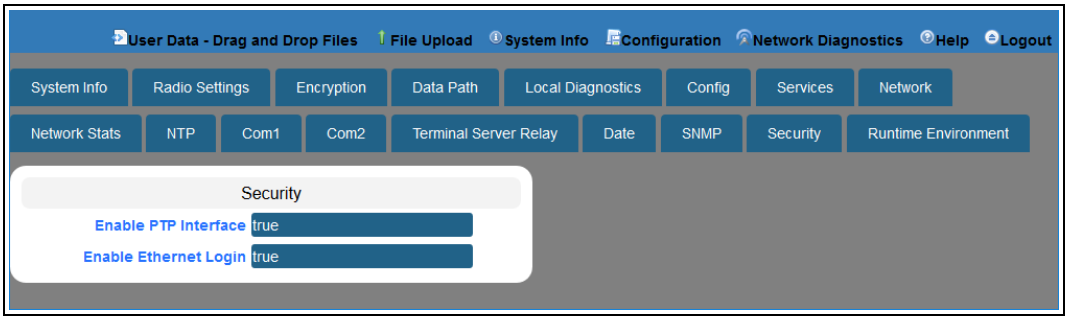


Figure 262: Security window

7. On the Menu bar, click the **Configuration** link to Change the Security Parameters (on page 142).

34.18. Services window

Note: See the services Parameters (on page 296) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 263)

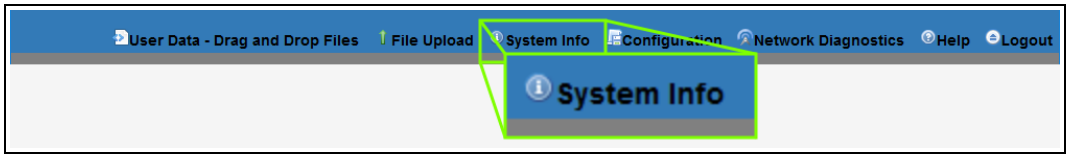


Figure 263: System Info link

   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 **Services** tab.
   The **Services** window opens. (Figure 264)

   Note: The information in this window is read-only.
   See the services Parameters (on page 296) for detailed information about the parameters.

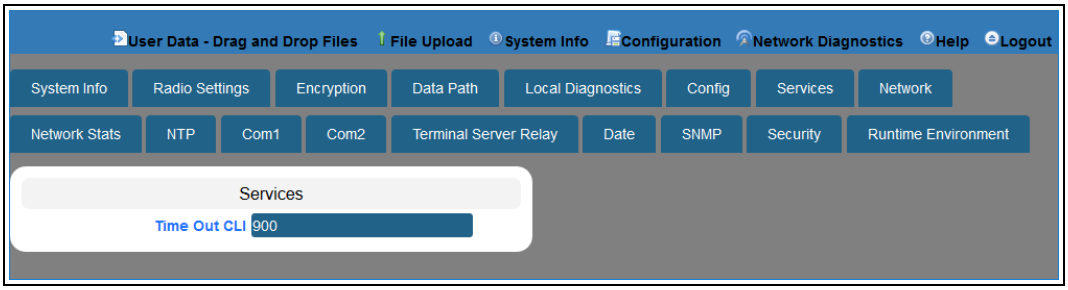


Figure 264: Services window

7. On the Menu bar, click the **Configuration** link to Change the Services Parameters (on page 145).

34.19. SNMP window

Note: See the SNMP Parameters (on page 298) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 265)

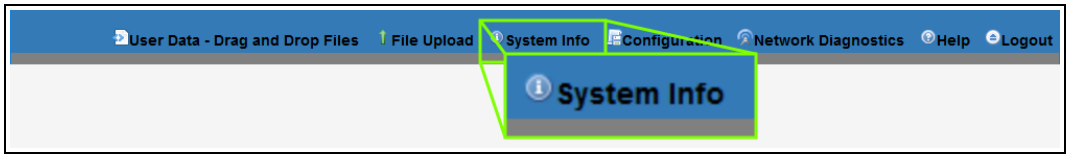


Figure 265: System Info link

   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 **SNMP** tab.
   The **SNMP** window opens. (Figure 266)

   Note: The information in this window is read-only.
   See the SNMP Parameters (on page 298) for detailed information about the parameters.

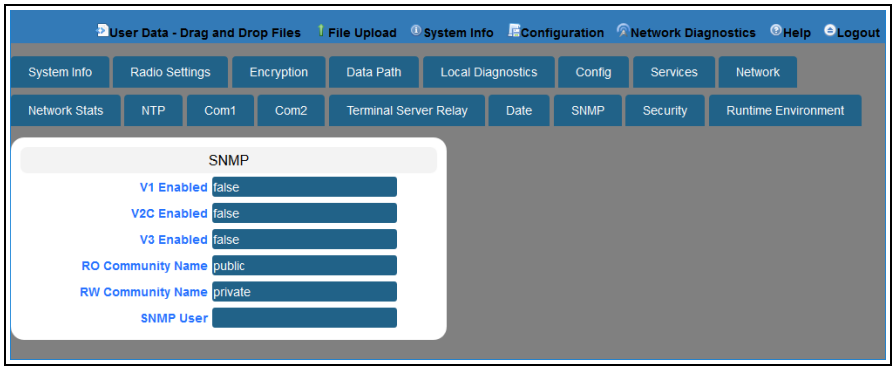


Figure 266: SNMP window

7. On the Menu bar, click the **Configuration** link to Change the SNMP Parameters (on page 148).

34.20. System Info window

The **System Info** window provides system level information for the Z9-P / Z9-PE / Z9-PE-GREY.

Note: See the systemInfo Parameters (on page 312) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 267)

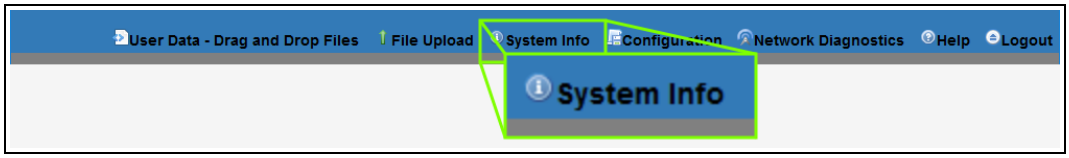


Figure 267: System Info link

   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. (Figure 268)

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

   The **System Info** window opens. (Figure 268)

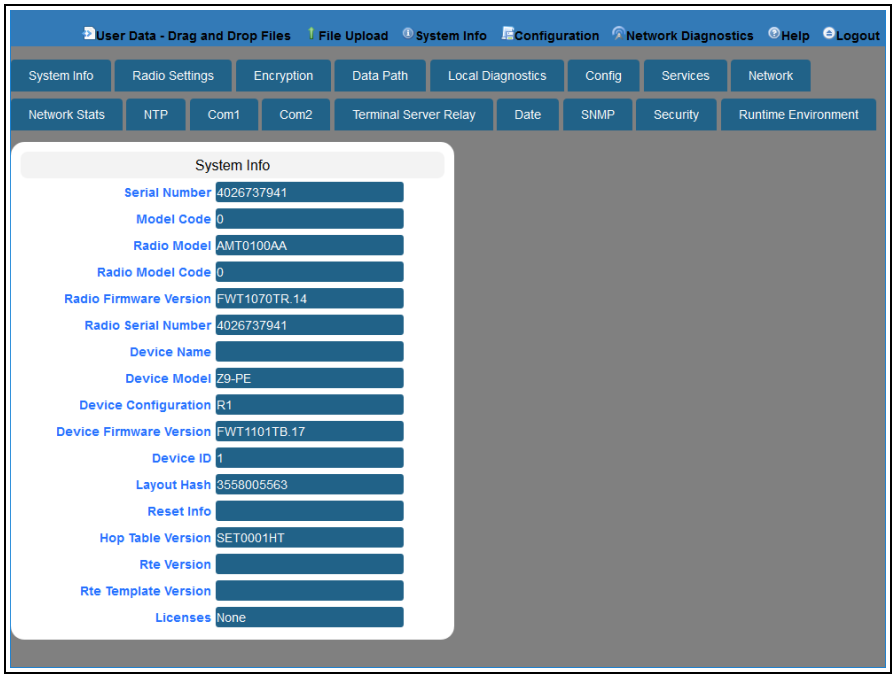


Figure 268: System Info window

6. On the Menu bar, click the **Configuration** link to Change the System Info Parameters (on page 151).

34.21. Terminal Server Relay window

Note: See the TerminalServerRelay Parameters (on page 322) for detailed information about the parameters.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.
3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. Click the **System Info** link. (Figure 269)

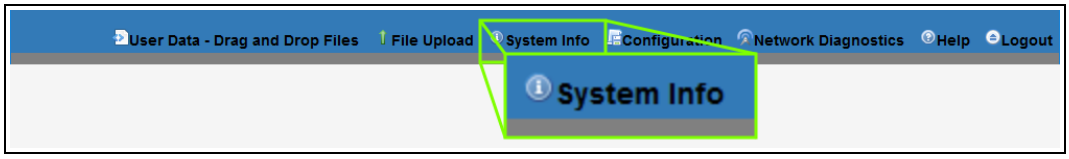


Figure 269: System Info link

   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 **Terminal Server Relay** tab.
   The **Terminal Server Relay** window opens. (Figure 270)

   Note: The information in this window is read-only.
   See the TerminalServerRelay Parameters (on page 322) for detailed information about the parameters.

