deltaLINK™ Router Installation & User Manual

Version: A0-00

DELTA
ENERGY & COMMUNICATIONS, INC.

The information provided in this document contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining the suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation, and testing of the products with respect to the relevant specific application or use thereof. Neither Delta Energy & Communications, Inc. nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product.

For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed. Failure to observe this information can result in injury or equipment damage.

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 About Delta Energy & Communications, Inc.

Delta Energy & Communications is a network, smart grid and big data company that provides a transformative technology to connect millions around the globe. Delta's novel and patented approach brings connective technology wherever there is electricity. In doing so, Delta helps utilities realize the benefits of data analytics to identify and mitigate both technical losses and non-technical losses while aiding in enterprise-wide utility optimization strategies and revenue enhancement. Delta's core values of dignity, empowerment, transparency, and innovation are the foundation for working with its partners and improving the communities it serves. Delta is headquartered in Murrieta, California and has offices in Cape Town, South Africa.

The Internet of Things is the fastest-growing opportunity for global municipalities, but these municipalities and their associated utilities are often stuck in outdated infrastructure. Recognizing the unique opportunity afforded by converging power distribution with a pioneering network deployment, our Delta Smart Grid Network (DSGN™) infrastructure solution offers a singular, standardized, scalable, patented, and secure solution that tackles all four elements of a power network: distribution and communication, smart metering, utility optimization, and installation and servicing. In addition, Delta concurrently brings connectivity to millions by providing a 5G comparable Wi-Fi 6 mesh network.

Our comprehensive and patented product portfolio, inclusive of hardware, software, mesh networking and cloud architecture technologies, provides our customers with a full-service solution. As Delta stands for ongoing innovation, our portfolio will continue to expand across new IoT solutions, including but not limited to smart street lighting, demand response devices, virtual utility systems, as well as smart connected drones.

1.1.1 Delta Smart Grid Network (DSGN™)

The Delta Smart Grid Network (DSGN™) infrastructure solution represents a step-change in utility infrastructure analytics, control, and networking systems. Converging historical smart grid methodologies, advanced Wi-Fi mesh networking, and leading cloud architecture configurations, the DSGN™ addresses national and international infrastructure concerns while delivering upon local power and connectivity commitments. Delta's infrastructure solution connects the dots in delivering a truly, transformative execution addressing our customer needs, mitigating their pain-points, and delivering upon prior unrealized customer delights.

The following graphic pictorially defines the technology components comprising this revolution in utility and community infrastructure. The ongoing summaries below further define these exciting technologies.

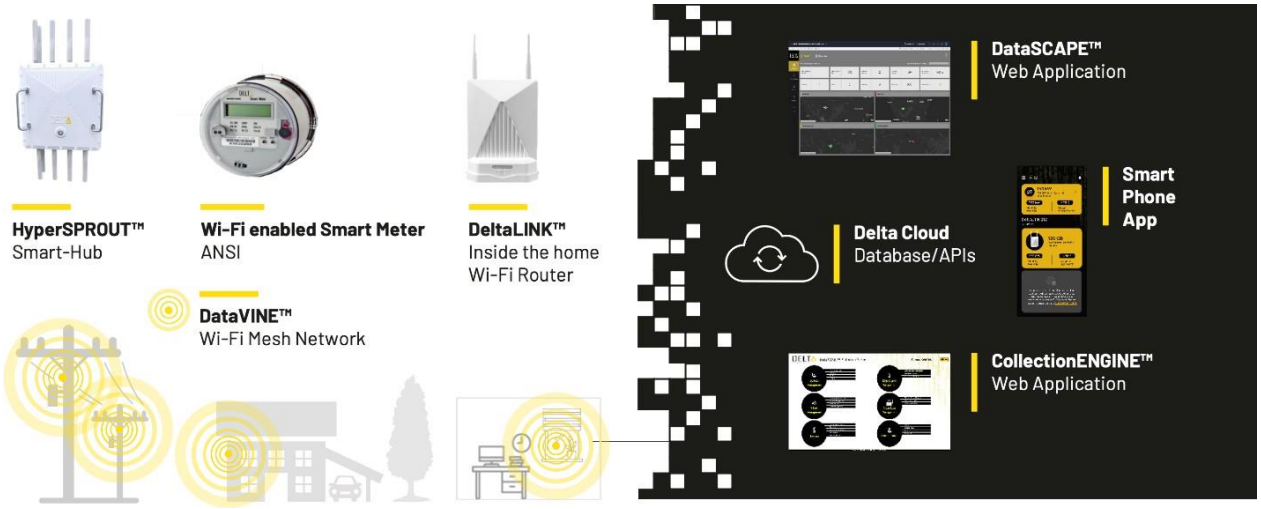

Figure 1 Delta Smart Grid Network (DSGN™)

1.1.2 HyperSPROUT™ & HyperHUB™

Delta's patented HyperSPROUT™ smarthub is a transformer monitoring, networking and backhauling device that forms a ubiquitous, efficient, and flexible Wi-Fi based WWAN mesh, capturing all operational and IoT data. It provides utilities with an effective way to monitor transformer electrical and health characteristics while collecting and collating system-wide electrical performance analytics in real-time. Typical benefits include the identification of energy theft, location of hardware and outage issues, and utility asset health reporting, all while creating a ubiquitous Wi-Fi 6 mesh network.

In companionship with our HyperSPROUT™ smarthub, our HyperHUB™ access point provides additional network build-out capability, where necessary, supplementing our HyperSPROUT™ smarthub in geographically complex and obstruction-rich deployments.

Features:

- Comprehensive data capture, network communication, and Wi-Fi-based WWAN mesh build-out
- Best-In-Class Transformer Monitoring
- Strict ergonomic and human factors focus
- Robust enclosure & packaging

1.1.3 DataVINE™

Delta's DataVINE™ Wi-Fi-based mesh network, included in our HyperSPROUT™ smarthub, DeltaLINK™ router and Wi-Fi mesh card, brings real-time data capability and active IoT device integration wherever there is electricity. Delta's DataVINE™ Wi-Fi mesh card is the world's first Wi-Fi based WWAN Mesh AMI smart metering solution, allowing utilities to maximize operational efficiency and expand into adjacent revenue enhancing business models. Typical benefits include the reduction in call center volume, truck rolls, bill complaints, meter rereads, system failures, and vehicle maintenance.

Features:

- Industry-leading 2.4GHz and 5GHz Wi-Fi-based WWAN mesh architecture
- Proprietary, modular, and universal component design
- Scalable with the DSGN™ infrastructure solution
- Optimized for the DataSCAPE™ analytics platform
- Utilized with the CollectionENGINE™ asset management system
- Multiple levels of network and cloud security

1.1.4 DeltaLINK™

Delta understands that addressing utility grid management and connectivity concerns mandates the realization of local efficiency and broadband commitments. We uniquely champion these commitments through instituting robust grid management while ensuring community Internet connectivity. Our DeltaLINK™ consumer router delivers upon this connectivity as the wireless bridge between our HyperSPROUT™ smarthub and residential/consumer Internet access.

Features:

- Industry-leading 2.4GHz and 5GHz Wi-Fi-based WWAN mesh architecture
- Companion simple, intuitive, and elegant iOS and Android smart applications
- Residence meter power reporting
- Residence DeltaLINK™ data reporting
- Full device operational control
- Multiple levels of network security

1.1.5 DataSCAPE™ & CollectionENGINE™

Our DataSCAPE™ analytics platform and synergistic CollectionENGINE™ asset management system build a single source software capability that provides prediction and identification capabilities with actionable intelligence through an enhanced, geo-spatial graphical user interface (GUI) representations and a robust, secure cloud-based deployment scheme. Collectively, these systems enable utilities to decrease

system costs, increase operational efficiency, and grow revenue. Typical benefits include identification of technical and non-technical losses, real-time asset health notifications, and ensured remote distributed system access and control — aiding in overall revenue enhancement and both pre-emptive and proactive action strategies.

Features:

- Enterprise-enabled "big data" analytics platform
- Industry-leading graphical user interface (GUI)
- Optimized for HyperSPROUT™ smarthub, DataVINE™ Wi-Fi mesh network, and DeltaLINK™ router
- Robust and secure cloud architecture with associated data storage

For more information on Delta, please visit www.deltaglobalnetwork.com.

For more information on Delta's patents, please visit www.deltaglobalnetwork.com/patents.

1.2 About the manual

This user manual provides detailed information on the deltaLINK™ router and its installation.

1.3 Overview

The Delta Smart Grid Network (DSGN™) communications network couples a Wi-Fi based WWAN mesh with an advanced power metering solution to deliver electrical distribution monitoring and pioneering analytics within a robust and secure, cloud-based network. Through this same network, the DSGN™ communications network facilitates a secure Internet delivery scheme to both residential and commercial customers.

1.4 Intended Audience

The user manual addresses the following target groups:

- Field installation technicians and operators
- Maintenance and repair personnel

1.5 Abbreviations

Table 1 Abbrevations

Acronym	Definition
CollectionENGINE™	Delta asset management system
DataSCAPE™	Delta analytics platform
DataVINE™	Delta Wi-Fi mesh network, node, and meter integrated communications card
DeltaLINK™	Delta router, access point, and repeater
DDR	Double Data Rate
DFMEA	Design Failure Mode and Effects Analysis
DSGN™	Delta Smart Grid Network infrastructure solution
EVT	Engineering Validation and Testing
GPS	Global Positioning System
GUI	Graphical User Interface
IoT	Internet of Things
IP67	Ingress Protection or International Protection
LED	Light Emitting Diode
LTE	Long Term Evolution
PCB	Printed Circuit Board
PTS	Production Technical Specification
USB	Universal Serial Bus
Wi-Fi	Wireless Fidelity
TBA	To Be Added

2. Specifications

2.1 Product Specification

Table 2 Product Specification

Features	Description
Electrical	
Input Voltage	• 12 VDC ± 10%
Power Adaptor	• Input Voltage: 100 – 240 VAC, 50 – 60 Hz, Universal Output Voltage: +12VDC • Standard North America NEMA 1-15 Plug
Connectivity and User Ports	
Wi-Fi	• Tri-band Wi-Fi 802.11ax and IEEE 802.11s Mesh • Wi-Fi Radio- 4x4 on 2.4GHz, 4x4 on 5GHz Low (5.15GHz - 5.33GHz), 4x4 on 5GHz High (5.49GHz - 5.85GHz) • Backwards compatibility to 802.11 a/b/g/n/ac
Buttons	• 1x Power ON/OFF • 1x Reset • 1x WPS
LED Indicators	• **Red:** Board Boot-up • **Green**: Mesh Link Status, WPS Switch Activity • **Blue**: Radios are Communicating, Ethernet Link Status • **Yellow:** OTA Upgrade Status
Ports	• DC Power Jack • USB- 3.0 Type-A • Ethernet
Ethernet	• 1G/2.5G/5G/10G – RJ45(Non-PoE)
Environmental	

Features	Description
Operating Temperature	• +0 C to +40 C
Standards	
USA – FCC	FCC Part 15.247, FCC Part 15.407, DFS testing,FCC Part 15B
Europe-CE	EN300 328 WiFi + BT, EN301 893 WiFi 5GHz B1~3, DFS testing, EN301 489-1/-17/-19/-52,EN50385/62311
cETLus	As per IEC 62638 -1
Environmental	IEC 60068-2-2, IEC 60068-2-14, MIL-STD-810(Drop, Shock, Vibration)
Mechanical	
Dimensions (Without Antenna andbracket)	• 180 (L) x 85 (W) x 249 (H) mm
EnclosureMaterial	• ABS Plastic Enclosure Designed for Indoorenvironment
Installation	• Wall Mounting or Desktop
Antenna	
Antenna	• Internal Patch Antenna 4x4 on 2.4GHz • Internal Patch Antenna 4x4 on 5GHz • RP-SMA (Male) 4x4 on 5GHz

The design of product complies with U.S. Federal Communications Commission (FCC) guidelines respecting safety levels of radio frequency (RF) exposure for Mobile devices.

RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

FCC PART 15 STATEMENT

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.

This equipment has been verified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. See 47 CFR Sec. 15.105(b). These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.
Increase the separation between the equipment and the receiver.
Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
Consult the dealer or an experienced radio/TV technician for help.

FCC CAUTION STATEMENT FOR MODIFICATIONS

CAUTION: Any changes or modifications not expressly approved by Delta Energy and Communication, Inc. could void the user's authority to operate the equipment

2.2 Application of the deltaLINK™ Router's WPS

WiFi Protected Setup(WPS) allows a wireless device to connect to the password-protected WiFi without the configuration of a password. WPS is disabled by default to protect the wireless network. The user must first activate WPS when the client is ready to connect. The following describes the Push Button Method (PBC) for WPS activation.

Step 1: To enable WPS:

Method A: Physically bpress and hold the WPS button on the front/back pane.

Method B: From the DeltaLink GUI select the WPS click option on the device configuration page.

Step 2: When WPS is enabled, the LED and WLAN will flash rapidly and synchronously until connected. This connection may take a few minutes.

Step 3: WPS-supported clients can now join the Wi-Fi network by choosing the deltaLINK™ SSID.

Step 4: Without the need for entering the Wi-Fi password, the client device will connect to the deltaLINK™ after a few seconds.

Step 5: When complete and idle, the deltaLINK™ will turn off WPS automatically after a few minutes. From the front panel, you will see the LED of the WLAN interface stop flashing and the LED will flash about once per second.

2.3 Utilization of the DeltaLINK™ Routers USB Port

A USB port is provided in the rear of the deltaLINK™ to support Bluetooth or Zigbee enabled dongles for future home automation activities.

2.4 Utilization of the DeltaLINK™ Routers Ethernet Port

The deltaLINK™ will be used as a Home Router ~~and provided~~ with a 10G Ethernet Port. The Ethernet port acts as a LAN side connector and provides~~ing~~ internet access for wired clients over the LAN such as laptops, desktops, printers, and similar.

Finding the Product Identity, Represented in Figure 2

Figure 2 Indication of Product Label

The serial number label contains the following information:

- Model number, such as DEC-H-H-003-10.
- Serial number, such as YYMMCCCCSSSSS (2103714002598) (11 alphanumeric digits).

The serial number format is shown below with an example:

Serial no format - YYMMCCCCSSSSS

YY- First two digits correspond to year of manufacturing

MM- Next two digits correspond to the month of manufacturing

CCCC- Customer and device-specific, 4-digit code

SSSSS -Serial number of that month

Example:-

2103714002598

21 – the year 2021

03 – month March

7140 – Customer and device-specific code

02598 – Serial number of that month

The deltaLINK™ router MAC address is located under the serial number on the back of the device. For example, 68BDABF54600 (12 hexadecimal digits).

Use the specific device's serial number when requesting support from Delta Energy & Communications, Inc.

3.1 Installation Flow

The following steps show the process for installing the deltaLINK™ router, Represented in Figure 3:

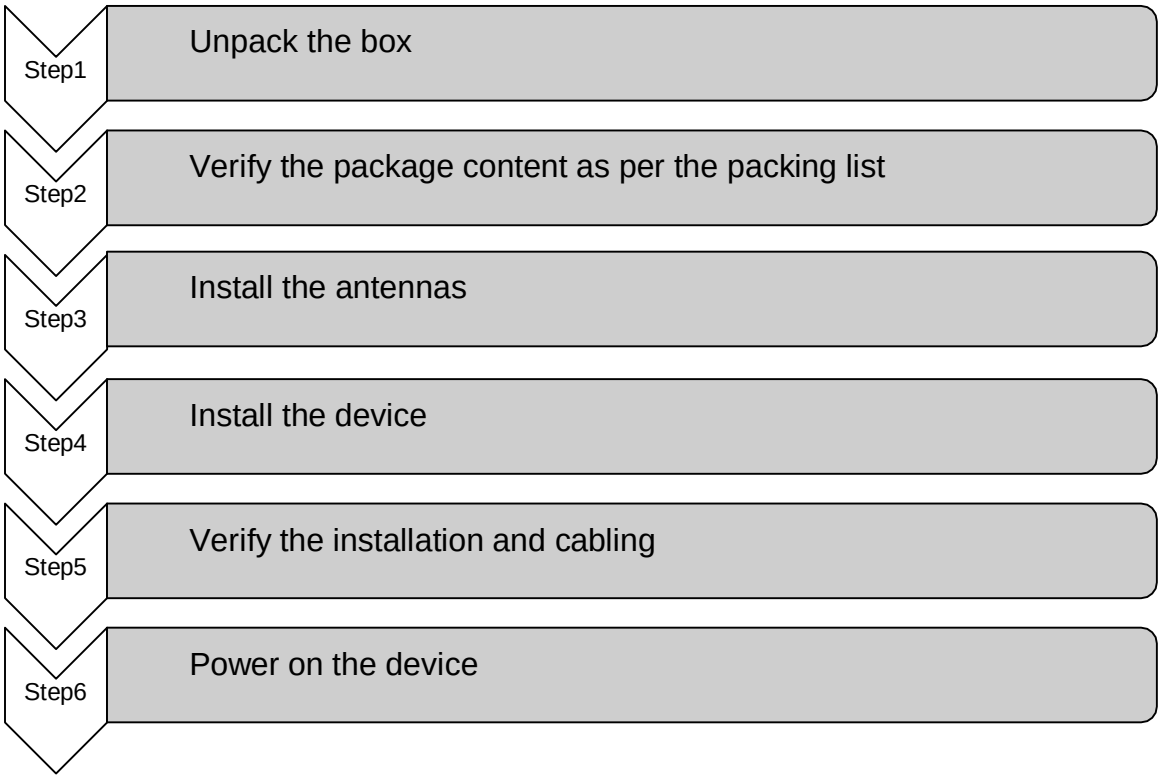

Figure 3 Installation Flow

3. Installation

3.2 Step 1. Unpack the Box

Before unpacking, ensure that the box has not been damaged during shipment or is wet. Stop unpacking if the equipment is rusted or wet. If product is damaged or wet, investigate the causes and contact the supplier.

Unpack the box.

After unpacking, check the items in the box against the packing list. If any item(s) are missing, contact the supplier or agent.

3.3 Step 2. Verify the Package Contents

Package contains the following items as represented in Figure 4:

A. deltaLINK™ router - 1 each
B. Whip Antenna - 4 each
C. External Antenna - 1 each
D. RPSMA Cable Assembly Variant-2 - 4 each
E. Power Adapter - 1 each
F. Fischer Wall Plugs for Number 6 X 1-1/2" screws - 2 each
G. Phillips Pan Head, Number 6 X 1-1/2" - 2 each
H. Wall Mounting Bracket - 1 each
I. Thumb Screw - 2 each
J. User Manual - 1 each

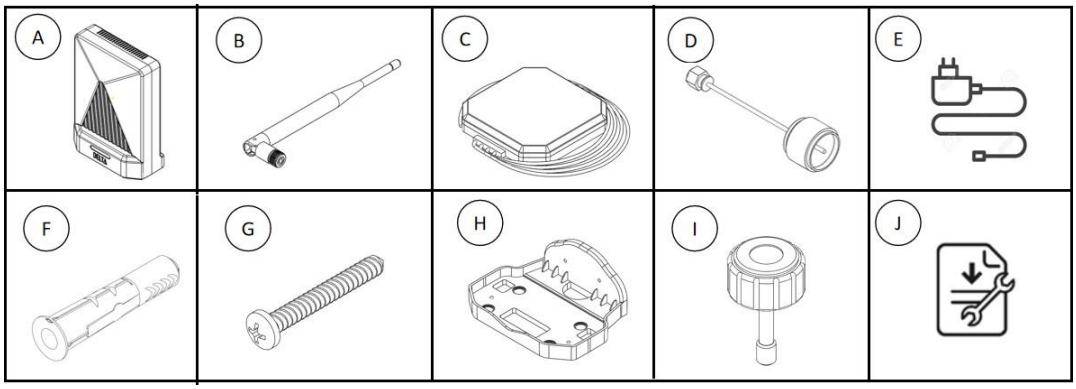

Figure 4 Package Contents

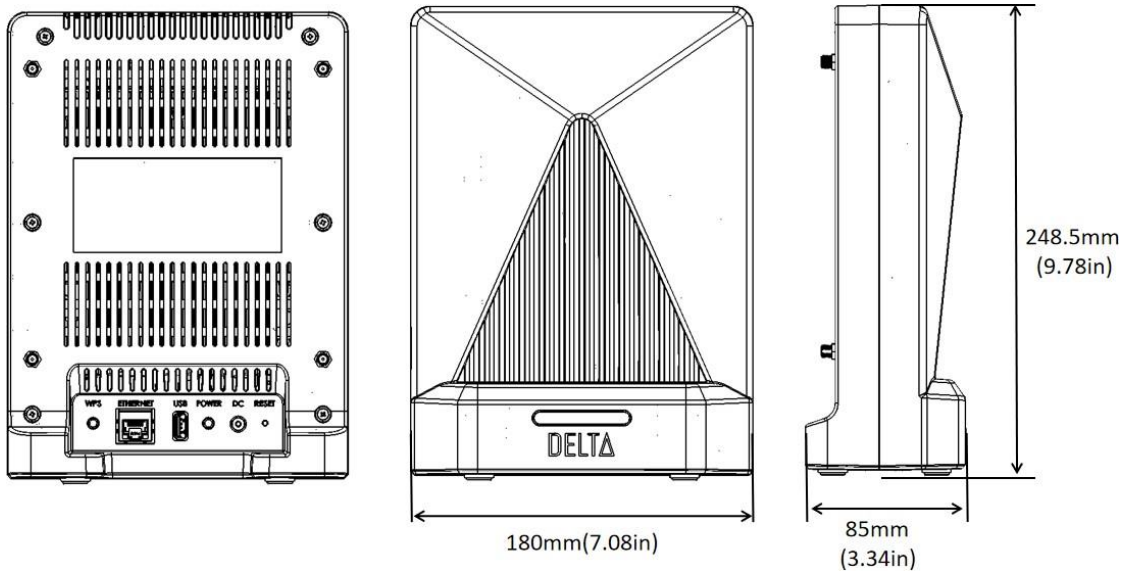

Figure 5 deltaLINK™ Device Dimensions

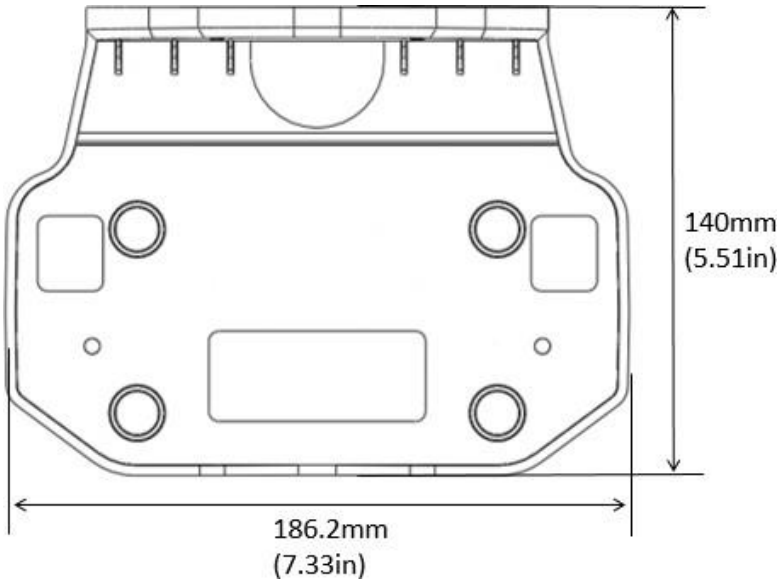

Figure 6 Mounting Bracket Top View

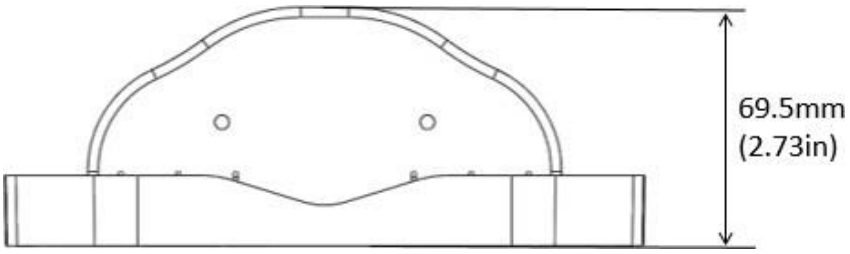

Figure 7 Mounting Bracket Front View

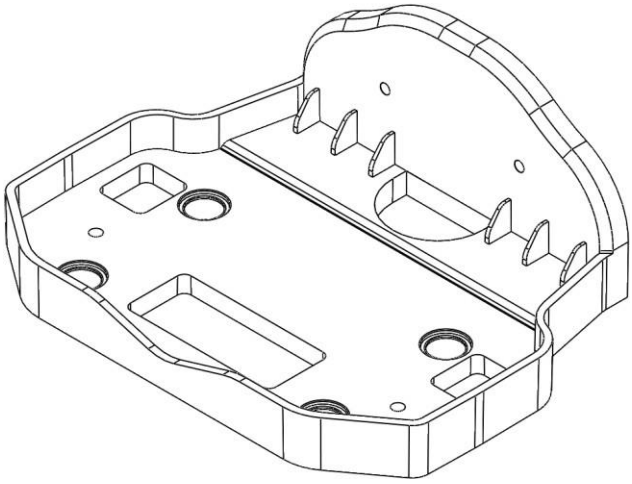

Figure 8 Mounting Bracket Side Angled View

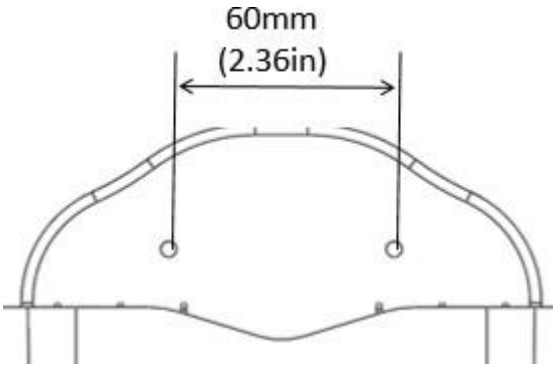

Figure 9 Mounting Bracket Bottom View

3.4 Step 3. Install the Antennas

3.4.1 Selection of Appropriate Antenna Configuration

The deltaLINK™ router has two alternative antenna configurations:

A. 4 individual whip antennas (applicable for desk mounting)

B. A single external antenna assembly (applicable for wall/window mounting)

[For Antenna Selection in GUI, Refer to Section 5.4]

The decision on which configuration to install is based on the availability of a suitable deltaLINK™ router location next to or close to a window with line-of-sight to a HyperSPROUT™ smarthub or HyperHUB™ access point.

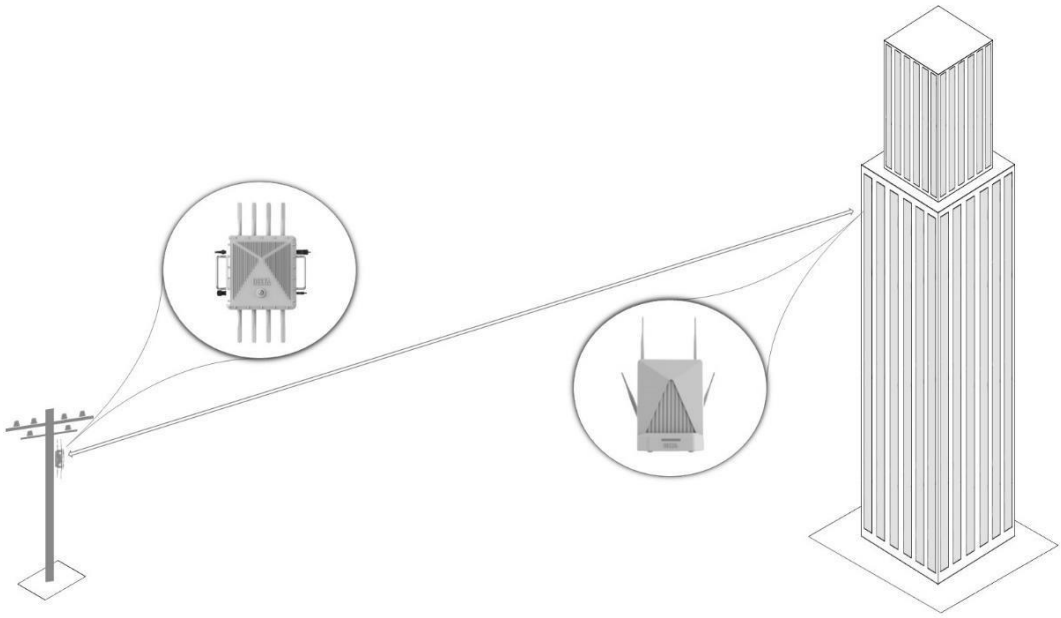

Figure 10 Line of Sight from hyperSPROUT/hyperHUB to deltaLINK

3.4.2 Individual Whip Antenna Installation

a) Locate the 4 antennas (Item-B).

Connect each antenna (Item-B) to the panel mount SMA connectors on the back of the device (Item-A) as shown in Figure 11. Tighten by hand. Be sure not to over-tighten the antenna.

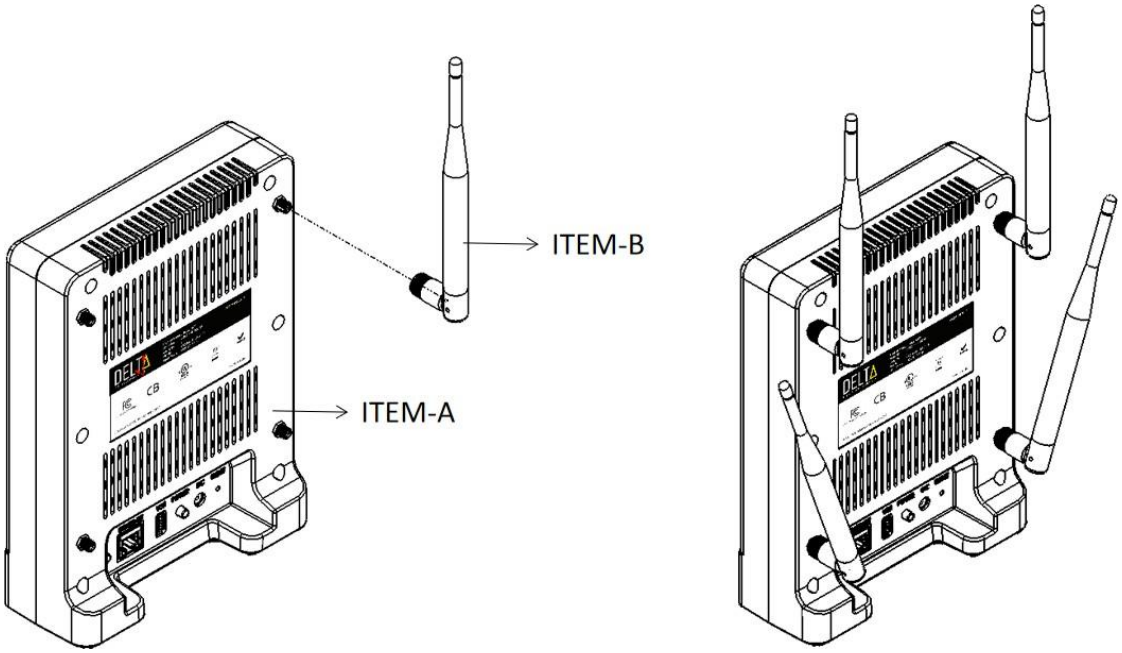

Figure 11 Whip Antenna Assembly on deltaLINK

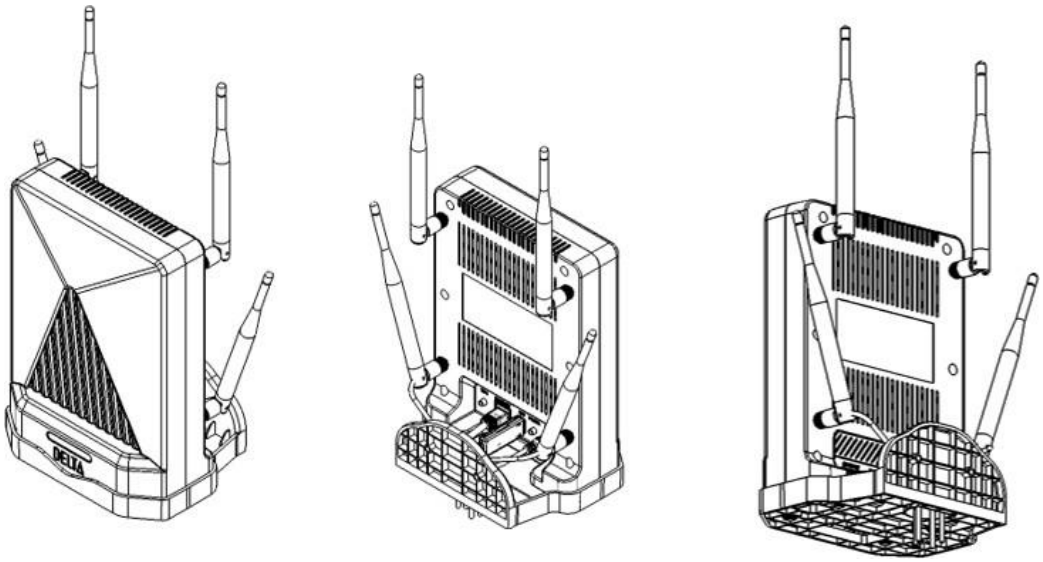

Figure 12 deltaLINK Mounting Bracket Representation

3.4.3 External Antenna Installation

WARNING

USE CAUTION WHEN INSTALLING THE EXTERNAL ANTENNA ONTO GLASS. POTENTIAL DAMAGE TO THE WINDOW GLASS OR INJURY FROM BROKEN GLASS MAY OCCUR IF CARE IS NOT TAKEN.

a) Locate the external antenna assembly (Item-A and Item-D).
   Note: If mounting the deltaLINK™ router to the wall bracket, do not install the cabling to the device until routing all of the cabling though the bottom of the wall bracket as shown in Figure 12. See section 3.5 for wall mounting instructions.
b) Connect the RPSMA cable assembly (Item-D) to the panel mount SMA connector on the device (Item-A) as shown in Figure 13. Tighten by hand. Be sure not to over-tighten the antenna.
c) Repeat same steps for all 4 locations on the device.