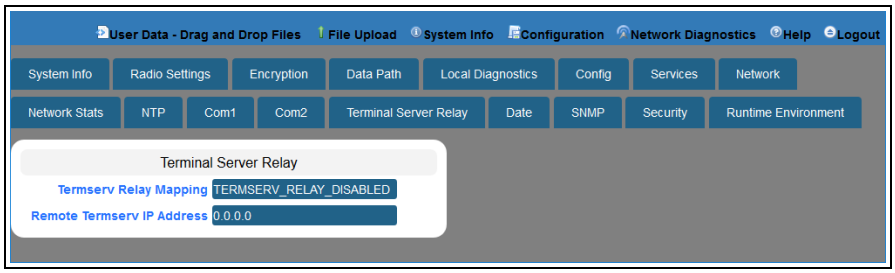


Figure 270: Terminal Server Relay window

7. On the Menu bar, click the **Configuration** link to Change the Terminal Server Relay Parameters (on page 154).

34.22. User Data - Drag and Drop window

The **User Data - Drag and Drop** window lists the default files of the Z9-P / Z9-PE / Z9-PE-GREY.

Access and Window Description

1. Open a web browser.
2. In the URL address bar, enter the IP address of the attached Z9-P / Z9-PE / Z9-PE-GREY.

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

   Example: For the first time, enter `192.168.111.100/config`.

3. Refresh the browser window (press <Enter> or <F5>).
   The Home window (on page 351) opens.
4. On the Menu bar, click the **User Data - Drag and Drop** link.

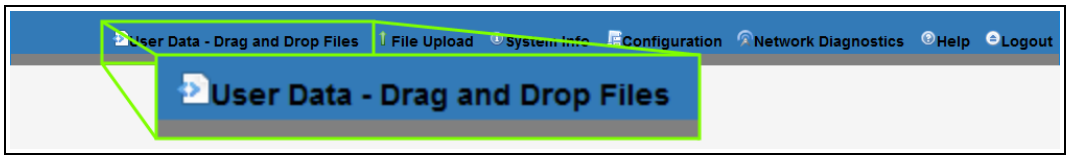


Figure 271: User Data - Drag and Drop Files link

   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 - Drag and Drop** window opens. (Figure 272)

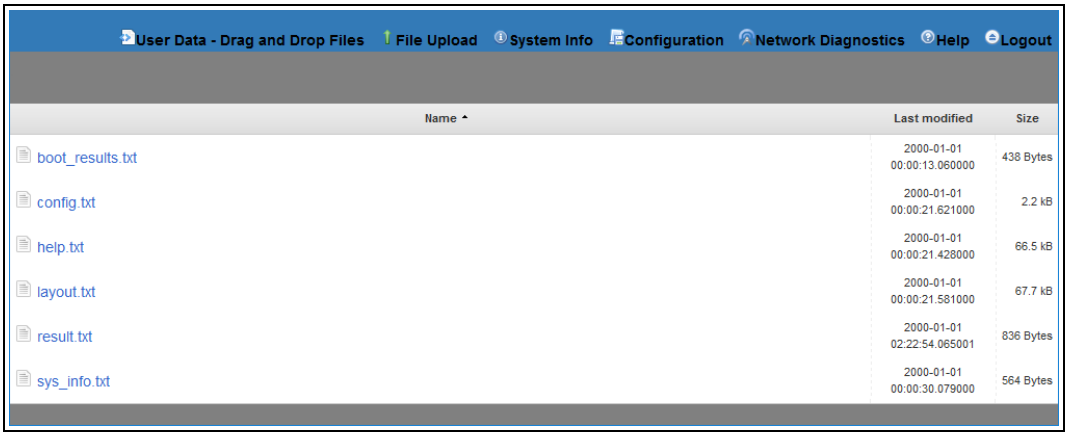


Figure 272: User Data - Drag and Drop window

Note: See the Z9-P / Z9-PE / Z9-PE-GREY Files and Descriptions (on page 438) for additional information.

35. Release Notes

These sections describe the additions, changes, known limitations, and workarounds in each software version. The most recent version is listed first.

The latest software versions and the most recent list of known limitations and workarounds are available on www.freewave.com.

35.1. Version 1.1.0.1

Release Date: September 2018

Additions and Changes

- Support has been added for:
  - Local Diagnostics:
    - noiseLevel (on page 232)
    - RxSuccess (on page 240)
    - TxAvailability (on page 242)
    - TxSuccess (on page 243)
    - VSWR (on page 243)

Important!: VSWR **may not** function on Z9-P / Z9-PE / Z9-PE-GREY models manufactured prior to September, 2018.
If the Z9-P / Z9-PE / Z9-PE-GREY reports a VSWR value of 0 (zero), VSWR is **not** supported.

- MTU (on page 247) 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 / Z9-PE / Z9-PE-GREY:
  - 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:
  - compressionEnabled (on page 211) default is now **True**.
  - beaconBurstCount (on page 263) default is now **3**.
  - radioHoppingMode (on page 275) default is now **Hopping_On**.
  - rfDataRate (on page 282) default is now **RATE_500K**.
  - txPower (on page 285) 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 323) settings enabled.
  - When rfDataRate =**RATE_4M** and beaconBurstCount =**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 TerminalServerTimeOut (on page 201) 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 / Z9-PE / Z9-PE-GREY.
- During boot, the COM LEDs will cycle indicating startup.
- For optimal throughput, when Repeaters are used and the RF environment is noisy, the beaconBurstCount (on page 263) is no longer required to be 2 or more.
- When an invalid Gateway is entered, the gateway (on page 246) is set to a null value.
  - When a Z9-P / Z9-PE / Z9-PE-GREY 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.
- ZumIQ 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 ZumIQ Application Environment.
> Contact FreeWave Technical Support (on page 13) for the license key.

- The default value for ntpReference (on page 260) was changed to NETWORK_TIME_SERVER.
  - This causes the Z9-P / Z9-PE / Z9-PE-GREY to attempt to contact the default external **time.nist.gov** IP address listed in ntp_address (on page 259) .

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 upgrading or downgrading, the ZumIQ template is changed but NOT the active ZumIQ runtime application environment version.
    - Active applications will continue to run.

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

  - Performing an rteReset (on page 290) 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 an **runtimeEnvironment.rteReset**.
- Changing the ip_address (on page 246) 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 / Z9-PE / Z9-PE-GREY.
- VSWR **may not** function on Z9-P / Z9-PE / Z9-PE-GREY models manufactured prior to September, 2018.
  If the Z9-P / Z9-PE / Z9-PE-GREY reports a VSWR value of 0 (zero), VSWR is **not** supported.
  - VSWR is less accurate at higher power levels (>20dBm).

  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.

- After updating the **systemInfo.rteTemplateVersion** parameter, a reboot is necessary to update the **sys_info.txt** file with the ZumIQ version.
- Rebooting a pair of radios simultaneously when one of the Z9-P / Z9-PE / Z9-PE-GREY has termserv_relay_mapping (on page 323) enabled, the terminal server relay takes between 2 and 5 minutes to become active.
- To update the Network Diagnostics window (on page 357), 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 aggregateEnabled (on page 210) on all Endpoints in a network prevents the neighbor table from being populated.

- The Network Diagnostics window (on page 357) does not appear correctly when **dataPath.aggregateEnabled=true**.
- TxAvailability (on page 242) is ONLY available via MIB, not via SNMP.
- RxSuccess (on page 240) is NOT available via SNMP.
- **localDiagnostics.TxAvailability** returns **localDiagnostics.RxSuccess** value via SNMP.
- Options are visible but not active in the handler (on page 197) parameter.
- The setKey (on page 225) **cannot** be entered using the Z9-P / Z9-PE / Z9-PE-GREY Web Interface.

> **Important!**: The **encryption.setKey** MUST BE entered in CLI.

35.2. Version 1.0.7.0

Release Date: June 2018

Warning! DO NOT remove power from the Z9-P / Z9-PE / Z9-PE-GREY during or immediately after the firmware upgrade process!
Wait until the Home window (on page 351) Web Interface is accessible before removing power from the **ZumLink** device (approximately 6-8 minutes).

If power is removed prematurely during the upgrade process, the Web Interface pages may not be accessible.
Reinstall the **.pkg** file and **WAIT for the file upgrade process to complete**.

Upgrade Notes for Z9-P / Z9-PE / Z9-PE-GREY - 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 (½) 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 beaconBurstCount (on page 263) 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 radioMode (on page 280) was changed.