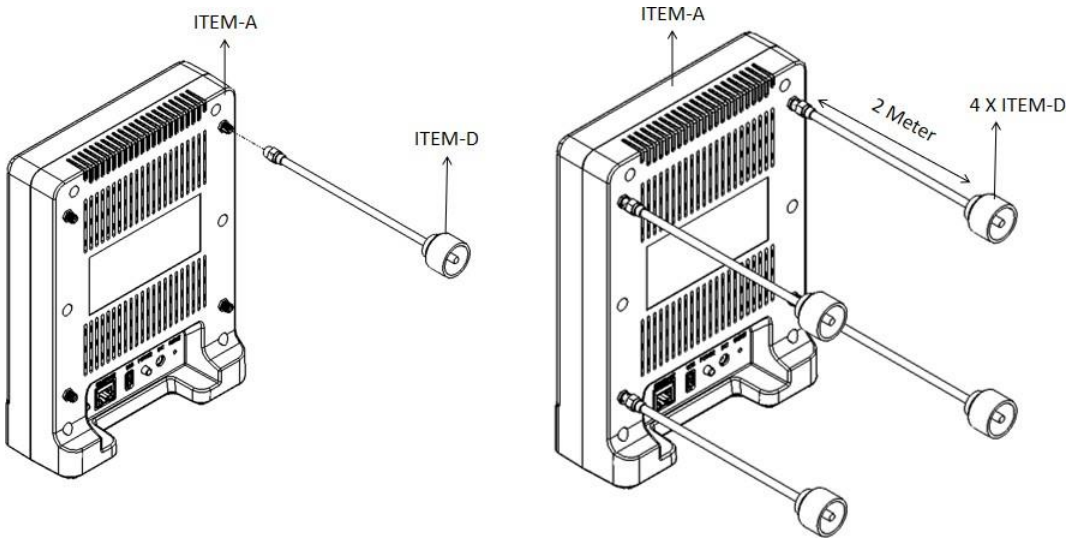

Figure 13 External Antenna Cable Installation - 1

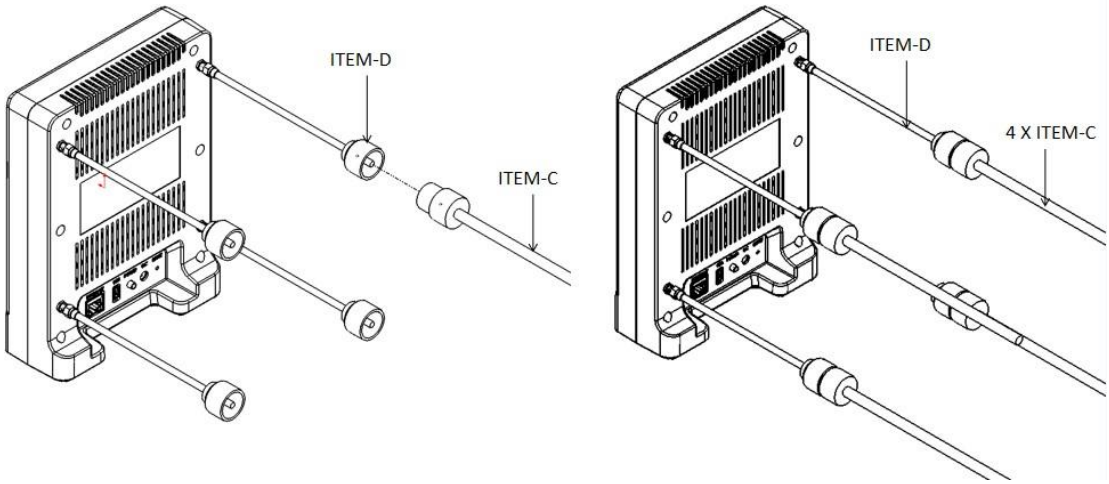

Figure 14 External Antenna Cable Installation - 2

d) Connect other end of the cable assembly (Item-D) to the N-type mating connector on the external antenna (Item - C) as shown in Figure 14.
e) Repeat the same steps for all (4) cable connections.
f) Locate a window that has line of sight to either a hyperSPROUT™ smarthub or hyperHUB™ access point and has a close electrical outlet available.
g) Peel off the outer cover layer of the sticky tape on the back of the external antenna and stick to the glass surface as shown in Figure 16.

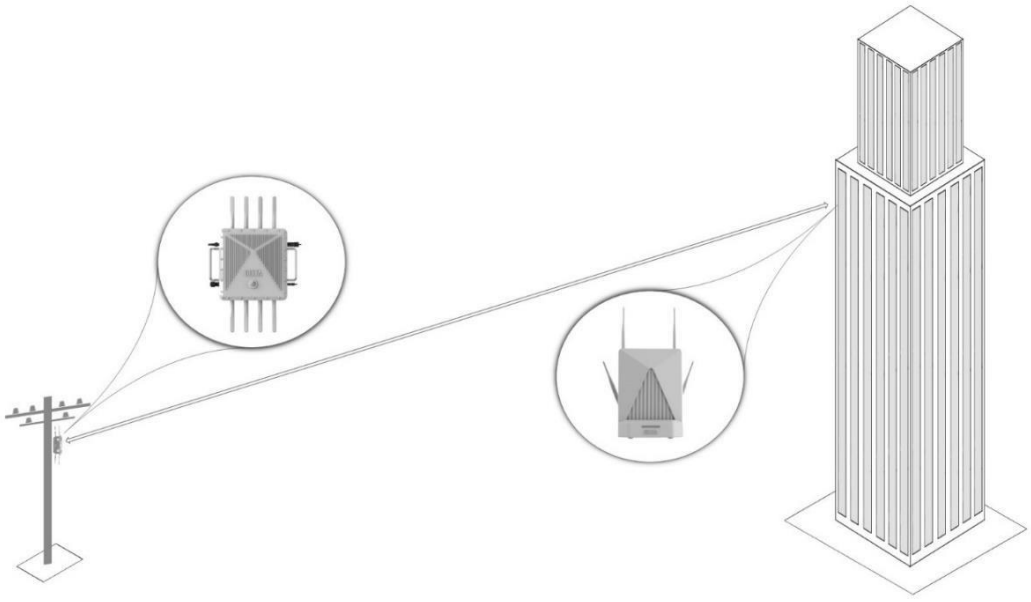

Figure 15 Line of Sight from HyperSPROUT/HyperHUB to DeltaLINK

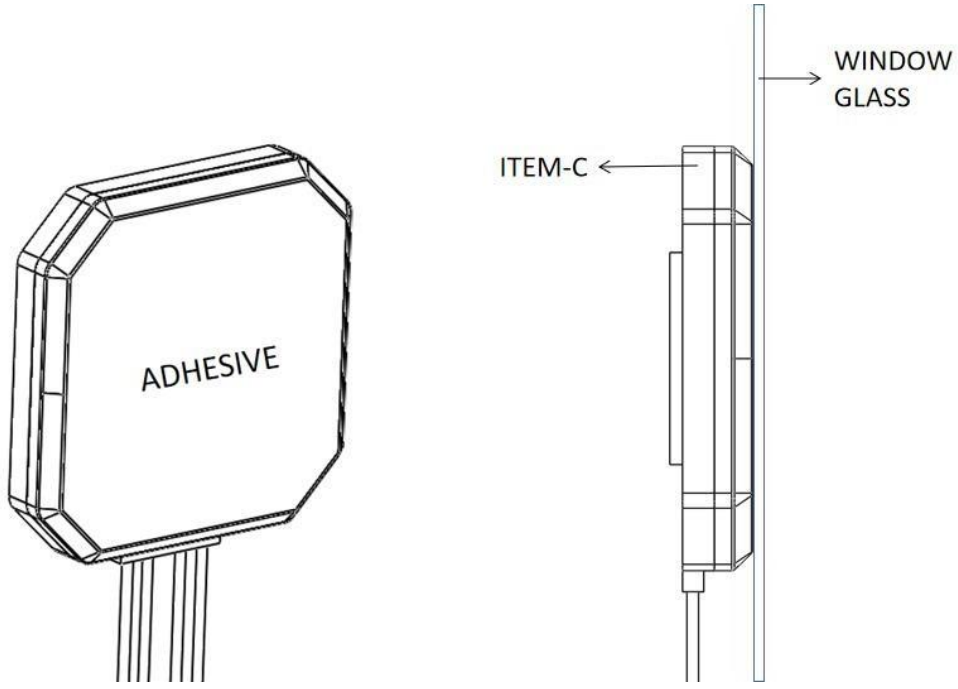

Figure 16 DeltaLINK External Antenna Installation in Window

3.5 Step 4. Install the Device

The deltaLINK™ router can be placed on a flat surface or attached to the wall with a bracket. Follow the instructions below for mounting the device on a wall.

a) Locate the wall mounting bracket (Item-H).

b) Find a location on a wall that has proximity to a window and is near an electrical outlet. Make sure the power adaptor will reach the bracket and connect to the deltaLINK™ router. Do not place the deltaLINK™ router or adapter in a wet environment.

WARNING

POTENTIAL DAMAGE TO STRUCTURE OR ELECTRIC SHOCK

Before installing any holes or fasteners into a wall, make sure there are no utilities behind the wall that could be damaged or cause injury, such as electrical wiring. Do not install near a source of water.

Failure to follow these instructions may result in death, serious injury, or damage to the structure.

c) Once the location on the wall has been verified, hold the bracket on the wall and mark the 2 mounting hole locations on the wall. See Figure 17. Based on the material of the wall (drywall/wood/plaster/etc.), install the bracket to the wall with the appropriate 2 fasteners.

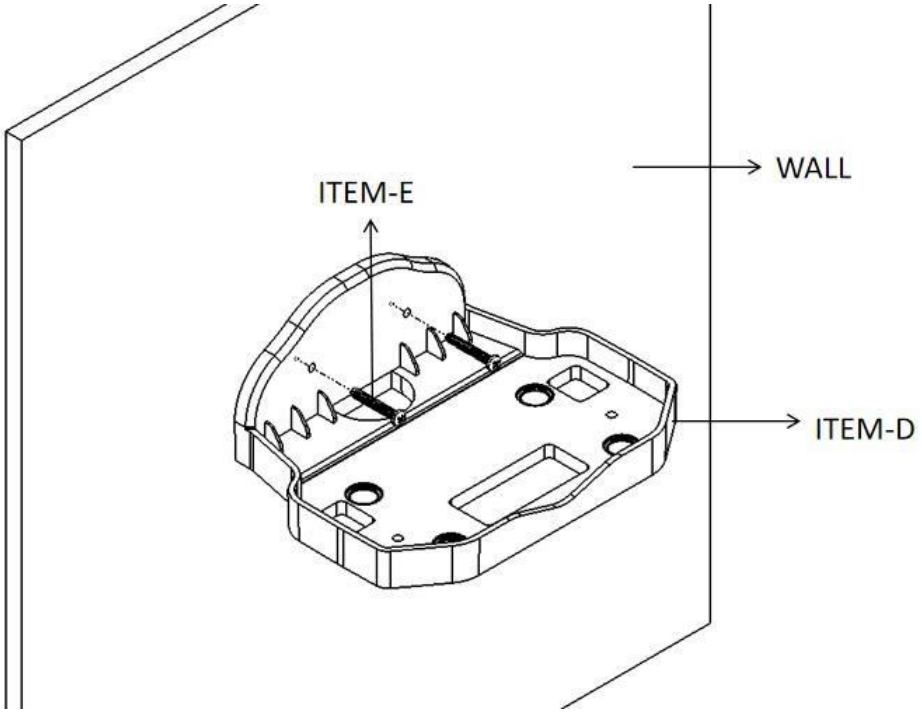

Figure 17 DeltaLINK Mounting Bracket Installation

d) Locate the deltaLINK™ router and 2 mounting screws (Item-A and Item-I).

e) Route all cabling through the bottom of the wall bracket before connecting to the deltaLINK™ router and securing the deltaLINK™ router to the wall bracket as shown in Figure 18 and Figure 19.

f) Connect all applicable wiring to the deltaLINK™ router, including Ethernet, USB, external antenna (Item-C), and power adapter (Item-E).

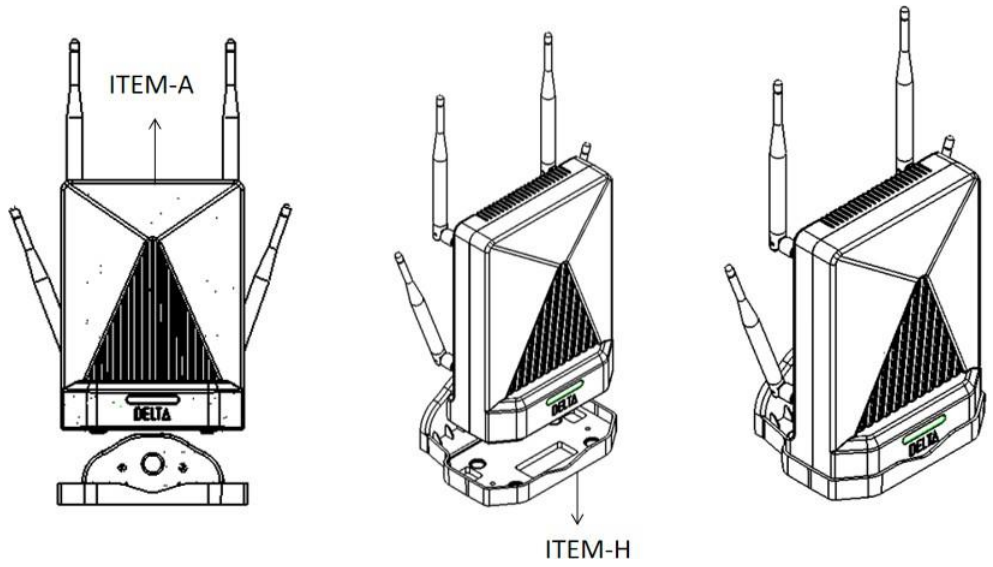

Figure 18 deltaLINK Placement on Wall Mounting Bracket - 1

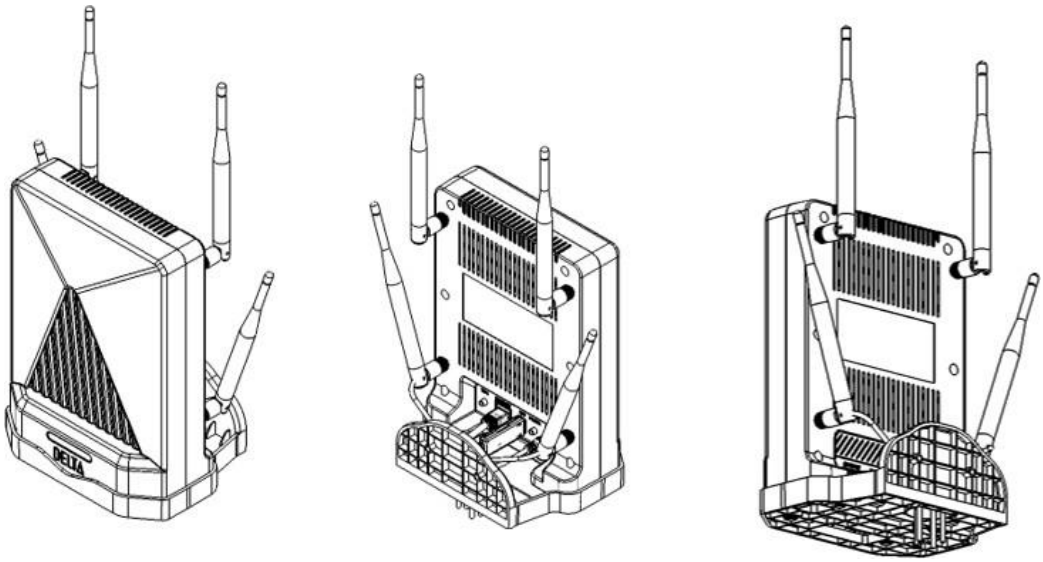

Figure 19 deltaLINK Placement on Wall Mounting Bracket - 2

.

g) Align the holes and tighten the 2 thumb screws (Item I) through the bottom of the bracket and into the deltaLINK™ router as shown in Figure 20, along with the wall mounting bracket (Item-H) and product (Item-A) as shown. Tighten by hand only.