- Significant data is lost between radios when operating in close proximity (3-6 feet) when `radioSettings.rfDataRate=RATE_4M`. (See rfDataRate (on page 282)).
  - **Workaround**: Reduce power on radios when operating in close proximity.
- When using the USB, the CLI may lock up on units with termserv_relay_mapping (on page 323) enabled.
  - **Workaround**:
    - Re-seat the cable.
    - Reconfigure the termserv_relay_mapping using either of these procedures:
    - Drag and Drop Configuration - ZumLink (on page 53) or
    - Web Interface Configuration (on page 75).
- COM ports temporarily stop functioning when passing traffic with certain **Terminal Server Relay** settings enabled.
- When the termserv_relay_mapping is in use, the connectionDrops (on page 193) count should be ignored.
- When operating at rfDataRate = `RATE_4M` and beaconBurstCount = `1`:
  - Endpoint-Repeaters may lose synchronization with the Gateway and reset themselves.
  - TCP traffic can be intermittent when operating multiple Repeaters.
- When operating at rfDataRate = `RATE_4M` and with multiple Repeaters, if a **short** beaconInterval and a **high** beaconBurstCount are designated, throughput is very low.
  - **Workaround**: Use either a **longer** beaconInterval or a **lower** beaconBurstCount.
- As Repeaters are chained in the network, round trip delay will increase.
  - When issuing pings of large packet sizes at the lower data rates, such as 115.2K, and a beaconInterval = `TWENTY_FIVE_MS`, the latency can increase causing the pings to fail.
  - **Workaround**: Allowing appropriate delay between pings resolves this issue.

  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.
- ZumIQ application environment is not available.

35.3. Version 1.0.6.0

Release Date: September 2017

Additions and Changes

> **Important!**: If a downgrade to v1.0.4.0 is needed, an upgrade to v1.0.7.0 is required first, then the user can install v1.0.4.0.

- ZumIQ 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 / Z9-PE / Z9-PE-GREY reboots.
- A reboot of the Z9-P / Z9-PE / Z9-PE-GREY 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.

35.4. 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.
- In **Local Diagnostics**, the RF data rate 1 Mbps reports a maximum signal level of -42 dBm.

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).

35.5. 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.

Additions and Changes	
Feature	**Description**
Radio Settings	Displays parameters that are required for radio mode, frequency hopping, and so forth. **Example**: The **radioSettings.beaconInterval** is not available for radios configured as Endpoints.
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 **radioSettings.beaconInterval** 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.
- In **Local Diagnostics**, the RF data rate 1 Mbps reports a maximum signal level of -42 dBm.

35.6. 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.

36. Available Accessories

These are the Z9-P / Z9-PE / Z9-PE-GREY accessories available from FreeWave.

36.1. Z9-P, Z9-PE, and Z9-PE-GREY Accessories

Available Accessories - Z9-P / Z9-PE / Z9-PE-GREY	
Part Number	**Description**
EAN0900SQ	• ¼ Wave Omni-directional 900 MHz Stub Antenna • 0 (zero) dBi gain • Straight, SMA Male RF connector
EAN0900SR	• ½ Wave Omni-directional 900 MHz Stub Antenna • 2 dBi gain • Right-angle 360 degree swivel, SMA Male RF connector
EAN0900WC	• Open coil Omni-directional 896-940 MHz Antenna • 5.15 dBi gain. **Important!**: Does NOT include mounting hardware or cable.
EAN0905WC	• Closed coil Omni-directional 896-970 MHz Antenna • 5 dBi gain

Available Accessories - Z9-P / Z9-PE / Z9-PE-GREY	
Part Number	**Description**
EAN0906YC	• 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	6½ foot long shielded Ethernet cable
EMD1280UX	12 VDC @ 800mA AC-to-DC power supply with phoenix connector This connector is used with either the: • Z9-PE (FreeWave Part Number: ASC0003ZL) or the • Z9-PE-GREY (FreeWave Part Number: ASC0003TH) power cable included with the Z9-P / Z9-PE / Z9-PE-GREY. See Included Equipment (on page 18).

36.2. Z9-P Only Accessories

Available Accessories - Z9-PE Only	
Part Number	**Description**
AOH0001HT	Multi-position DIN rail bracket kit

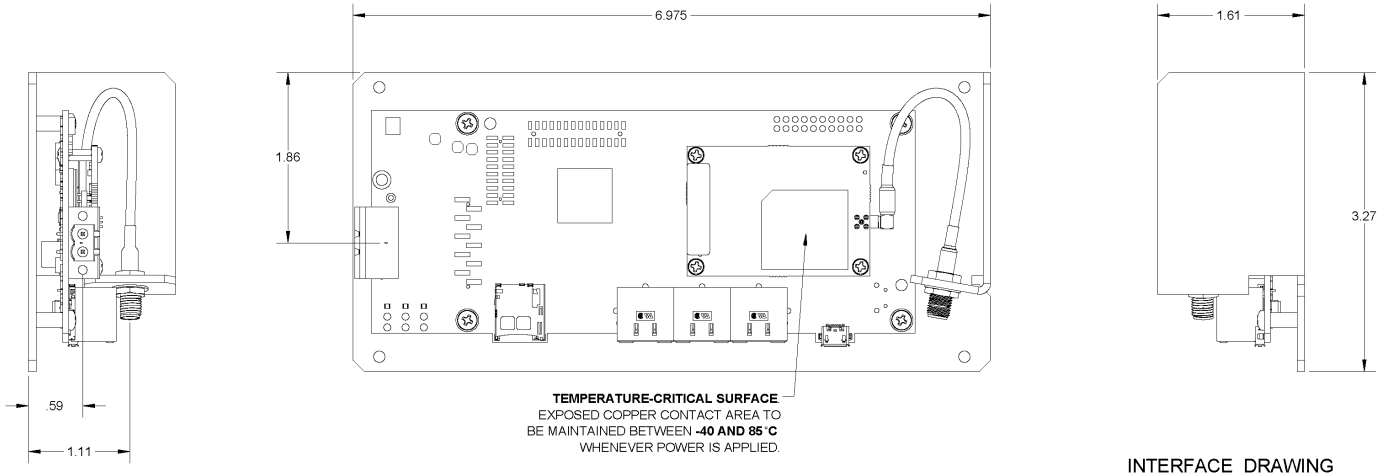
36.3. Z9-PE Only Accessories

Available Accessories - Z9-PE Only	
Part Number	**Description**
EMD1280UW	12 VDC @ 800mA AC-to-DC power supply with DC plug
ASC0002ZL	12 inch power adapter with jack **Note**: For use with EMD1280UW Power Supply.
AOH4003SP	Reversible DIN rail bracket kit

37. Mechanical Drawing - Z9-P

37.1. Z9-P - Top and Sides

REVISION HISTORY				
REV	ECN	DESCRIPTION	DATE	APPROVED
A	4294	INITIAL RELEASE (PRODUCT SPECIFICATIONS REMOVED)	2017-05-31	JACK STRANDQUIST



INTERFACE DRAWING

DIMENSIONS IN INCHES PER ASME Y14.5 - 2009	APPROVALS	
	DRAWN	JACK STRANDQUIST
TOLERANCES: ±.02 INCH	CHECKED	
	APPROVED	TIM MESTER
THIRD ANGLE PROJECTION	INFORMATION IN THIS DRAWING IS PROPRIETARY. IT IS ISSUED IN CONFIDENCE AND SHALL NOT BE USED AS A BASIS FOR MANUFACTURE WITHOUT WRITTEN PERMISSION FROM FREEWAVE TECHNOLOGIES.	

FREEWAVE

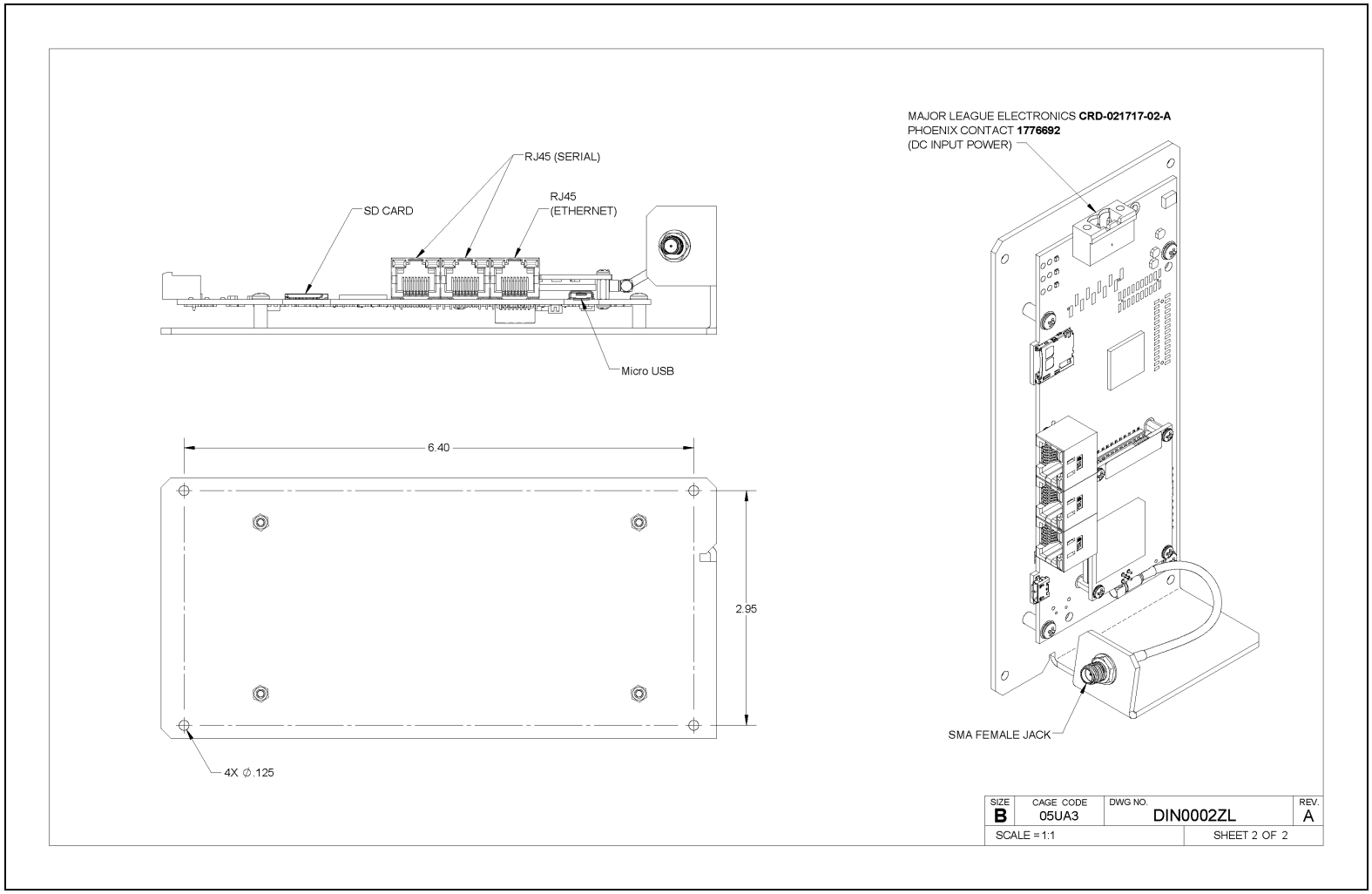
FreeWave Technologies, Inc.
5395 Pearl Parkway
Boulder, Colorado 80301