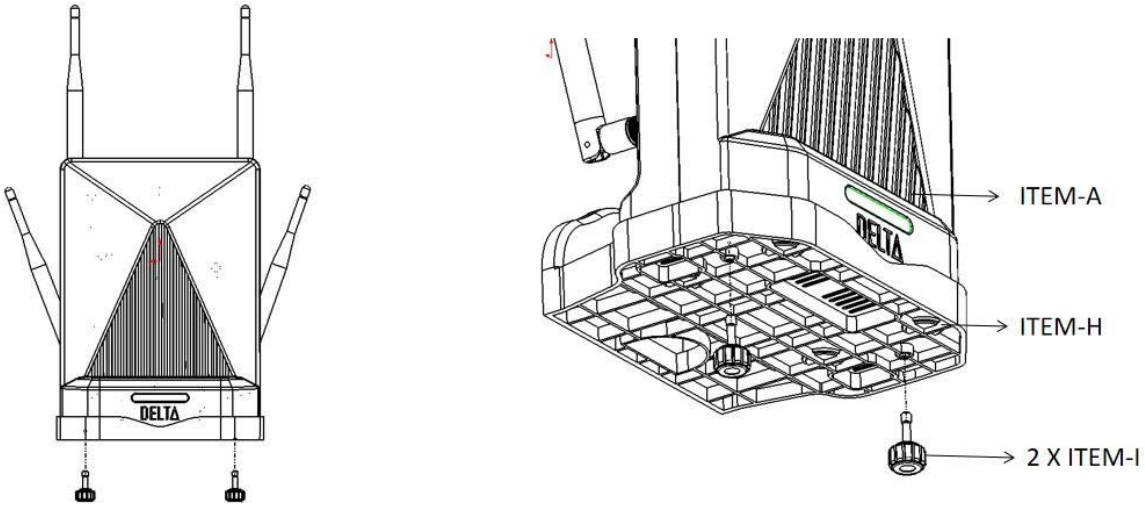

Figure 20 deltaLINK Placement on Wall Mounting Bracket - 3

3.6 Step 5. Verify the Installation and Cabling

Post installation, ensure that all cabling is secured on the back of the device, including the power cord (Item-E), ethernet cable, and antenna cabling (Item-C) (if external antennas were selected).

Remember to validate line-of-sight of the deltaLINK™ router to a hyperSPROUT™ smarthub or hyperHUB™ access point.

3.7 Step 6. Power On the Device

Press the power button once on the back of the device and wait untill the LED in the front Glows. Once the LED Glows, the device is completely powered ON.

The power button on the device is as represented in Figure 21.

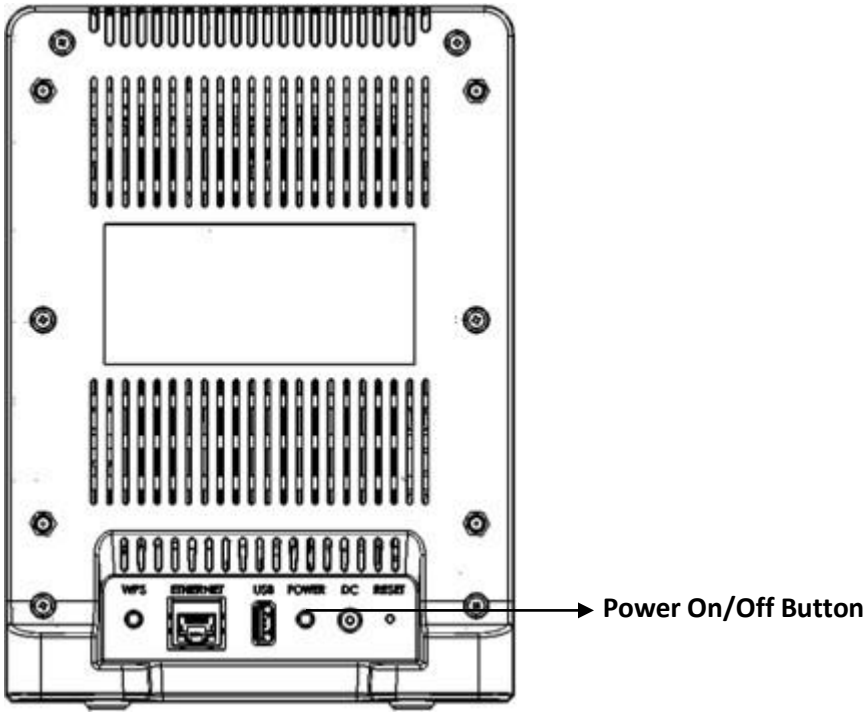

Figure 21 deltaLINK Power Button

4. Operations & Troubleshooting

4.1 Powering ON

Connect the power adapter to the 120VAC electrical outlet on the deltaLINK™ router. During the power on condition, the LED indication will steadily glow **Red**.

As soon as the deltaLINK™ radios begin communicating, the LED indication will steadily glow **Blue**.

When the mesh network is established, the LED indication will steadily glow **Green** and indicate that the deltaLINK™ router is functioning properly.

4.2 Operation - LED Indication

The below table shows the LED operational descriptions for the deltaLINK™ router at various stages:

Table 3 LED Indication

Item	State	LED Color		Glowing pattern	Duty cycle
1	Board boot-up	Red		Always active	Not applicable
2	Wi-Fi manager started and radios are down	Red		Blinking (moderate)	ON - 500ms OFF - 500ms
3	Radios are communicating	Blue		Always active	Not applicable
4	Mesh linkage status	Green		Always active	Not applicable
5	OTA upgrade status	Yellow		Always active	Not applicable

Item	State	LED Color	Glowing pattern	Duty cycle
6	WPS button activity status	Green	Blinking (moderate)	ON - 500ms OFF - 500ms
7	Ethernet link status and mesh activity status	Blue	Blinking (moderate)	ON - 500ms OFF - 500ms

4.3 Troubleshooting

If the deltaLINK™ router is not functioning properly, use the troubleshooting functions available in the collectionENGINE™ asset management system before resetting in the field. The device can be reset either manually in-field or remotely by using the collectionENGINE™ asset management system.

To reset the deltaLINK™ manually, follow the directions below. Note that the reset switch is to the rear of the deltaLINK™ device, on the lower right (when viewing the back of the device) and located in a small hole. The reset switch must be accessed with a tool (paperclip or similar device).

a) Perform a reboot by pressing the reset pin switch for 0-10 seconds (see Figure 22).

b) If a reboot does not restore functionality, perform a factory reset by pressing the reset switch for 10-20 seconds.

c) If the factory reset does not correct the function, contact the supplier or agent, or replace the deltaLINK™ router.

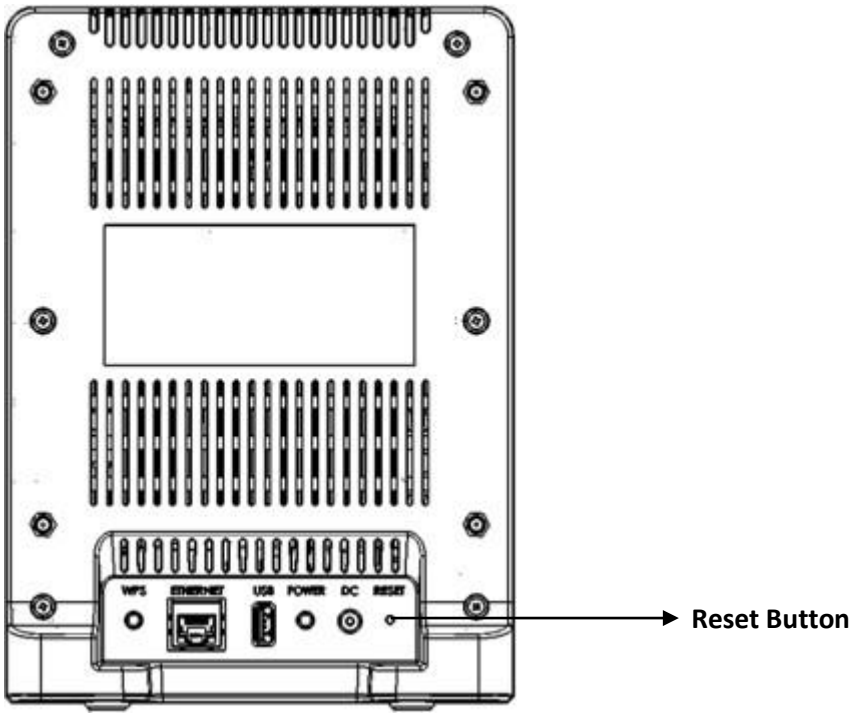

Figure 22 deltaLINK Reset Pin

5. LOCAL GUI

5.1 Local GUI

This section explains the Local GUI interface details for the deltaLINK™ router.

IMPORTANT: Upon initial commissioning of the deltaLINK™ router using the Local GUI, the installer is strongly advised to lock the device's local GUI interface using the collectionENGINE™ asset management system. This locking prevents any un-authorized user from gaining local control of the device via the Local GUI. Note that configuration changes to the deltaLINK™ router may still be processed remotely using the collectionENGINE™ asset management system after performing this lock.

5.2 deltaLINK™

a) Connect a laptop with default provisioning SSID (ex: DeltaLink_XX:XX:XX:XX:XX:XX).

b) Type the default device IP address in the browser https://192.168.10.1

c) After giving the default IP address, the browser will redirect to the login page as shown in the Figure 23 below.

d) Enter the following user name and password to login into the device.

- User Name: root
- Password: delta123

e) After Entering the "User Name" and "Password" press the "LOGIN" button.

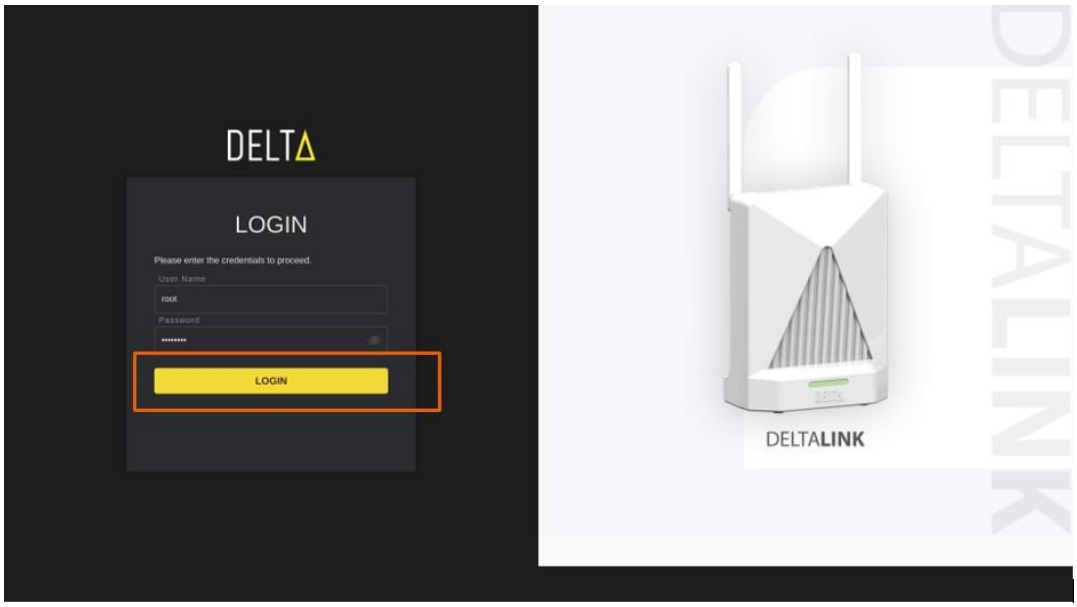

Figure 23 deltaLINK Login Page

f) Logging in with the correct user name and password will redirect to the setup wizard page.

5.3 Setup Page

a) Once in the Wizard page, select the appropriate "Country" and "Time Zone" from the drop-down menus and click "SAVE," as shown in the Figure 24 below.

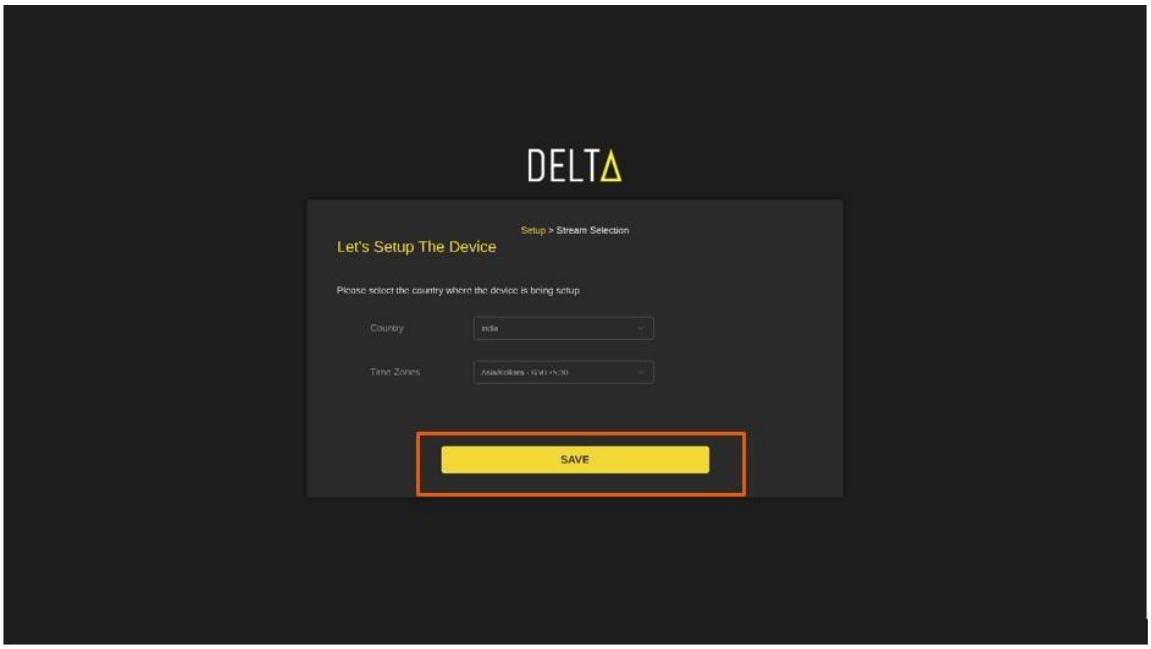

Figure 24 deltaLINK Setup Page - 1

b) The GUI will then redirect to the "Role" selection page. The "Role" sets the primary function for the deltaLINK™ router being configured.

c) For configuring as the primary router click "Connect to DataVine". For configuring as the secondary router, establishing a mesh with the primary router, click "Add an Extender", As shown in the Figure 25.

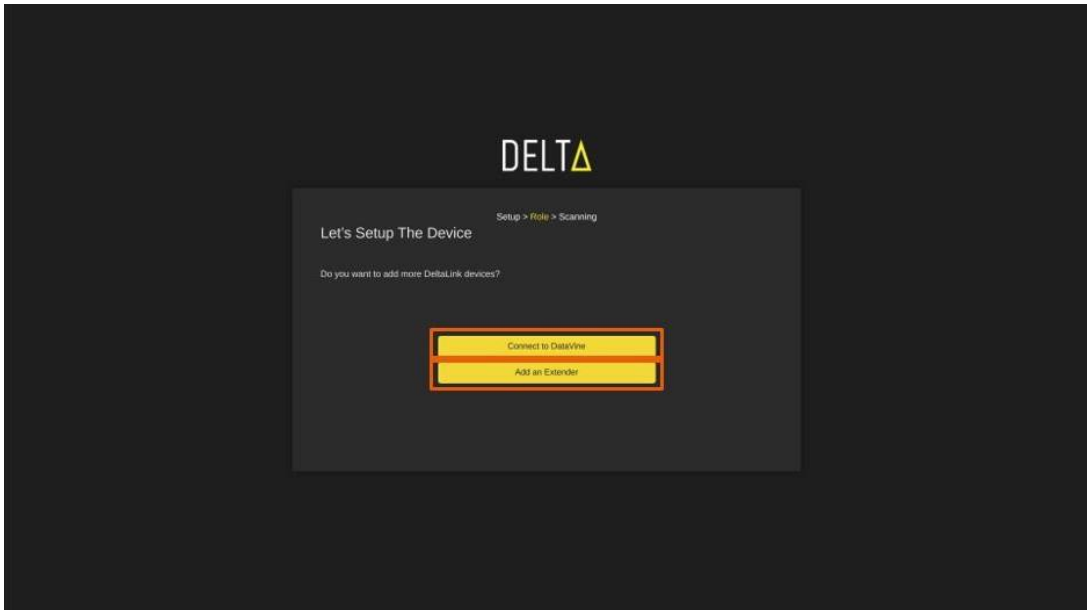

Figure 25 deltaLINK Setup Page - 2

d) After selecting the role, the GUI will redirect to the "Scanning" page.

e) Click on "SCAN" to view available mesh neighbor devices, As shown in the Figure 26.

f)