TITLE
ZUMLINK 900 MHz Radio
MODEL Z9-P

SIZE	CAGE CODE	DWG NO.	REV.
B	05UA3	DIN0002ZL	A

SCALE = 1:1 SHEET 1 OF 2

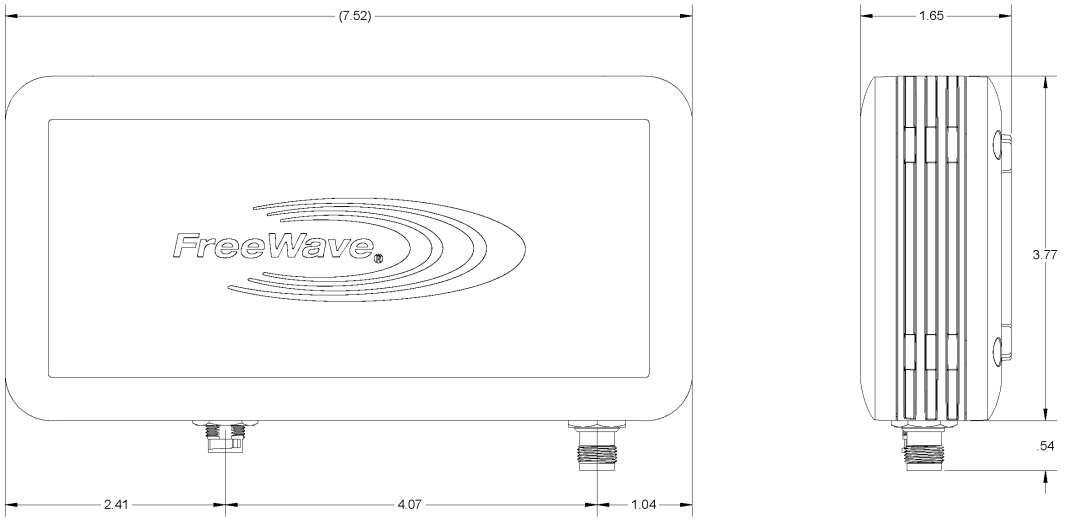
37.2. Z9-P - Back and Sides



38. Mechanical Drawing - Z9-PE

38.1. Z9-PE - Top and Sides

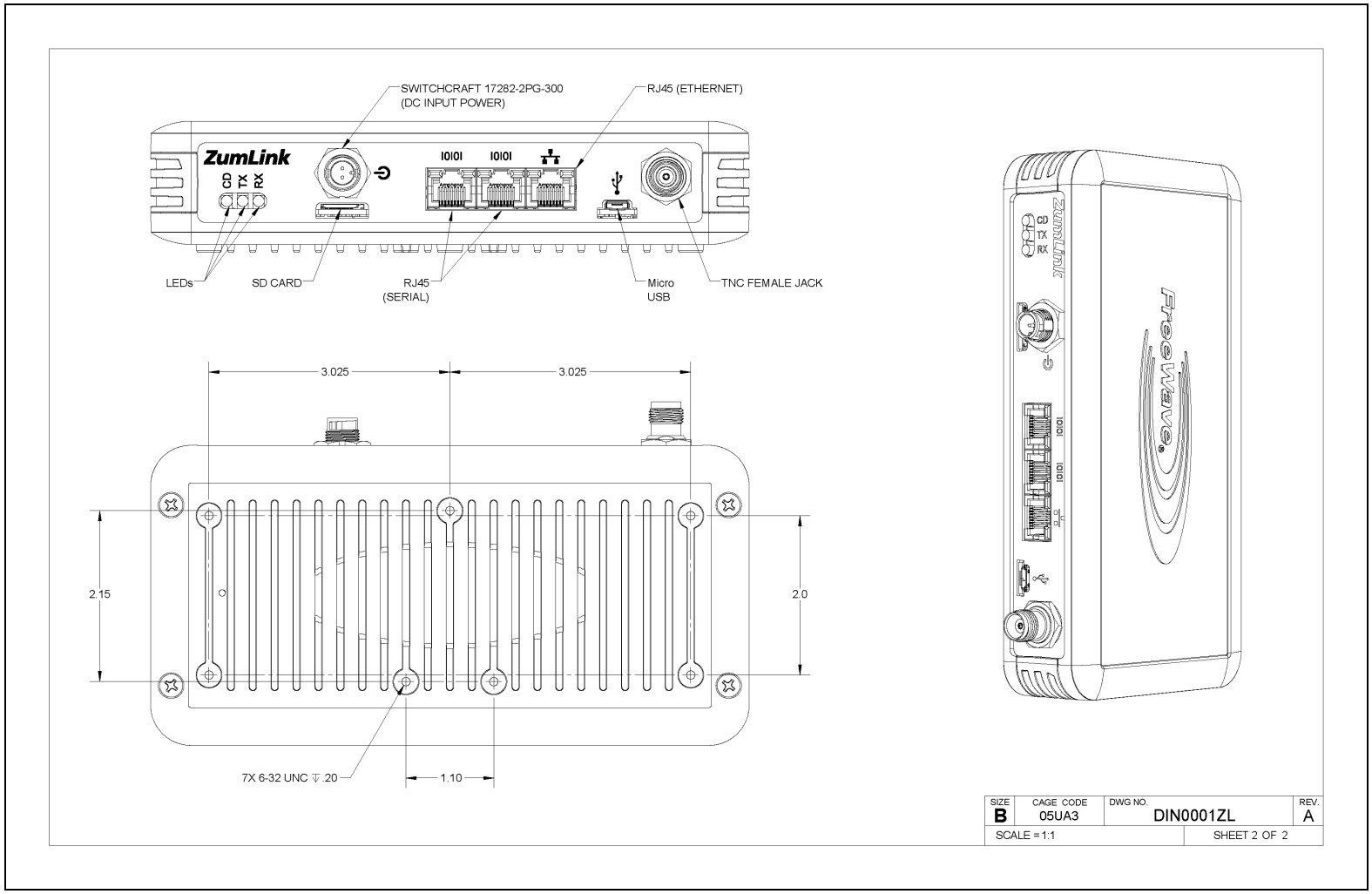
REVISION HISTORY				
REV	ECN	DESCRIPTION	DATE	APPROVED
A	4292	INITIAL RELEASE (PRODUCT SPECIFICATIONS REMOVED)	2017-05-31	JACK STRANDQUIST



INTERFACE DRAWING

DIMENSIONS IN INCHES PER ASME Y14.5 - 2009	APPROVALS	FREEWAVE — FreeWave Technologies, Inc. 5395 Pearl Parkway Boulder, Colorado 80301
	DRAWN: JACK STRANDQUIST	
TOLERANCES: ±.02 INCH	CHECKED:	TITLE: ZUMLINK 900 MHz Radio MODEL Z9-PE
	APPROVED: TIM MESTER	
THIRD ANGLE PROJECTION	INFORMATION IN THIS DRAWING IS PROPRIETARY. IT IS ISSUED IN CONFIDENCE AND SHALL NOT BE USED AS A BASIS FOR MANUFACTURE WITHOUT WRITTEN PERMISSION FROM FREEWAVE TECHNOLOGIES.	SIZE: B; CAGE CODE: 05UA3; DWG NO.: DIN0001ZL; REV.: A
		SCALE = 1:1; SHEET 1 OF 2

38.2. Z9-PE - Back and Sides



39. Hop Tables

39.1. Standard Hop Set - ZumLink 900MHz Channels

These are the standard channels supported when the radioHoppingMode (on page 275) is **Enabled**.

Note: When the **Radio Hopping Mode** is **Disabled**, the frequency can be set manually.

- RF Data Rate: 115.2 kbps (on page 399)
- RF Data Rate: 250 kbps (on page 400)
- RF Data Rate: 500 kbps (on page 400)
- RF Data Rate: 1 Mbps (on page 401)
- RF Data Rate: 1.5 Mbps (on page 401)
- RF Data Rate: 4 Mbps (on page 402)

39.1.1. RF Data Rate: 115.2 kbps

Channel Size (MHz): 0.2304

Number of Channels: 110

Standard Hop Set - ZumLink 900MHz Channels										
RF Data Rate: 115.2 kbps										
Frequency		Frequency		Frequency		Frequency		Frequency		Frequency
MHz		MHz		MHz		MHz		MHz		MHz
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		

39.1.2. RF Data Rate: 250 kbps

Channel Size (MHz): 0.3456

Number of Channels: 73

Standard Hop Set - ZumLink900MHz Channels										
RF Data Rate: 250 kbps										
Frequency		Frequency		Frequency		Frequency		Frequency		Frequency
MHz		MHz		MHz		MHz		MHz		MHz
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		

39.1.3. RF Data Rate: 500 kbps

Channel Size (MHz): 0.6912

Number of Channels: 36

Standard Hop Set - ZumLink 900MHz Channels										
RF Data Rate: 500 kbps										
Frequency		Frequency		Frequency		Frequency		Frequency		Frequency
MHz		MHz		MHz		MHz		MHz		MHz
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

39.1.4. RF Data Rate: 1 Mbps

Channel Size (MHz): 1.3824

Number of Channels: 18

Standard Hop Set - ZumLink 900MHz Channels		
RF Data Rate: 1 Mbps		
Frequency		Frequency
MHz		MHz
903.0528		915.4944
904.4352		916.8768
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

39.1.5. RF Data Rate: 1.5 Mbps

Channel Size (MHz): 1.3824

Number of Channels: 17

Standard Hop Set - ZumLink 900MHz Channels	
RF Data Rate: 1.5 Mbps	
MHz	
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	

39.1.6. RF Data Rate: 4 Mbps

Channel Size (MHz): 3.2256

Number of Channels: 7

Standard Hop Set - ZumLink 900MHz Channels
RF Data Rate: 4 Mbps
Frequency
MHz
904.5504
907.7760
911.0016
914.2272
917.4528
920.6784
923.9040

39.2. Australia Hop Set - ZumLink 900MHz Channels

These are the standard channels supported when the radioHoppingMode (on page 275) is **Enabled**.

Note: When the **Radio Hopping Mode** is **Disabled**, the frequency can be set manually.

39.2.1. RF Data Rate: 115.2 kbps

Channel Size (MHz): 0.2304

Number of Channels: 54

Australia Hop Set - ZumLink 900MHz Channels										
RF Data Rate: 115.2 kbps										
Frequency		Frequency		Frequency		Frequency		Frequency		Frequency
MHz		MHz		MHz		MHz		MHz		MHz
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		

39.2.2. RF Data Rate: 250 kbps

Channel Size (MHz): 0.3456

Number of Channels: 35

Australia Hop Set - ZumLink 900MHz Channels						
RF Data Rate: 250 kbps						
Frequency		Frequency		Frequency		Frequency
MHz		MHz		MHz		MHz
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
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		

39.2.3. RF Data Rate: 500 kbps

Channel Size (MHz): 0.6912

Number of Channels: 17

Australia Hop Set - ZumLink 900MHz Channels		
RF Data Rate: 500 kbps		
Frequency		Frequency
MHz		MHz
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		

39.2.4. RF Data Rate: 1 Mbps

Channel Size (MHz): 1.3824

Number of Channels: 8

Australia Hop Set - ZumLink 900MHz Channels
RF Data Rate: 1 Mbps
Frequency
MHz
916.8768
918.2592
919.6416
921.0240
922.4064
923.7888
925.1712
926.5536

39.2.5. RF Data Rate: 4 Mbps

Channel Size (MHz): 3.2256

Number of Channels: 3

Australia Hop Set - ZumLink 900MHz Channels
RF Data Rate: 4 Mbps
Frequency
MHz
917.4528
920.6784
923.9040

40. ZumLink MIB

These are the supported item groups in the Z9-P / Z9-PE / Z9-PE-GREY MIB file:

40.1. 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 }

40.2. 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 }

dskEntry	DskEntry	Not Accessible	Current	An entry containing a disk and its statistics.
				Index = { dskIndex }
				`DskEntry ::= SEQUENCE {`
				`dskPath DisplayString,`
				`dskDevice DisplayString,`
				`dskTotal Integer32,`
				`dskAvail Integer32,`
				`dskUsed Integer32,`
				`dskPercent Integer32,`
				`dskPercentNode Integer32`
				`}`
					{ 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 }

ZumLink MIB - Disk Usage					
Objective Type	**Syntax**	**MAX Access**	**Status**	**Description**	**::=**
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 }

40.3. 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 }

ZumLink MIB - Memory Usage						
Objective Type	**Syntax**	**Units**	**MAX Access**	**Status**	**Description**	**::=**
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 }
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 }

40.4. FreeWave Technologies-MIB

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtPlusModemStatusTable	This table gives basic status information for each radio modem in the system.	Not Accessible	
fwtPlusModemStatusTableEntry	A row containing status information for a specific radio modem.	Not Accessible	
fwtPlusModemSerial	The serial number for the radio the given status table entry line is for	Not Accessible	Gauge32
fwtPlusModemSignal	The received signal level for this radio modem, in dBm.	Read-only	Integer32
fwtPlusModemNoise	The detected noise for this radio modem, in dBm.	Read-only	Integer32
fwtPlusModemSupplyVoltage	The supply voltage to this radio modem, in units of 1/100th of a volt.	Read-only	Integer32
fwtPlusModemRxRate	The current receive rate as a percentage of the maximum, in units of one Hundredth of a percent.	Read-only	Gauge32
fwtPlusModemReflectedPower	The current amount of reflected RF power.	Read-only	Gauge32
fwtPlusModemTemperature	The current temperature of this radio modem in degrees Celsius.	Read-only	Integer32
fwtPlusModemRange	The current approximate range of this radio modem from its peer, in meters.	Read-only	Gauge32

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtPlusModemTxRate	The current transmit rate as a percentage of the maximum, in units of one Hundredth of a percent.	Read-only	Gauge32
fwtPlusModemSNDelta	The current margin (absolute) between the received signal and the noise at this radio.	Read-only	Integer32
fwtPlusModemVendorString	The name of the vendor of this radio modem.	Read-only	DisplayString
fwtPlusModemConnectedTo	The serial number of the radio that we currently have an RF link with.	Read-only	Gauge32
fwtPlusModemUpstreamSignal	The received signal level that the upstream radio receives from this radio, in dBm.	Read-only	Integer32
fwtPlusModemUpstreamNoise	The noise level that the upstream radio receives from this radio, in dBm.	Read-only	Integer32
fwtPlusModemDisconnectCount	The number of times this radio has lost its RF link.	Read-only	Gauge32
fwtPlusModemPacketRxCount	The number of Ethernet packets the radio has received over its RF link.	Read-only	Gauge32
fwtPlusModemPacketTxCount	The number of Ethernet packets the radio has sent over its RF link.	Read-only	Gauge32
fwtPlusModemPacketDroppedCount	The number of Ethernet packets the radio has dropped	Read-only	Gauge32
fwtPlusModemPacketBadCount	The number of BAD / corrupt Ethernet packets the radio has received over its RF link.	Read-only	Gauge32
fwtPlusModemControlTable	This table contains some parameters which may be adjusted for each radio modem in the system.	Not Accessible	
fwtPlusModemControlTableEntry	A row containing adjustable parameters for a specific radio modem.	Not Accessible	

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtPlusModemNetworkMode	The network mode to be used by a radio modem.	Read-Write	INTEGER
fwtPlusModemMode	The modem mode to be used by a radio modem.	Read-Write	INTEGER
fwtPlusModemFrequencyKey	The frequency key to be used by a radio modem.	Read-Write	Gauge32
fwtPlusModemMinPacketSize	The minimum packet size to be used by a radio modem.	Read-Write	Gauge32
fwtPlusModemMaxPacketSize	The maximum packet size to be used by a radio modem.	Read-Write	Gauge32
fwtPlusModemTxPower	The transmit power to be used by a radio modem.	Read-Write	Gauge32
fwtPlusModemRetryTimeout	How many times a radio modem should try to transmit a packet before timing out.	Read-Write	Gauge32
fwtPlusModemRFDataRate	The RF data rate to be used by a radio modem. Permissible values are 1200,867,614, 154, or 115, depending on the series of radios.	Read-Write	Gauge32
fwtPlusModemBroadcastRepeat	The number of times a Gateway will send out a packet of information before moving on to the next.	Read-Write	Gauge32
fwtPlusModemNetworkID	A numerical ID that radios use to decide which network they are allowed to link to.	Read-Write	Gauge32
fwtPlusModemRepeaters	Allows for repeaters in the network, or not.	Read-Write	INTEGER
fwtPlusModemRxSubnetID	A numerical ID that radios use to decide which subnet they are allowed to link to.	Read-Write	Gauge32
fwtPlusModemTxSubnetID	A numerical ID that radios use to decide which subnet they will transmit on.	Read-Write	Gauge32