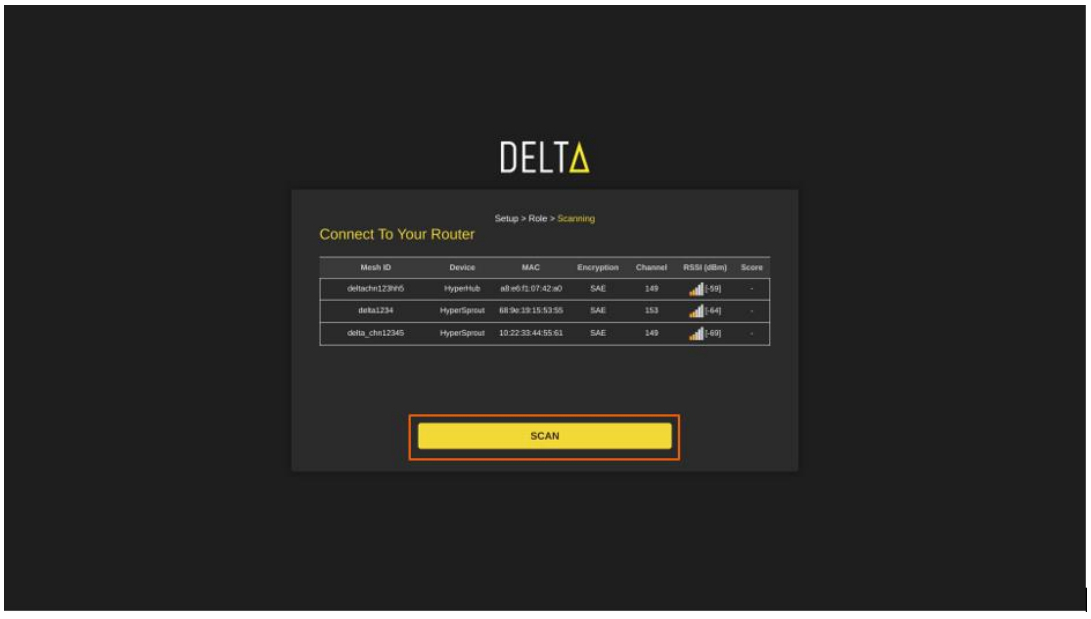

Figure 26 deltaLINK Setup Page - 3

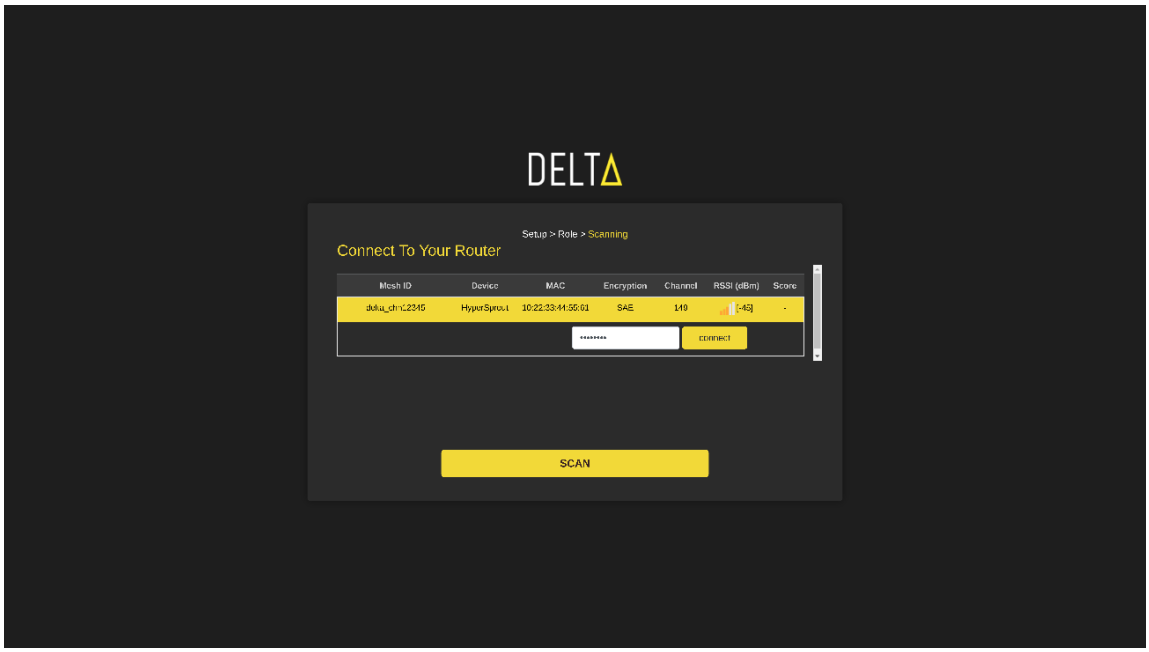

Figure 27 deltaLINK Setup Page - 4

g) The scan results will show the score for all available devices based on the RSSI (dBm) and other parameters. Select the device to connect as shown in the Figure 27. It is best to select the appropriate device with an RSSI (dBm) closest to zero.

5.4 Antenna Selection page

a) On the "Scanning" page, if the device selected for mesh connection has a signal strength RSSI (dBm) less than -75dBm (i.e., -74dBm is a good RSSI), the GUI will open a pop-up window to allow the user to select a different deltaLINK™ antenna.

b) To improve RSSI (dBm) from the selected device, the user may vary the antenna connection, as described in the following steps. Note the prior summary and figure which indicated that the deltaLINK™ router should be located in or near a window that has line of sight to either a hyperSPROUT™ smarthub or hyperHUB™ access point.

c) Click "Next" to view the type of antennas which may be connected as shown in the figures below (Figure 28 & Figure 29).

d) Once the desired antenna(s) are connected select "Done" to proceed.

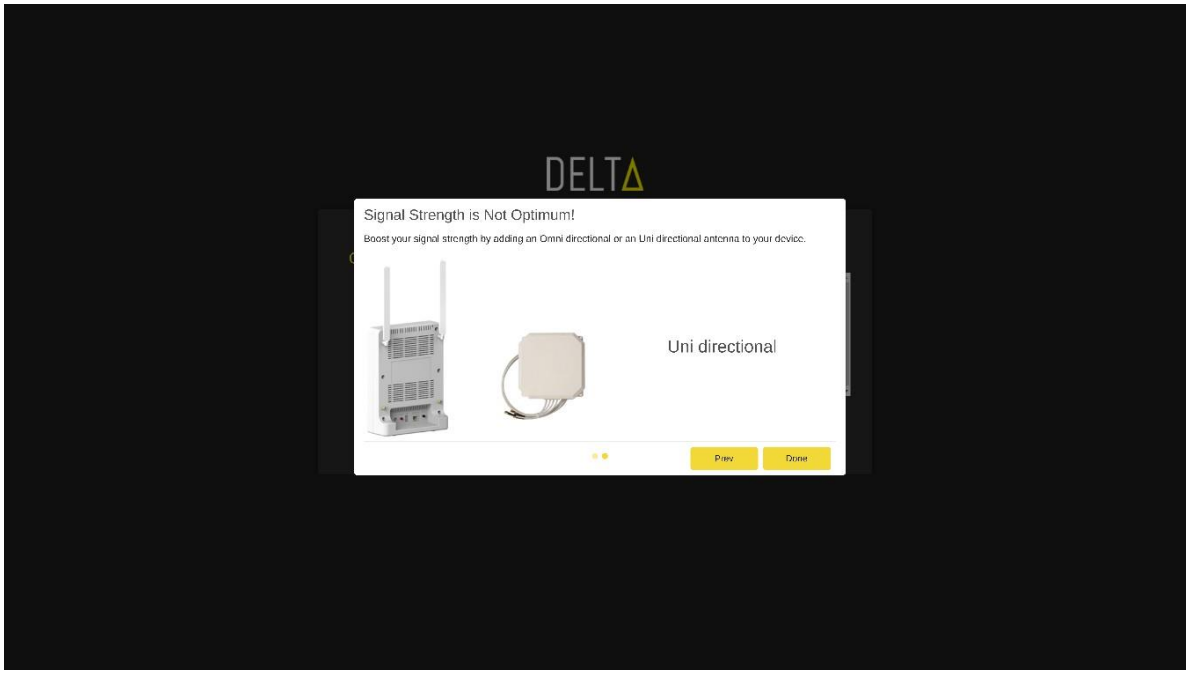

Figure 28 Antenna Selection - Uni Directional

Figure 29 Antenna Selection - Omni Directional

Note: The operator/user can connect 4 antennas of the same type to the device based on their local requirement. The figures are shown for

illustration purposes only. There are two primary antenna configurations for selection: 1 external antenna with four wires or 4 individual omni directional whip antennas which must be connected individually as noted. Note the prior two figures as examples of these two types of configurations. In most cases, the proper antenna configuration will be a function of the location of the deltaLINK™ router and its ability to access a window for line-of-sight visibility to the selected mesh connection device either a hyperSPROUT™ smarthub or a hyperHUB™ access point.

5.5 Dashboard

After selecting the appropriate mesh connection device from the scan results, the GUI will redirect the user to the "Dashboard" page. This page will show the "Device Name", "HyperSprout link status", wireless "MAC Address", and "No. of Extenders connected". Note the following Figure 30.

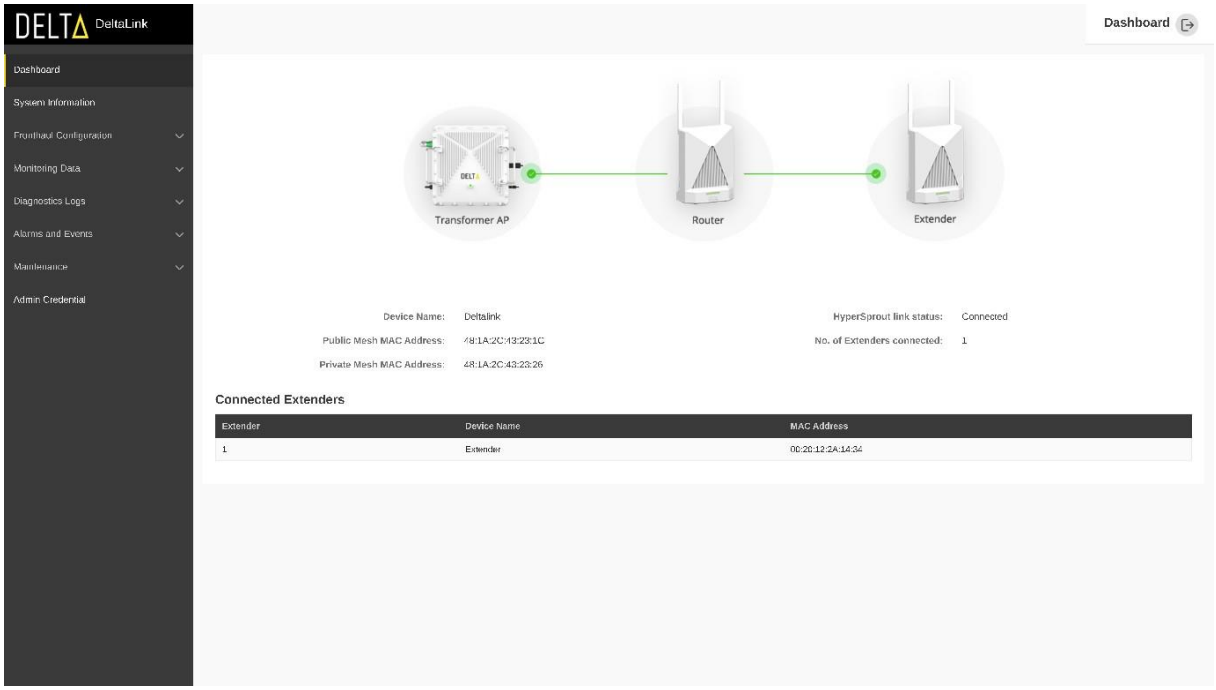

Figure 30 Dashboard

5.6 System Information

a) The "System Information" page contains following device information:
   - System Name

- Serial No.
- Ethernet MAC Address
- Wireless MAC Address for 2.4GHz
- Wireless MAC Address for 5GHz
- Country
- Timezone
- Current Firmware Version
- Backup Firmware Version
- Current Date & Time
- UpTime
- Cloud Status
- Radio
- Antenna
- Wireless mode
- Channel

f) The "System Information" page also contains information regarding the "Wireless Settings" as shown in the below Figure 31.

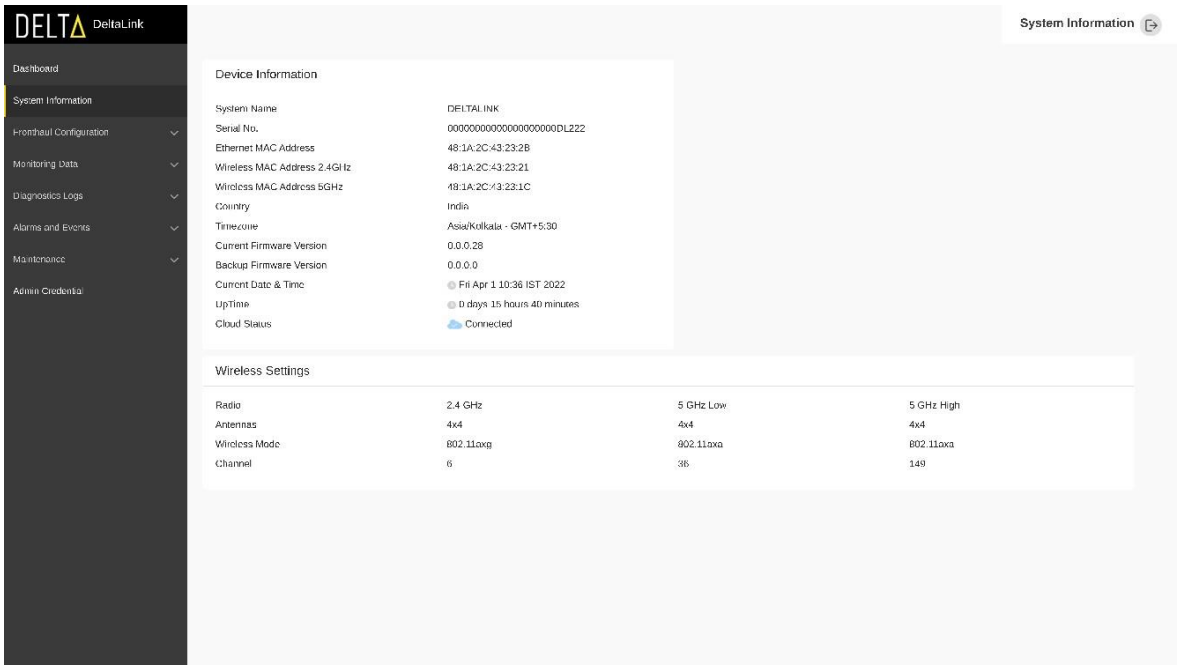

Figure 31 Device Information

5.7 Fronthaul Configuration

The "Radio Configuration", the "Mesh Configuration", the "Hotspot Configuration", and the "DHCP Server Configuration" can be accessed and modified in the "Fronthaul Configuration" section.

5.7.1 Radio Configuration

a) To view/modify the radio configuration, navigate to "Fronthaul Configuration" and select "Radio Configuration" from the expanded menu. Note the Figure 32 below.

b) On the "Radio Configuration" page, you can configure the following radio related parameters 2.4GHz, 5GHz (Low), and 5GHz (High):

- Radio Mode
- Channel Width
- Channel
- Transmit Power
- Guard Interval
- Stream Selection

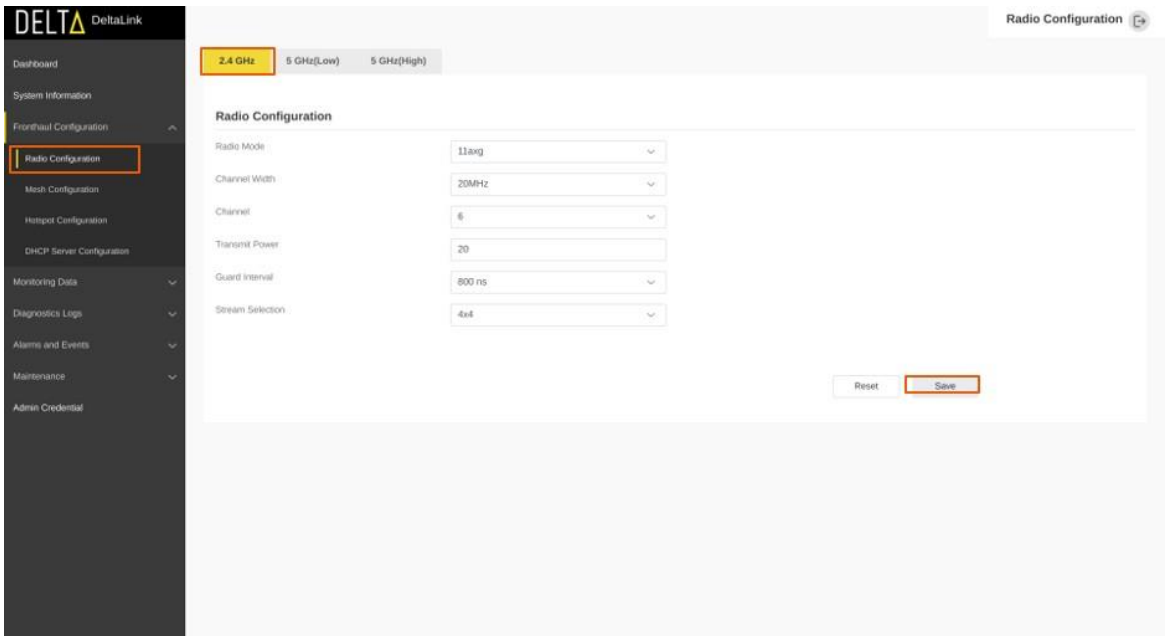

Figure 32 Radio Configuration

5.7.2 Mesh Configuration

a) To view/modify the mesh configuration, navigate to "Fronthaul Configuration" and select "Mesh Configuration" from the expanded menu. Note the figure below. On the "Mesh Configuration" page, you

can configure the "Mesh Profile" and "Add Private Mesh Vap" configure the Mesh ID to Extender). (

b) To "Configure Mesh Profile" select the 5GHz(High) tab. Click "Scan" and connect to the available device as shown in the Figure 33.