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtPlusModemReboot	Set to 1 to reboot radio. This will force any changes to take effect.	Read-Write	INTEGER
fwtPlusModemMaxSlaveRetry	The maximum number of times an Endpoint can attempt to deliver data to the Gateway before it discards the data.	Read-Write	Gauge32
fwtPlusModemSystemName	A textual identifier for a given system.	Read-Write	DisplayString
fwtPlusModemControlFreqZoneTable	This table describes the available frequency zones for a radio modem and allows them to be selectively enabled and disabled.	Not Accessible	
fwtPlusModemControlFreqZoneTableEntry	A row describing a specific frequency zone and whether it is enabled or disabled.	Not Accessible	
fwtPlusModemFreqZoneIndex	An index used to identify a specific frequency zone for a specific radio modem.	Not Accessible	Gauge32
fwtPlusModemFreqZoneDescr	A textual description of a specific frequency zone for a specific radio modem.	Read-only	DisplayString
fwtPlusModemFreqZoneEnabled	If the value of this object is true(1) then the referenced frequency zone is enabled for the relevant radio modem. If the value of this object is false(2), then the frequency zone is disabled.	Read-Write	TruthValue
fwtZumLinkSerialNumber	Serial Number	Read-only	Unsigned32
fwtZumLinkModelCode	Model Code	Read-only	Unsigned32
fwtZumLinkRadioModel	Radio model	Read-only	DisplayString
fwtZumLinkRadioModelCode	Radio Model Code	Read-only	Unsigned32
fwtZumLinkRadioFirmwareVersion	Radio Firmware Version	Read-only	DisplayString
fwtZumLinkRadioSerialNumber	Radio Serial Number	Read-only	DisplayString

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkDeviceName	Device Name	Read-only	DisplayString
fwtZumLinkDeviceModel	Device Model	Read-only	DisplayString
fwtZumLinkDeviceConfiguration	Device Configuration	Read-only	DisplayString
fwtZumLinkDeviceFirmwareVersion	Device Firmware Version	Read-only	DisplayString
fwtZumLinkDeviceId	Device Identifier	Read-only	Unsigned32
fwtZumLinkLayoutHash	Unique Layout Identifier	Read-only	Unsigned32
fwtZumLinkResetInfo	Reset Information	Read-only	DisplayString
fwtZumLinkHopTableVersion	Radio Hop Table Version	Read-only	DisplayString
fwtZumLinkRteVersion	Runtime Environment Version	Read-only	DisplayString
fwtZumLinkRteTemplateVersion	Runtime Template Environment Version	Read-only	DisplayString
fwtZumLinkLicenses	License Information	Read-only	DisplayString
fwtZumLinkRadioMode	Radio Operational Mode	Read-Write	ZUMLINK_RADIO_ MODE_THOR
fwtZumLinkRfDataRate	RF Link Data Rate	Read-Write	ZUMLINK_RF_ DATA_RATES
fwtZumLinkRadioMaxRepeaters	Max Repeater slots in the Network	Read-Write	Unsigned32
fwtZumLinkRadioRepeaterSlot	Repeater Slot	Read-Write	Unsigned32
fwtZumLinkTxPower	Transmit Power	Read-Write	ZUMLINK_RADIO_ TX_POWER
fwtZumLinkNetworkId	Network Identifier	Read-Write	Unsigned32
fwtZumLinkNodeId	Node ID	Read-Write	Unsigned32
fwtZumLinkFrequencyKey	Frequency Key	Read-Write	ZUMLINK_ FREQUENCYKEYS
fwtZumLinkRadioFrequency	Operating Center Frequency in MHz	Read-Write	Float32TC

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkRadioHoppingMode	Radio Hopping Mode	Read-Write	ZUMLINK_RADIO_ HOPPING_MODE
fwtZumLinkBeaconInterval	Beacon Interval	Read-Write	ZUMLINK_ BEACON_ INTERVALS
fwtZumLinkBeaconBurstCount	The number of beacons to send per beacon time.	Read-Write	Unsigned32
fwtZumLinkLnaBypass	LNA Bypass	Read-Write	Unsigned32
fwtZumLinkMaxLinkDistanceInMiles	The max link distance in miles	Read-Write	Unsigned32
fwtZumLinkFrequencyMasks	Frequency Masks	Read-Write	DisplayString
fwtZumLinkFrequencyMasksErrors	Frequency Masks Error	Read-only	DisplayString
fwtZumLinkEncryptionMode	Encryption mode	Read-Write	ZUMLINK_ ENCRYPTION_ MODE
fwtZumLinkActiveKey	The active selected key.	Read-Write	ZUMLINK_ ENCRYPTION_ KEYS
fwtZumLinkSetKeySelect	Selection of the next encryption key to be modified.	Read-Write	ZUMLINK_ ENCRYPTION_ KEYS
fwtZumLinkSetKeyValue	Set the value of the selected key.	Read-Write	DisplayString
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

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
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
fwtZumLinkRadioContentionDrop	Radio Contention Drop	Read-only	Unsigned32
fwtZumLinkRadioSendingDrop		Read-only	Unsigned32

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkRadioLLTx	Radio Low Level Transmit	Read-only	Unsigned32
fwtZumLinkRadioLLRx	Radio Low Level Receive	Read-only	Unsigned32
fwtZumLinkCntSTX		Read-only	Unsigned32
fwtZumLinkCntETX		Read-only	Unsigned32
fwtZumLinkCntBadSync		Read-only	Unsigned32
fwtZumLinkCntBadBCC		Read-only	Unsigned32
fwtZumLinkInterfaceDataTx		Read-only	Unsigned32
fwtZumLinkInterfaceDataRx		Read-only	Unsigned32
fwtZumLinkInterfaceBytesTx		Read-only	Unsigned32
fwtZumLinkInterfaceBytesRx		Read-only	Unsigned32
fwtZumLinkResetsDetected		Read-only	Unsigned32
fwtZumLinkResetsSent		Read-only	Unsigned32
fwtZumLinkResetStats	Reset Statistics	Read-Write	ZUMLINK_NOW_ OPTION
fwtZumLinkMonitoredNode	Monitor Node	Read-Write	Unsigned32
fwtZumLinkChannelDiagsTable	Show Channel Diagnostics	Not Accessible	
fwtZumLinkChannelDiagsEntry	A row containing diagnostics for a channel.	Not Accessible	
fwtZumLinkChannelDiagsIdx	Index to a set of diagnostics for a channel	Not Accessible	Unsigned32
fwtZumLinkChannelDiagsFreq	Channel Diagnostics Frequency	Read-only	Float32TC
fwtZumLinkChannelDiagsRSSI	Channel Diagnostics RSSI	Read-only	INTEGER
fwtZumLinkChannelDiagsMargin	Channel Diagnostics Margin	Read-only	INTEGER
fwtZumLinkChannelDiagsNodeId	Channel Diagnostics Node ID	Read-only	Unsigned32
fwtZumLinkNodeDiagsTable	Show Monitored Node Diagnostics	Not Accessible	
fwtZumLinkNodeDiagsEntry	A row containg diagnostics for a node.	Not Accessible	

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkNodeDiagsNodeId	Node Diagnostics Node ID	Read-only	Unsigned32
fwtZumLinkNodeDiagsFreq	Node Diagnostics Frequency	Read-only	Float32TC
fwtZumLinkNodeDiagsRSSI	Node Diagnostics RSSI	Read-only	INTEGER
fwtZumLinkNodeDiagsMargin	Node Diagnostics Margin	Read-only	INTEGER
fwtZumLinkMacTableClear	Clear the MAC to nodeId mapping table and force routes to be relearned.	Read-Write	ZUMLINK_NOW_OPTION
fwtZumLinkNoiseLevel	Noise Level	Read-only	INTEGER
fwtZumLinkVSWR	VSWR	Read-only	Unsigned32
fwtZumLinkTxSuccess	Transmit Success Percentage	Read-only	Unsigned32
fwtZumLinkTxAvailability	Transmit Availability Percentage	Read-only	Unsigned32
fwtZumLinkRxSuccess	Receive Success Percentage	Read-only	Unsigned32
fwtZumLinkReset		Read-Write	ZUMLINK_RESET_OPTIONS
fwtZumLinkFactoryDefaults		Read-Write	ZUMLINK_FDR_OPTIONS
fwtZumLinkSave		Read-Write	ZUMLINK_NOW_OPTION
fwtZumLinkTimeOutCli	The number of seconds of idle before CLI connection will be closed.	Read-Write	Unsigned32
fwtZumLinkMac_address		Read-only	MacAddress
fwtZumLinkIp_address	IP address of unit when DHCP is disabled.	Read-Write	IpAddress
fwtZumLinkNetmask	Netmask of unit when DHCP is disabled.	Read-Write	IpAddress
fwtZumLinkGateway	Gateway of unit when DHCP is disabled.	Read-Write	IpAddress
fwtZumLinkStpEnabled	Spanning tree protocol is enabled or disabled.	Read-Write	TruthValue

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkTxqueuelen	Sets the Ethernet transmit packet queue length.	Read-Write	Unsigned32
fwtZumLinkMtu	Sets the MTU frame size for the unit.	Read-Write	Unsigned32
fwtZumLinkNetmaskFilterEnabled	Enable or disable bridge firewall.	Read-Write	TruthValue
fwtZumLinkNameserver_address1	DNS for name-to-address resolution.	Read-Write	IpAddress
fwtZumLinkNameserver_address2	DNS for name-to-address resolution.	Read-Write	IpAddress
fwtZumLinkRx_bytes	Number bytes of Ethernet packets received from the radio network.	Read-only	Unsigned32
fwtZumLinkRx_packets	Number of Ethernet packets received from the radio network.	Read-only	Unsigned32
fwtZumLinkRx_dropped	Number of Ethernet packets received from the radio network that were dropped at the Ethernet interface.	Read-only	Unsigned32
fwtZumLinkRx_errors	Number of Ethernet packets received from the radio network that were had Ethernet errors.	Read-only	Unsigned32
fwtZumLinkTx_bytes	Number bytes of Ethernet packets received from the Ethernet port and sent over the radio network.	Read-only	Unsigned32
fwtZumLinkTx_packets	Number Ethernet packets received from the Ethernet port and sent over the radio network.	Read-only	Unsigned32
fwtZumLinkTx_dropped	Number Ethernet packets received from the Ethernet port but dropped because the txqueue was full.	Read-only	Unsigned32
fwtZumLinkTx_errors	Number Ethernet packets received from the Ethernet port that were in error.	Read-only	Unsigned32
fwtZumLinkNtpReference	Clock reference for NTP.	Read-Write	ZUMLINK_NTP_ REFERENCE

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkNtpRestart	Cause the NTP system to restart.	Read-Write	ZUMLINK_NOW_OPTION
fwtZumLinkNtpDate	Set the local time from other NTP servers on the network.	Read-Write	ZUMLINK_NOW_OPTION
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

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
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
fwtZumLinkCom1TerminalServerTimeOut	Terminal Server TimeOut	Read-Write	Unsigned32
fwtZumLinkCom1TxBytes	The total bytes sent out of the Com port.	Read-only	Unsigned32
fwtZumLinkCom1RxBytes	The total bytes received from the Com port.	Read-only	Unsigned32
fwtZumLinkCom1ConnectionDrops	The number of terminal server connections dropped due to inactivity.	Read-only	Unsigned32
fwtZumLinkCom2Mode	Com port mode	Read-Write	ZUMLINK_UART_MODE
fwtZumLinkCom2Handler	Protocol of the com port	Read-Write	ZUMLINK_UART_HANDLER
fwtZumLinkCom2Baudrate	Com port baud rate	Read-Write	ZUMLINK_UART_BAUDRATES
fwtZumLinkCom2Databits	Com port data bits	Read-Write	ZUMLINK_UART_DATABITS
fwtZumLinkCom2Parity	Com port parity	Read-Write	ZUMLINK_UART_PARITY

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkCom2Stopbits	Com port number of stop bits	Read-Write	ZUMLINK_UART_ STOPBITS
fwtZumLinkCom2Duplex	Com port is full or half duplex	Read-Write	ZUMLINK_UART_ DUPLEX
fwtZumLinkCom2FlowControl	Com port hardware flow control is on or off	Read-Write	ZUMLINK_UART_ FLOWCONTROL
fwtZumLinkCom2DelayBeforeSendMs	Com port will delay sending in Ms to allow the other side to switch from tx to rx mode.	Read-Write	Unsigned32
fwtZumLinkCom2BreakBeforeSendUs	Com port will send a break signal for at least the number of microseconds specified before sending the data.	Read-Write	Unsigned32
fwtZumLinkCom2TerminalServerPort	The TCP port number to use when handler is set to TerminalServer.	Read-Write	Unsigned32
fwtZumLinkCom2TerminalServerTimeOut	Terminal Server Time Out	Read-Write	Unsigned32
fwtZumLinkCom2TxBytes	The total bytes sent out of the Com port.	Read-only	Unsigned32
fwtZumLinkCom2RxBytes	The total bytes received from the Com port.	Read-only	Unsigned32
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_ TERMSERV_ 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

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
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
fwtZumLinkV1Enabled	SNMP V1 Enable / Disable	Read-Write	TruthValue
fwtZumLinkV2cEnabled	SNMP V2C Enable / Disable	Read-Write	TruthValue
fwtZumLinkV3Enabled	SNMP V3 Enable / Disable	Read-Write	TruthValue
fwtZumLinkRoCommunityName	Read-Only Community Name	Read-Write	DisplayString
fwtZumLinkRwCommunityName	Read-Write Community String	Read-Write	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	
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

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
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	
fwtZumLinkNetworkNeighborEntry	A row containing status information for a specific neighbor node.	Not Accessible	

FreeWave Technologies-MIB			
Object	**Description**	**Access**	**Syntax**
fwtZumLinkNetworkNeighborNodeId	Neighbor Node ID	Read-only	Unsigned32
fwtZumLinkNetworkNeighborRSSI	RSSI From Neighbor Node	Read-only	INTEGER
fwtZumLinkNetworkPathTable	List of nodes in path from current node where info is gathered to current node	Not Accessible	
fwtZumLinkNetworkPathEntry	A row containing status information for a node in the path.	Not Accessible	
fwtZumLinkNetworkPathIdx	Index to a node in the path	Not Accessible	Unsigned32
fwtZumLinkNetworkPathNodeId	Node In Path From Current Node	Read-only	Unsigned32
fwtZumLinkNetworkPathRSSITable	RSSI values between all the nodes along the path	Not Accessible	
fwtZumLinkNetworkPathRSSIEntry	A row containing RSSI for a node along the path.	Not Accessible	
fwtZumLinkNetworkPathRssiIdx	Index to a pair of source and destination nodes along the path	Not Accessible	Unsigned32
fwtZumLinkNetworkPathRssiSrc	Source Node	Read-only	Unsigned32
fwtZumLinkNetworkPathRssiDst	Destination Node	Read-only	Unsigned32
fwtZumLinkNetworkPathRssiSrcDstRSSI	Source Destination RSSI	Read-only	INTEGER
fwtZumLinkNetworkPathRssiDstSrcRSSI	Source Destination RSSI	Read-only	INTEGER

40.5. SNMP Write Access

1. Verify v2cEnabled (on page 302) is enabled.
2. Make a note of the rwCommunityName (on page 299).

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

Technical Specifications	
Specification	**Description**
Transmitter	
Frequency Range	• 902 to 928MHz • Australia: 915-928 MHz
Output Power	• 10mW to 1W • User selectable
Range	97 km (60 miles), clear line of sight
Channel Spacing	• 230.4 kHz • 345.6 kHz • 691.2 kHz • 1382.4 kHz • 3225.6 kHz
RF Data Rate	User selectable • 115.2 kbps • 250 kbps • 500 kbps • 1 Mbps • 4 Mbps
Receiver	
IF Selectivity	> 40 dB
System Gain	136 dB

<table>
<tr><th colspan="2">Technical Specifications</th></tr>
<tr><th>Specification</th><th>Description</th></tr>
<tr><td>Sensitivity</td><td>
<table>
<tr><th>RF Data Rate</th><th>Without FEC</th><th>With FEC</th></tr>
<tr><td>115.2 kbps</td><td>-105 dBm</td><td>-108 dBm</td></tr>
<tr><td>250 kbps</td><td>-102 dBm</td><td>-105 dBm</td></tr>
<tr><td>500 kbps</td><td>-99 dBm</td><td>-102 dBm</td></tr>
<tr><td>1 Mbps</td><td>-95 dBm</td><td>-98 dBm</td></tr>
<tr><td>1.5 Mbps (Beta)</td><td>-90 dBm</td><td>-93 dBm</td></tr>
<tr><td>4 Mbps</td><td>-83 dBm</td><td>-86 dBm</td></tr>
</table>
</td></tr>
<tr><th>Data Transmission</th><th></th></tr>
<tr><td>Type</td><td>Frequency Hopping Spread Spectrum</td></tr>
<tr><td>Modulation</td><td>• 2 level GFSK
• 4- and 8-ary FSK</td></tr>
<tr><td>Link Throughput</td><td>• Maximum of 1.6 Mbps
• 4 Mbps with Compression</td></tr>
<tr><td>Error Detection</td><td>• 16-bit CRC, FEC, and ARQ
• Retransmit on error</td></tr>
<tr><td>Hopping Rates</td><td>User selectable
• 25ms
• 50ms
• 100ms
• 200ms
• 400ms</td></tr>
<tr><td>Hopping Channels</td><td>• Maximum of 110 channels
• Dependent on the rfDataRate (on page 282) setting
• User selectable
Note: See the Australia Hop Set - ZumLink 900MHz Channels (on page 403) for additional information.</td></tr>
<tr><td>Hopping Patterns</td><td>• Maximum of 16 patterns
• Dependent on the rfDataRate (on page 282) setting
• User selectable</td></tr>
<tr><td>Protocol</td><td>Adaptive Spectrum Learning (ASL)</td></tr>
<tr><td>User Interface Rate</td><td>• Ethernet Rate: 10/100 Mbps
• Serial Rate: Maximum of 250 kbps</td></tr>
<tr><td>Data Encryption</td><td>128-bit and 256-bit AES Counter Mode</td></tr>
<tr><td>VLAN</td><td>Layer 2, pass tagged and double-tagged packets</td></tr>
</table>