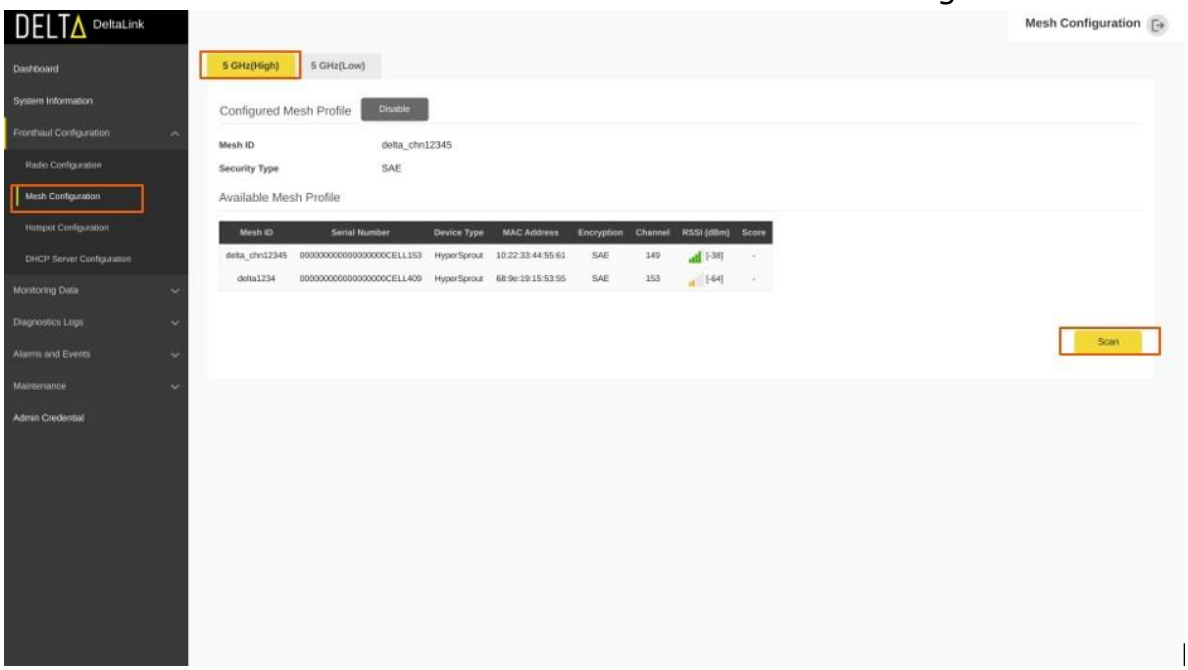

Figure 33 Mesh Configuration 5GHz High

c) To "Add Private Mesh Vap" select the 5GHz(Low) tab.

d) On this page, the user can configure the "Mesh ID", "Encryption Type", and "Pre-shared Key".

e) Select "Save" to apply the configurations as shown in the below Figure 34 .

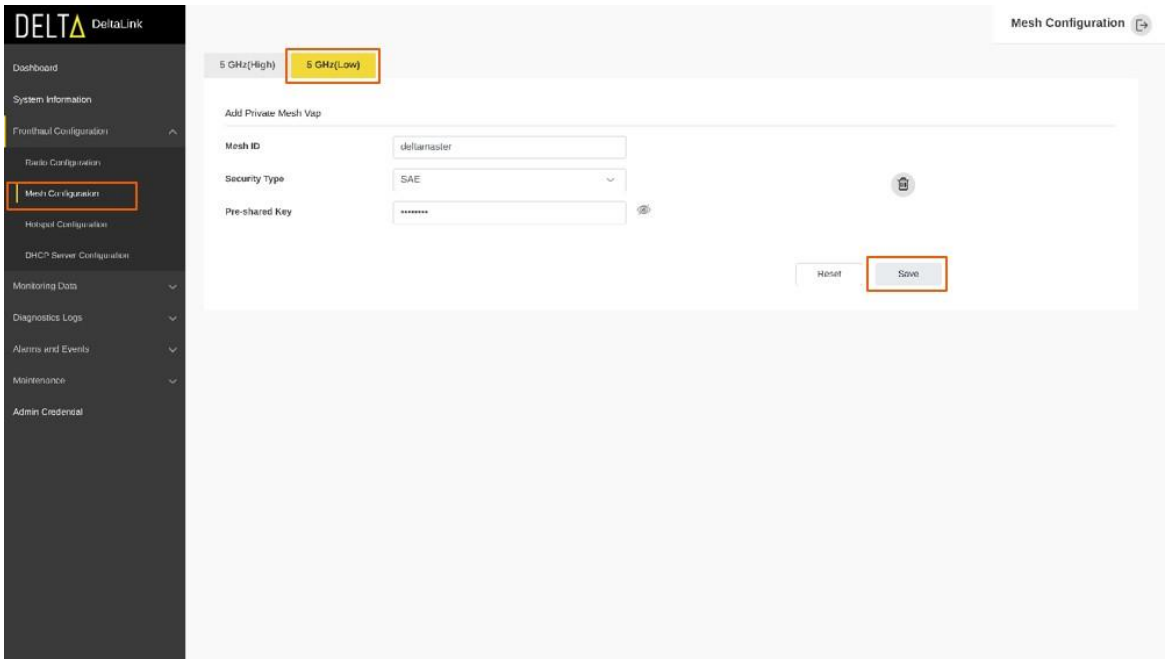

Figure 34 Mesh Configuration 5GHz Low

5.7.3 Hotspot Configuration

a) To view/modify the hotspot configuration, navigate to "Fronthaul Configuration" and select "Hotspot Configuration" from the expanded menu. Here you can configure 2.4GHz and 5GHz SSID connections.

b) To configure 2.4GHz SSID connections, select the "2.4 GHz" tab as shown in the Figure 35 below.

c) By default, the "Hotspot Configuration" in the "2.4 GHz" tab is set to the noted provisioning SSID.

d) Create a new "Guest Network" SSID by clicking the "+" icon and configuring the SSID and "Wireless Security" mode (OPEN / WPA2-PSK) as desired.

e) Then, select "Save" to apply the configuration as shown in the below Figure 35 and Figure 36. The device now broadcasts the configured SSID.

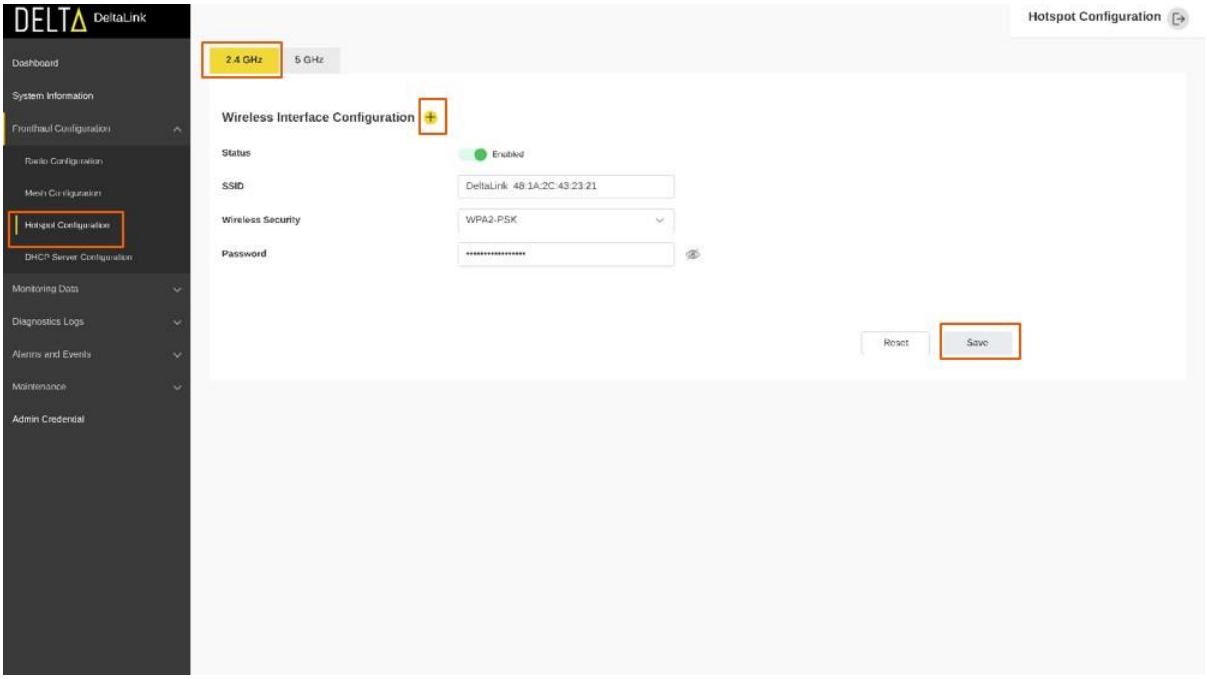

Figure 35 Hotspot Configuration 2.4 GHz - 1

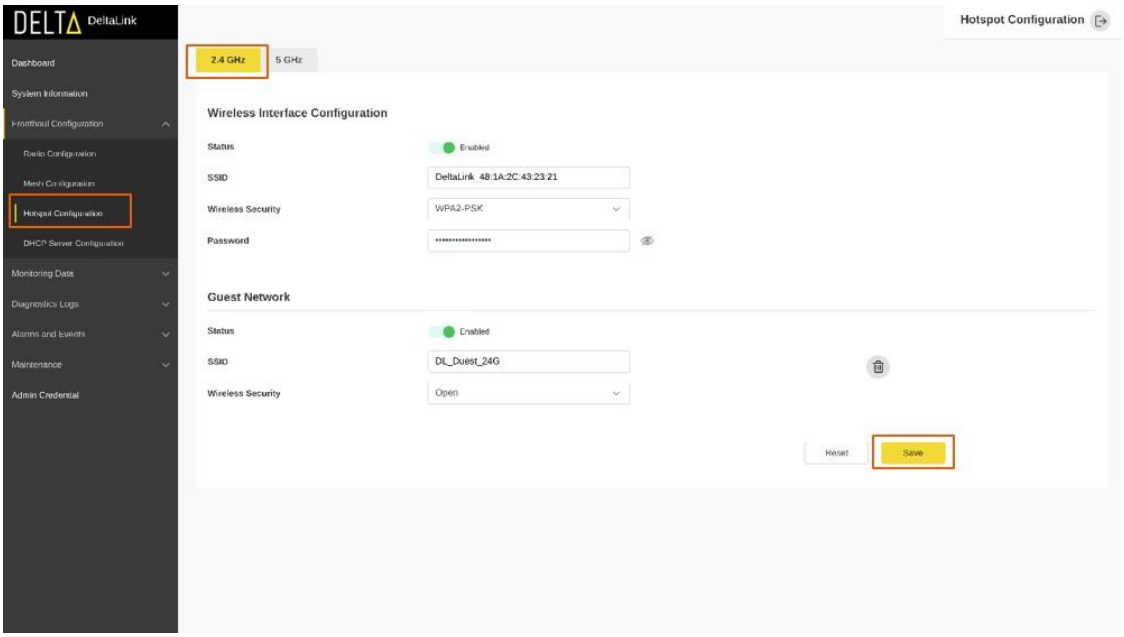

Figure 36 Hotspot Configuration 2.4 GHz - 2

f) To configure 5GHz SSID connections, select the "5 GHz" tab as shown in the Figure 37 and Figure 38 below.
g) For 5GHz hotspots, configure both the primary and "Guest Network" SSIDs by clicking the "+" icon.
h) Select "Save" to apply the configurations.

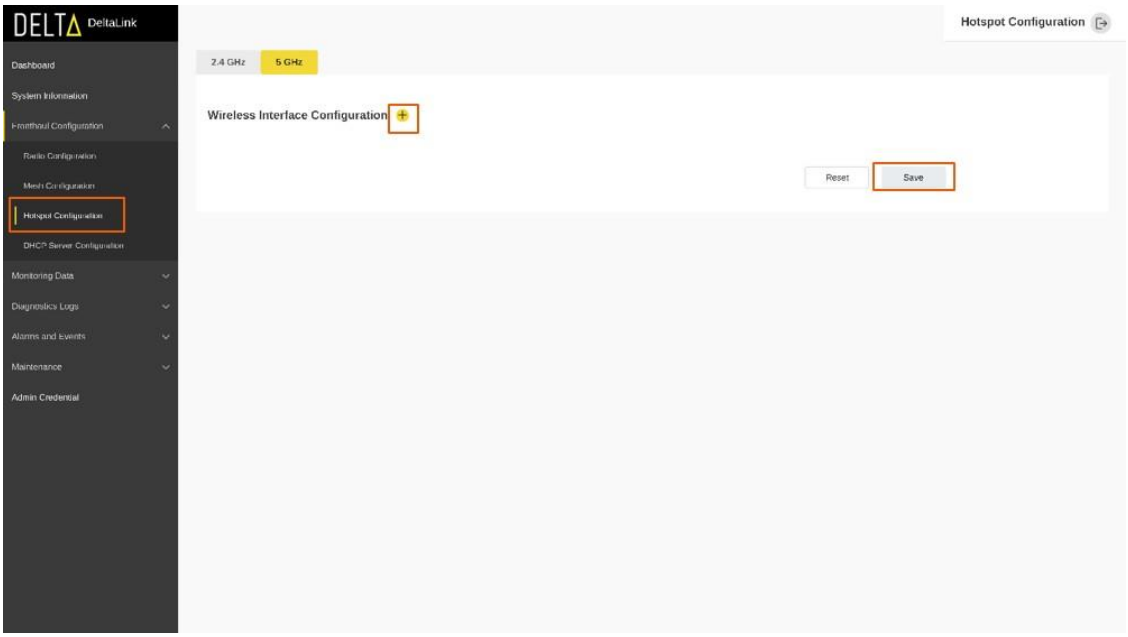

Figure 37 Hotspot Configuration 5 GHz - 1

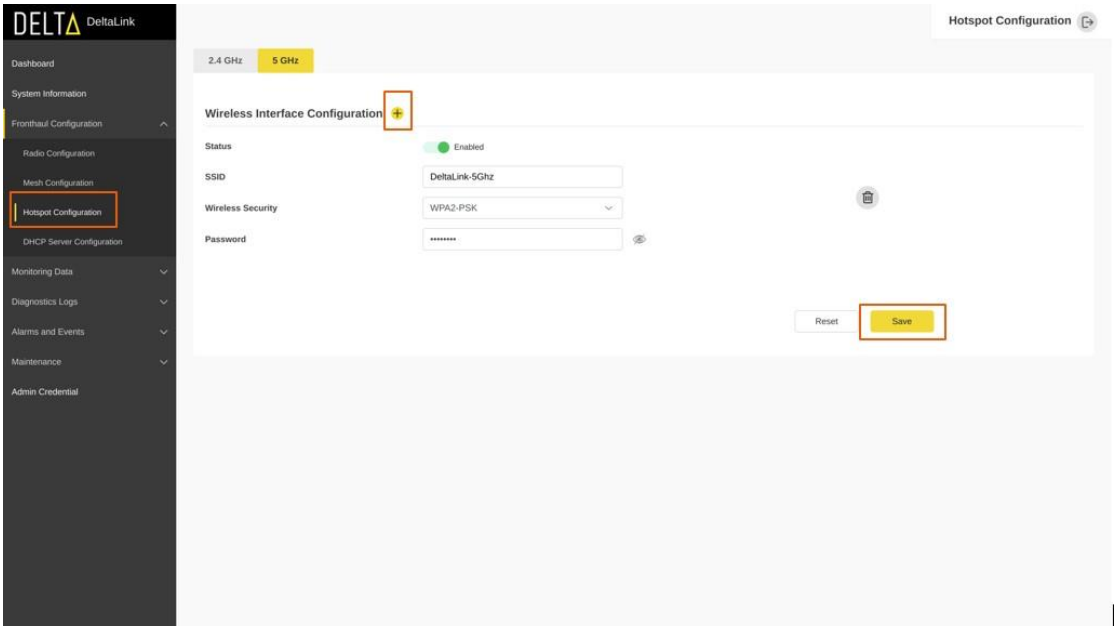

Figure 38 Hotspot Configuration 5 GHz - 2

5.7.4 DHCP server configuration:

a) To configure the IP address for hotspots, navigate to "Fronthaul Configuration" and select "DHCP Server Configuration" from the expanded menu as shown in the Figure 39 below.

b) Select “Enable” or “Disable” to enable or disable the DHCP server. If the DHCP server is disabled, devices must be connected via a static IP configuration.

c) If the DHCP server is enabled, following items can be configurated:

- Starting Address
- Ending Address
- Subnet Mask
- Default Gateway
- Primary DNS
- Secondary DNS

d) Select “Save” to apply the configurations as shown in below Figure 39.