Technical Specifications	
Specification	**Description**
Advanced Features	• Forward Error Correction • Packet Aggregation • Packet Compression • User selectable
Programmability	
CPU	ARM Coretex-A8 1 GHz
RAM	512 MB
Storage	1 GB
OS	Debian (Linux Kernal 3.14.1)
Power Requirements	
Operating Voltage	+6 to +30 VDC (+/- 10%)
Idle Current	130 mA at 12 VDC
Receive Current	145 mA at 12 VDC
Transmit Current	355 mA at 12 VDC
Interfaces	

Data Connector	• Three RJ-45
	  • 1 Ethernet
	  • 2 Serial

USB Connector	Micro USB
RF Connector	• **Z9-P**: SMA • **Z9-PE**: TNC
Power Connectors	• **Z9-P**: Phoenix Contact (# 1776692) • **Z9-PE**: Switchcraft (#17282-2PG-300)

Technical Specifications	
Specification	**Description**
General Information	
Operating Temperature	**Z9-P** • -40°C to +85°C • -40°F to +185°F **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 434) , Figure 273. See Mechanical Drawing - Z9-P (on page 394). **Z9-PE** • -40°C to +75°C • -40°F to +167°F **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.
Humidity	0 to 95% non-condensing
Dimensions	**Z9-P** • 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** • 191.04 L x 109.47 W x 41.91 H (mm) • 7.52 L x 4.31 W x 1.65 H (in)
Weight	**Z9-P** • 172g • 0.38 lbs **Z9-PE** • 750g • 1.7 lbs
Reliability	91,328 hour MTBF

Z9-P: Exposed Copper Heat Sink

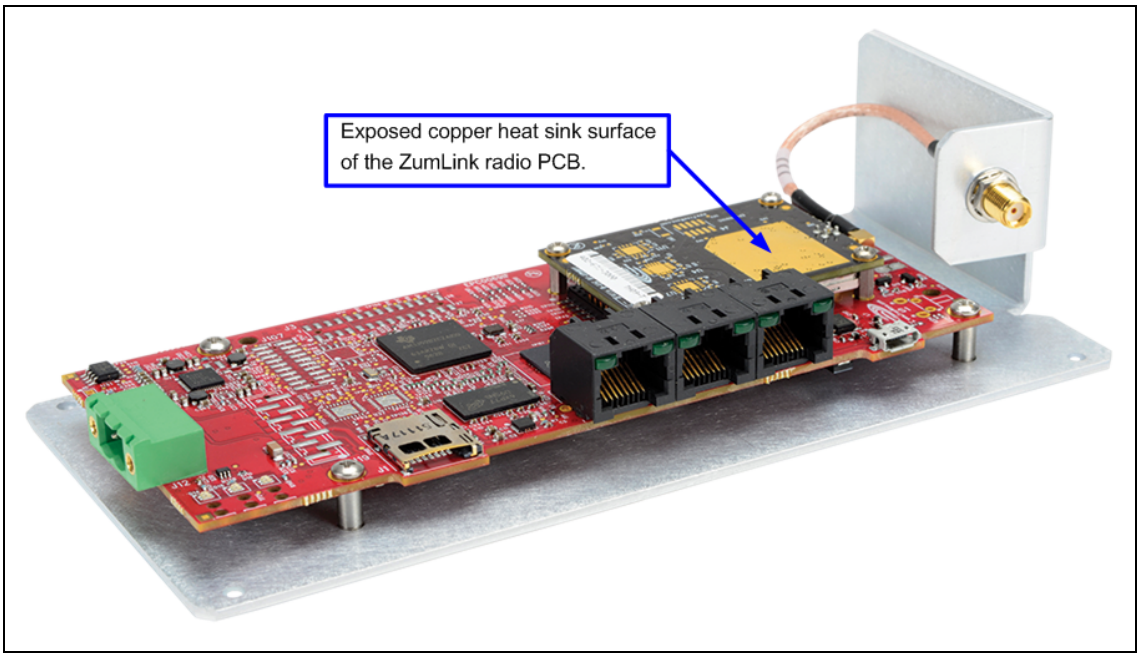


Figure 273: Exposed copper heat sink surface of the ZumLink Z9-P radio PCB.

Appendix B: LEDs

These are the LEDs for the Z9-P / Z9-PE / Z9-PE-GREY.

Note: See Z9-P Port Connections (on page 21) and Z9-PE Port Connections (on page 21) for additional information.

Normal Operation

LEDs - Normal Operation

CD	TX	RX	Condition	Notes
Solid Red			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		Solid Green	Receiving Data	The radio is actively receiving data over the wireless RF link.
Solid Green or Alternate Solid Green / Solid Red	Solid Green		Transmitting Data	The radio is actively transmitting data over the wireless RF link.

LEDs - Normal Operation				
CD	**TX**	**RX**	**Condition**	**Notes**
Alternate Solid Green / Solid Red		Solid Green	Receiving Data	• 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	• 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	• Shows Activity. • LED will blink / flicker while sending and receiving data on the Ethernet port.

Appendix C: Z9-P / Z9-PE / Z9-PE-GREY Files and Descriptions

When the Windows® Explorer window of the Z9-P / Z9-PE / Z9-PE-GREY 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 / Z9-PE / Z9-PE-GREY has been upgraded or rebooted, other files may appear.

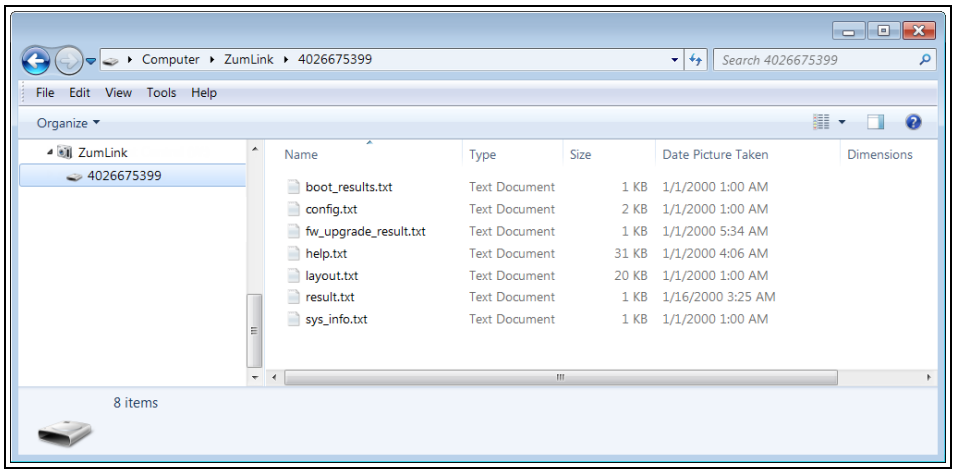


Figure 274: Z9-P / Z9-PE / Z9-PE-GREY Files shown in Windows® Explorer

Files and Descriptions - Z9-P / Z9-PE / Z9-PE-GREY	
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 / Z9-PE / Z9-PE-GREY. 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 upgrade procedure for the device firmware. **Note**: This file appears after the **ZumLink** has been upgraded 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.
modbuslayout.txt	**Note**: The **modbuslayout.txt** file is not used.
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 D: FreeWave Legal Information

Export Notification

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FCC Notifications

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

The content of this guide covers FreeWave Technologies, Inc. models sold under FCC ID: 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 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 52 cm between the radiator and your body.

FCC Notification of Power Warning

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

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

IC Notifications

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

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

The content of this documentation covers FreeWave Technologies, Inc. models sold under IC: 2329B-PMT0101AB.

IC Host Installation and Label

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**".

IC 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 7.8 inches (20 cm) 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 7.8 pouces (20 cm) séparant l'antenne d'une personne présente en conformité avec les limites permises d'exposition du grand public.

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

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

ANATEL

Agência Nacional de Telecomunicações

03838-18-02478

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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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.

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:
  - IEC/EN 60950-1
  - CAN/CSA C22.2 No. 60950-1-07.
- Input voltage for the Z9-P / Z9-PE / Z9-PE-GREY is +6 to +30 VDC (+/- 10%).

Z9-P Only

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.

Standards and Editions

- HazLoc Standards
  - ANSI/ISA 12.12.01-2013
  - 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 0
  -  II 3 G Ex nA IIC 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.
- All connectors (J1 to J4) do not have mating connectors with the devices.
- The securement of these connectors must be evaluated during end-product investigation.

- **Z9-PE Only**
  - Temperature test was conducted at a rated supply voltage and the maximum surface temperature of +61°C was recorded at +60°C ambient temperature.
  - All input power supply wires should be at least **20AWG** 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.

FREEWAVE