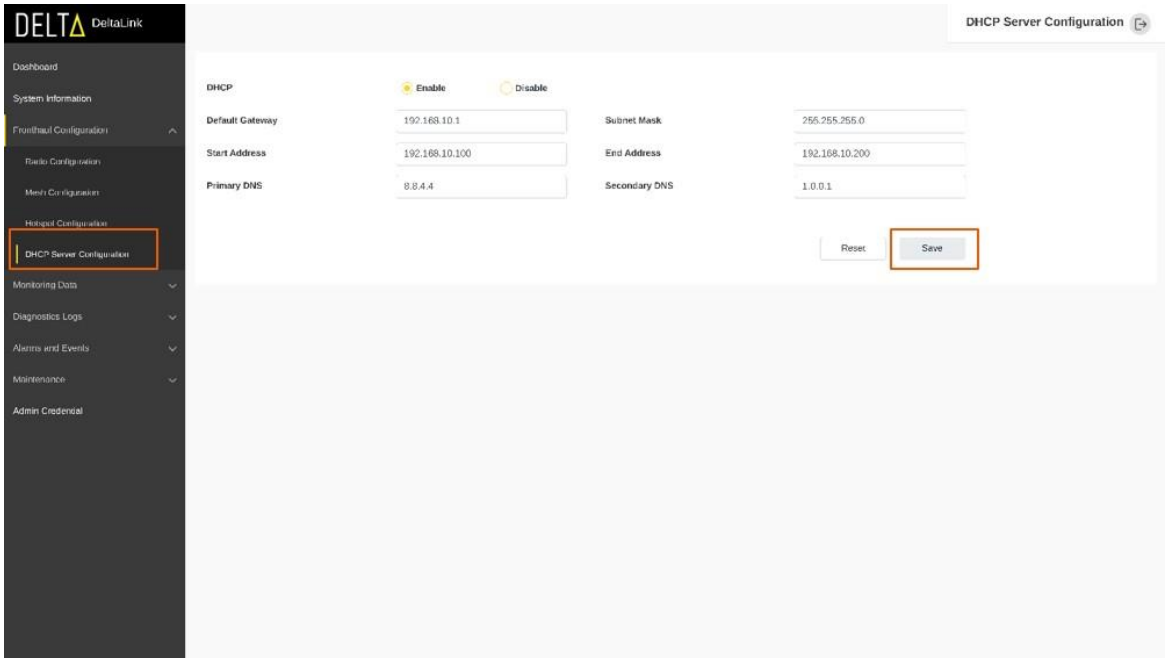

Figure 39 DHCP Server Configuration

5.8 Monitoring Data

The "MAC ACL" and the "Wi-Fi Status" can be accessed and modified in the "Monitoring Data" section. ACL stands for "Approved Connection Listing" and represents those digitial devices specifically authorized to access the deltaLINK™ router.

5.8.1 MAC ACL

The hotspot MAC ACL is a feature that allows or denies digital endpoint clients connections with the deltaLINK™ router.

a) Navigate to "Monitoring Data" and select "MAC ACL" from the expanded menu as shown in the Figure 40 below.
b) By default, the hotspot MAC ACL feature shows the "Status" "Disabled". To enable and configure the MAC ACL feature, switch the "Status" to "Enabled" as shown in the Figure 40 & Figure 41 below.

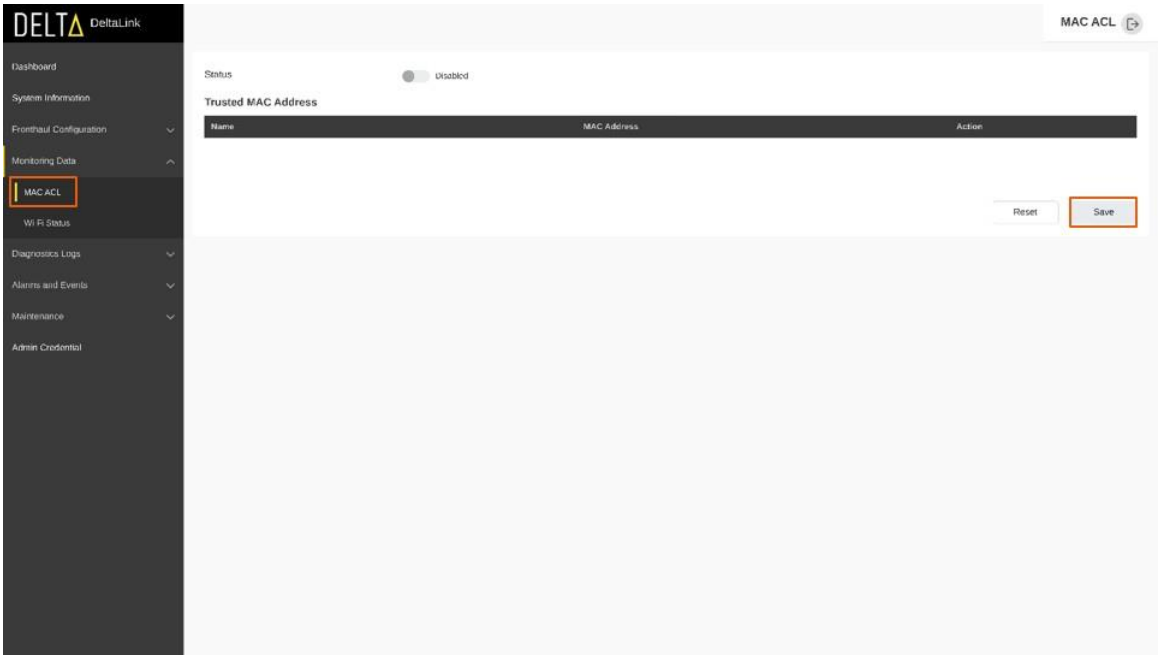

Figure 40 MAC ACL - 1

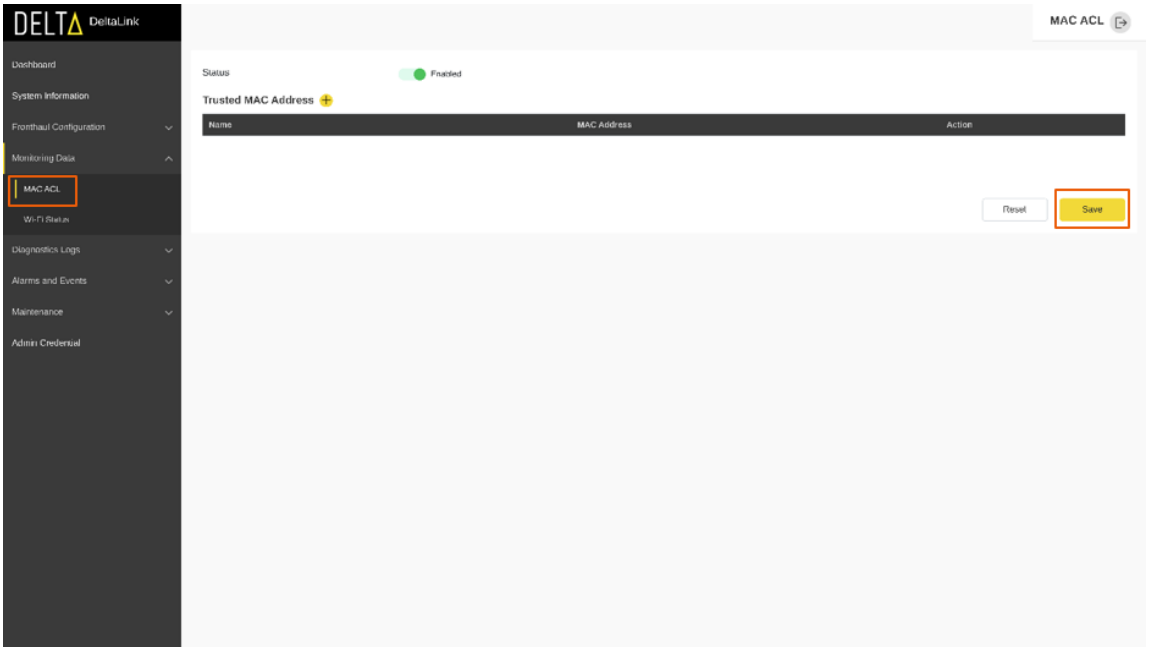

Figure 41 MAC ACL - 2

c) Click the "+" icon that has appeared after enabling the feature. Now a new device can be connected to the deltaLINK™ by adding the device's "MAC Address" along with a "user name".
d) Select "Save" to apply the configurations as shown in the below Figure 42.

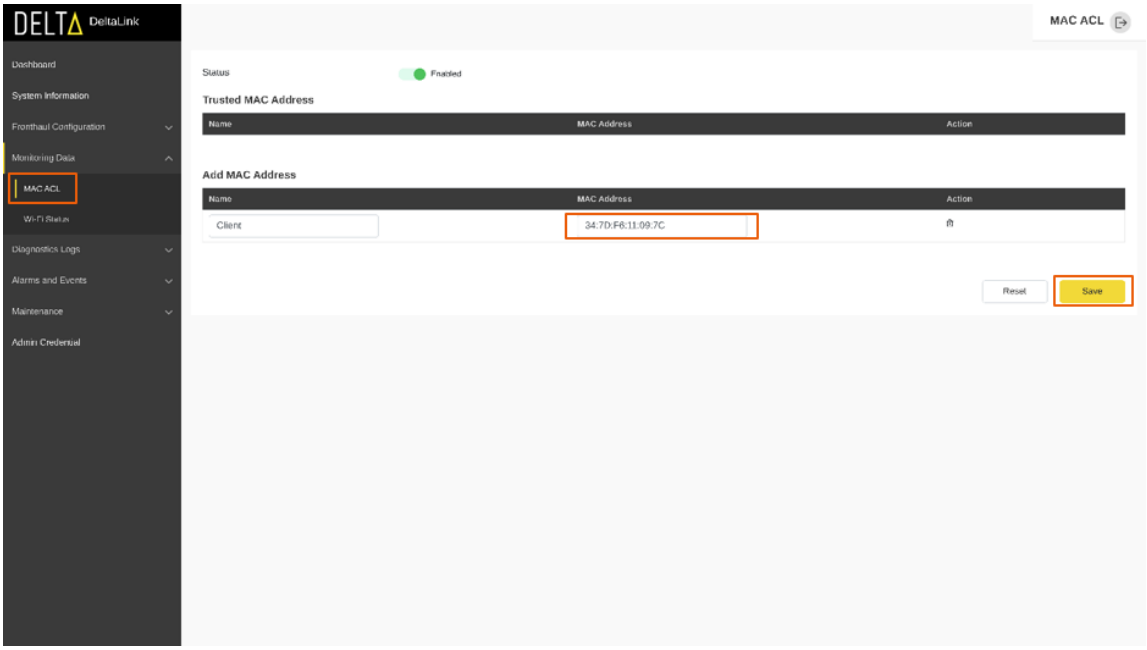

Figure 42 MAC ACL - 3

e) After saving the “MAC Address”, it will be listed in the “Trusted MAC Address” list as shown in below Figure 43.

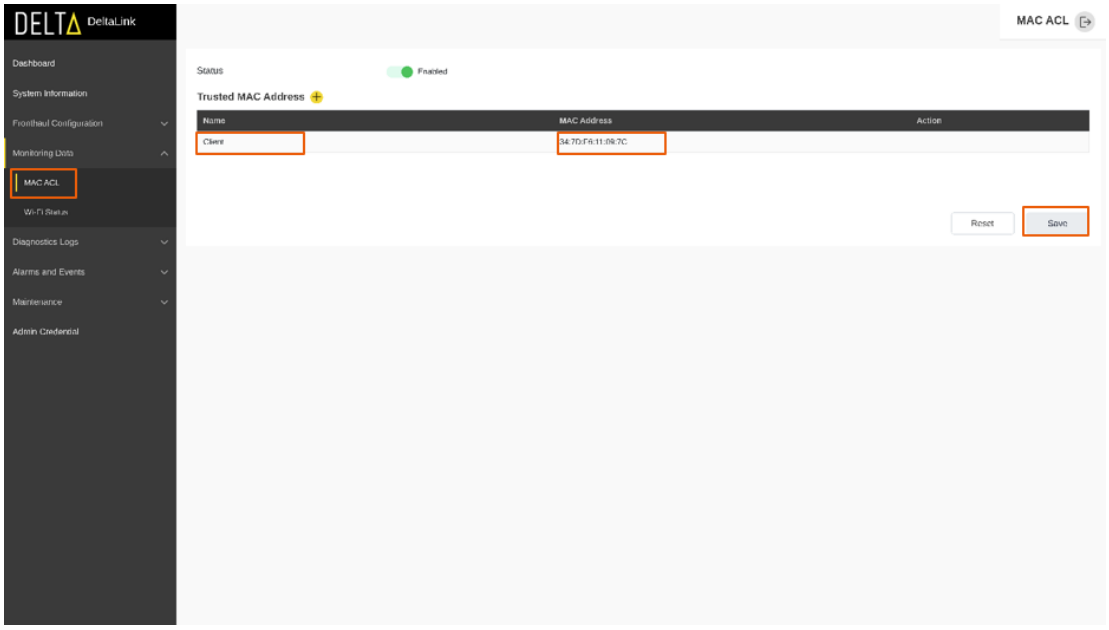

Figure 43 MAC ACL - 4

5.8.2 Wi-Fi Status

The Wi-Fi Status page provides an overview of mesh neighbors and digital end point clients. Note that “mesh neighbors” are those devices to whom the deltaLINK™ router is connecting through. “Digital end point clients” are devices which are connecting through the deltaLINK™. If the “MAC ACL” has been enabled, these are devices which have been granted permission to connect through the deltaLINK™ router.

a) Navigate to “Monitoring Data” and select “WiFi Status” from the expanded menu as shown in the Figure 44 below.
b) Select the “Mesh Neighbors” tab to view a list of connected mesh neighbors, their link status, and other connection details as shown in the below Figure 44.

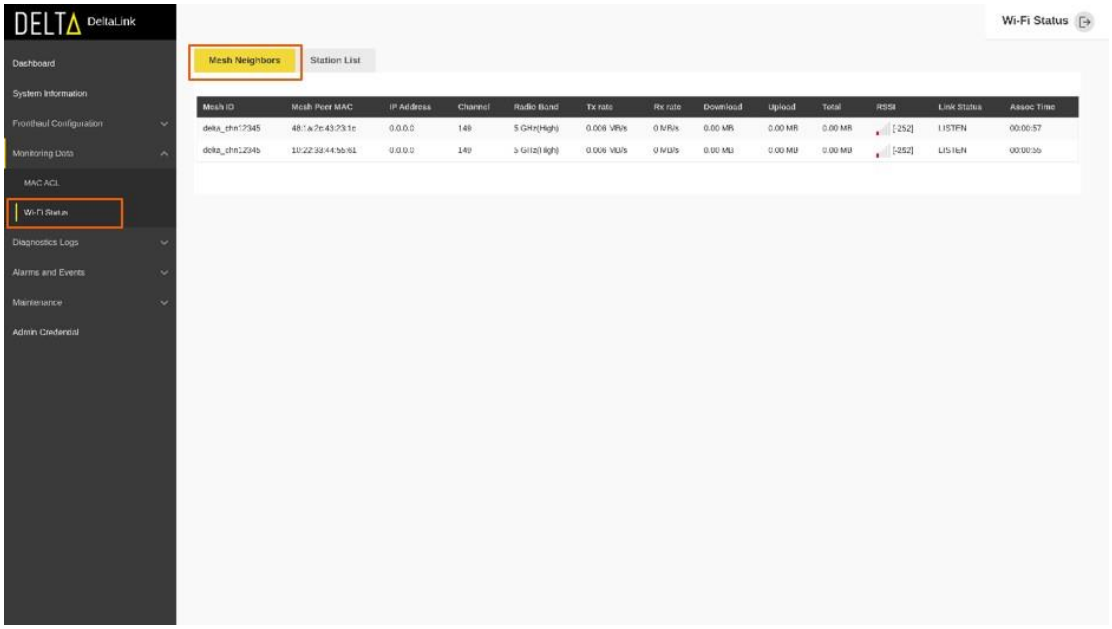

Figure 44 WiFi Status Mesh Neighbours

c) Select the "Station List" tab to view a list of connected digital endpoint clients as shown in the Figure 45.

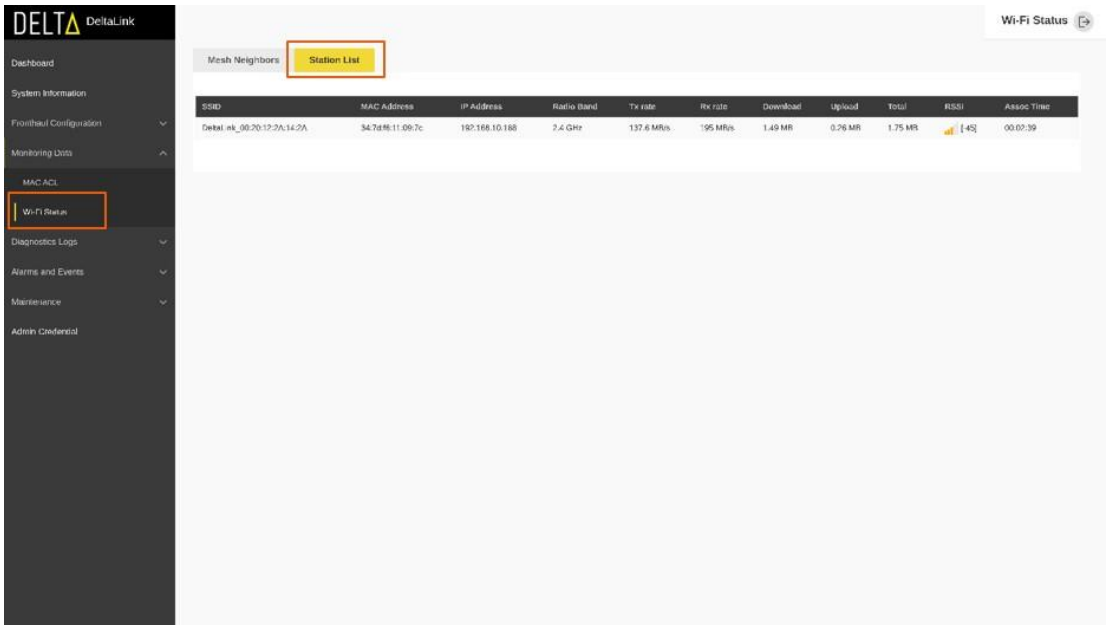

Figure 45 WiFi Status Station List

5.9 Diagnostics Logs

The "Diagnostics Logs" section contains options to access the device logs and debugging tools to understand/validate ongoing deltaLINK™ router functionalities in real time.

5.9.1 System Logs

a) Navigate to "Diagnostics Logs" and select "System Logs" from the expanded menu as shown in the Figure 46.
b) From the drop-down menu, select "Delta Logs", "Wpa Supplicant Logs", or "Hostapd Logs" to view logs on the Delta application, the mesh, or the hotspot respectively.

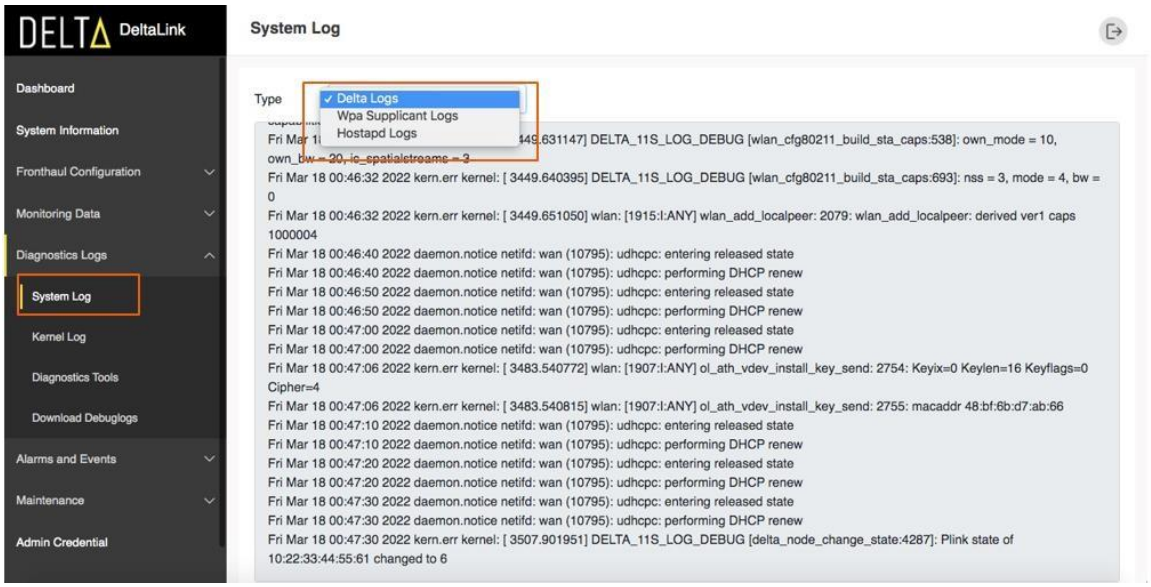

Figure 46 System Log

5.9.2 Kernel Log

a) To view "Kernel Logs", navigate to "Diagnostics Logs" and select "Kernel Logs" from the expanded menu as shown in the Figure below.

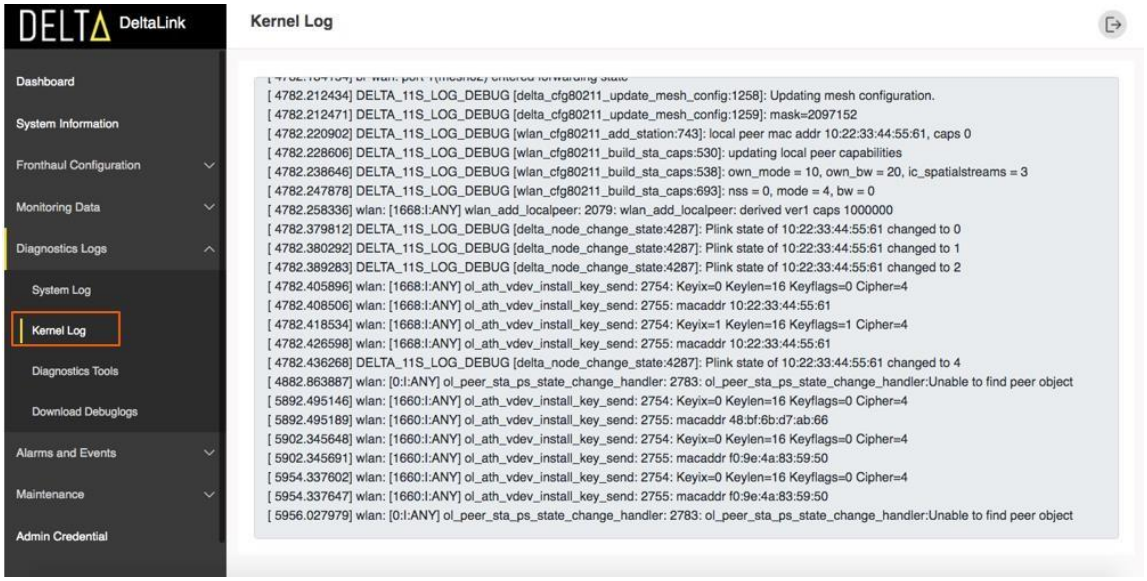

Figure 47 Kernel Log

5.9.3 Diagnostics Tools

a) To verify network functionalities in the device, navigate to "Diagnostics Logs" and select "Diagnostics Tools" from the expanded menu as shown in the Figure 48 below.
b) To "Ping" an IP address/hostname, enter the IP address and select "Ping".
c) To locate an IP address, enter the IP address and select "Traceroute".
d) To find the IP address of a domain name (e.g. google.com), enter the IP address and select "Nslookup"

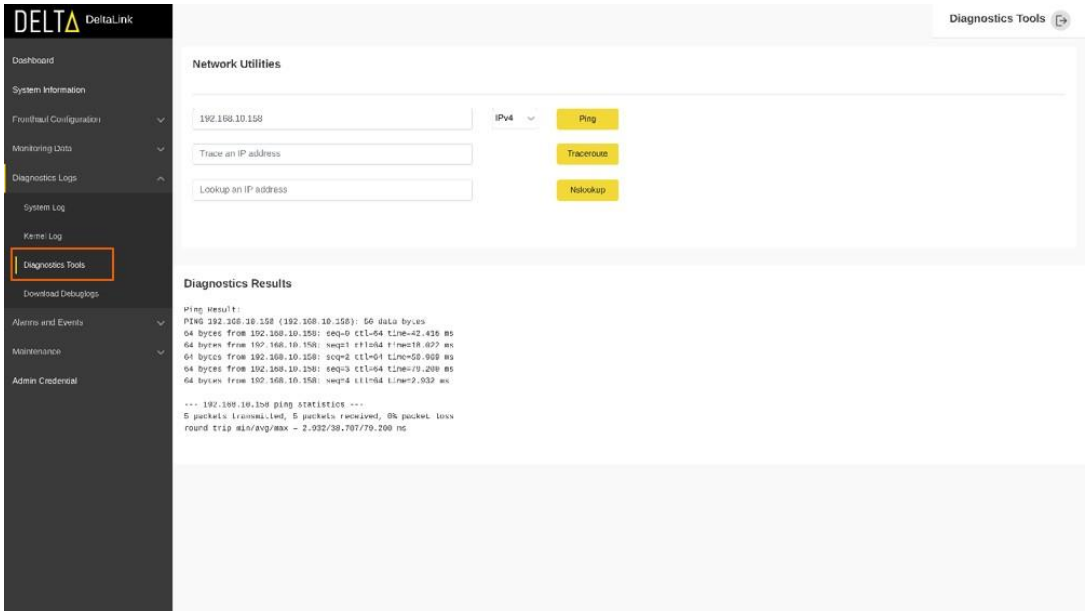

Figure 48 Diagnostics Tools

5.9.4 Download Debugging Logs

a) To download the debugging logs, navigate to "Diagnostics Logs" and select "Download Debug Logs" from the expanded menu as shown in the Figure 49 below.

b) Select "Download Debug Logs" to download the device logs in .tar format. The file will be downloaded to the user selected location on their local computer drive.

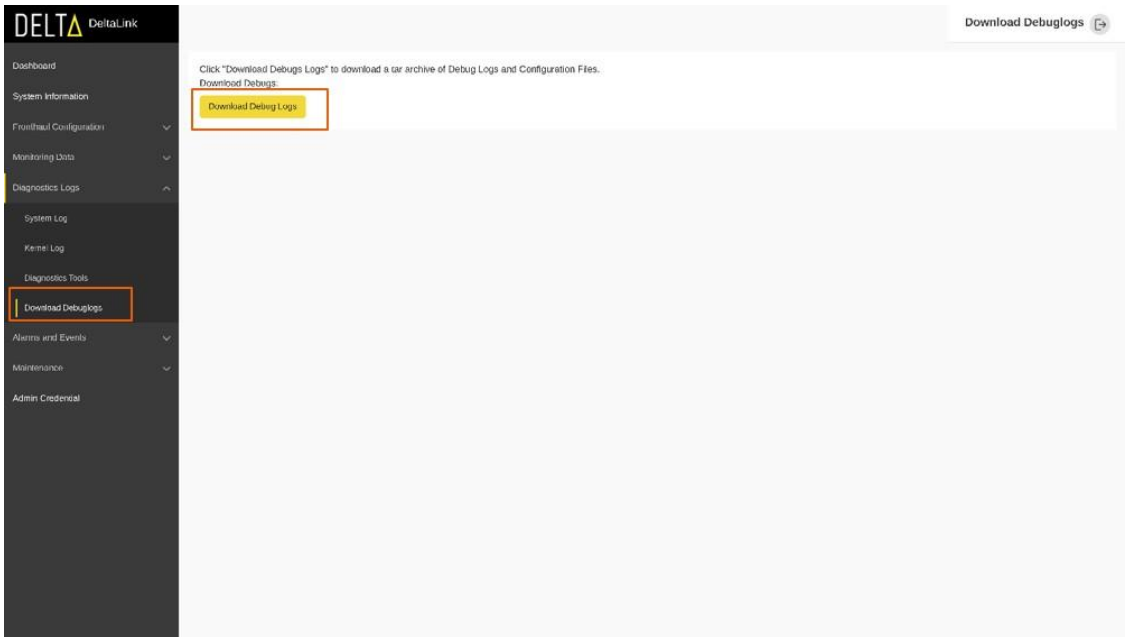

Figure 49 Debug Logs Download

5.10 Alarms and Events

The "Alarms and Events" section provides an option to view details on active and historical alarms.

5.10.1 Active Alarms

a) To view active alarms, navigate to "Alarms and Events" and select "Active Alarms" from the expanded menu as shown in the Figure 50 below.

b) The page includes a list of active alarm details, including "Time Stamp", "Alarm" type, "Severity", and "Alarm Information".

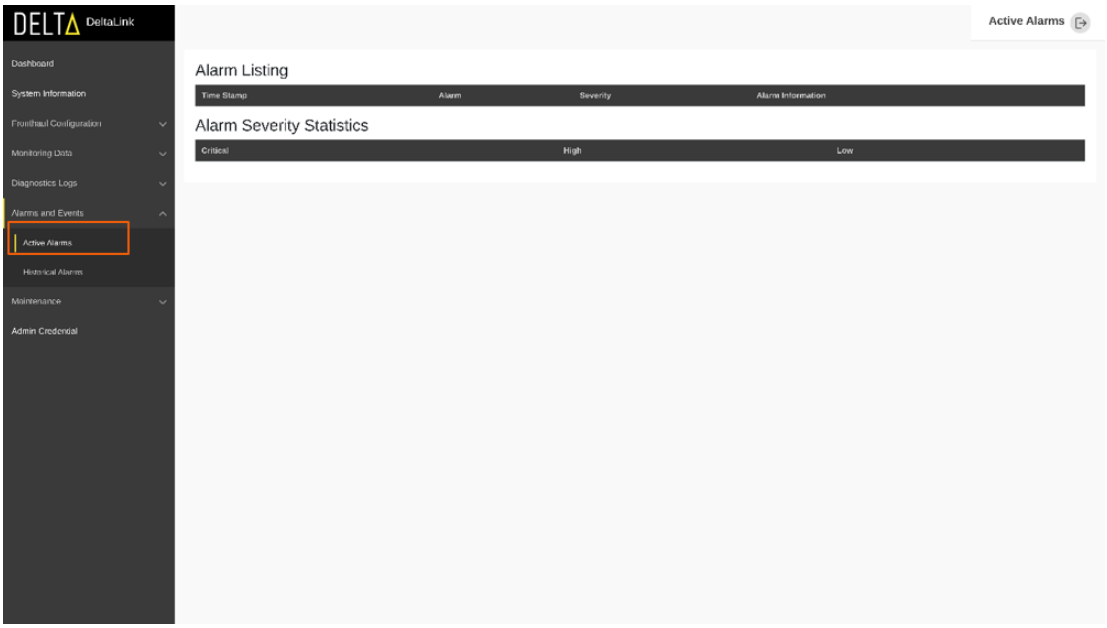

Figure 50 Active Alarms

5.10.2 Historical Alarms

a) To view the alarm history, navigate to "Alarms and Events" and select "Historical Alarms" from the expanded menu as shown in the Figure 51 below.

Figure 51 Historical Alarms

5.11 Maintenance

The following section provides general activities relevant to the ongoing operation and maintenance of the deltaLINK™ router. Within this section a user my upgrade a deltaLINK™ router's firmware, configure device settings, reboot, reset and backup and restore.

5.11.1 Firmware Upgrade

a) To upgrade the device to a new firmware image, navigate to "Maintenance" and select the "Firmware Upgrade Wizard" from the expanded menu as shown in the Figure 52 below.
b) Click "Choose file" and select the required file to upload from the laptop/PC.
c) Then, select "Upload Image" as shown in the below Figure 52.

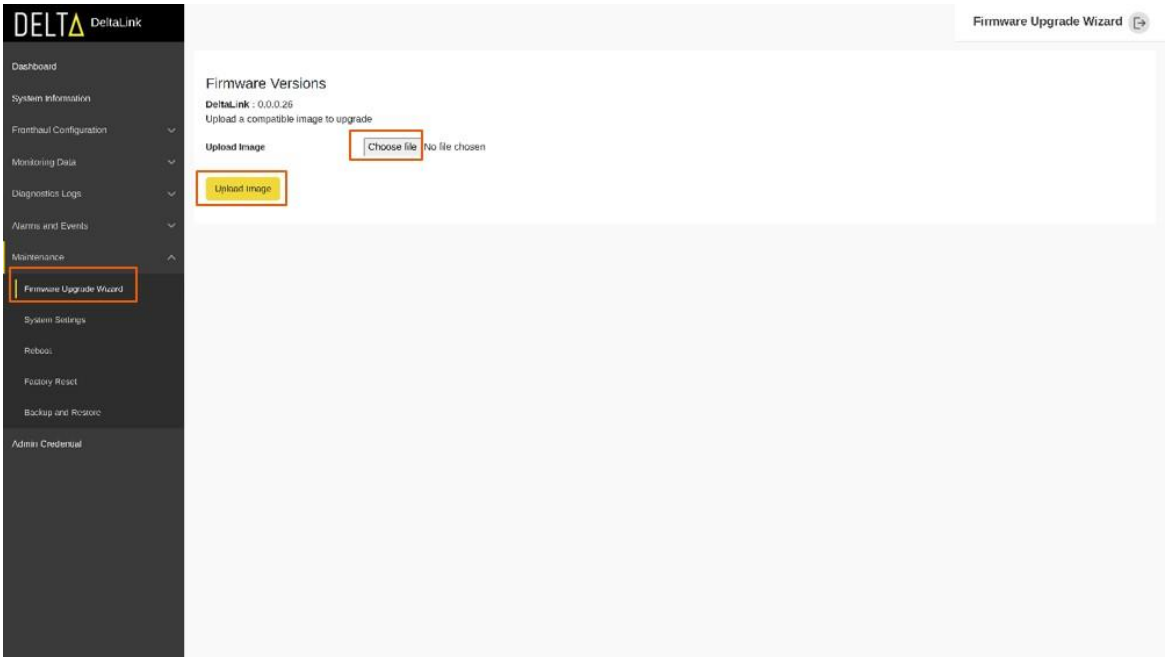

Figure 52 Firmware Upgrade Wizard - 1

d) After the image has been uploaded, select "Proceed" to complete the image upgrade as shown in the Figure 53 below. The deltaLINK™ router will now reboot with the uploaded image.

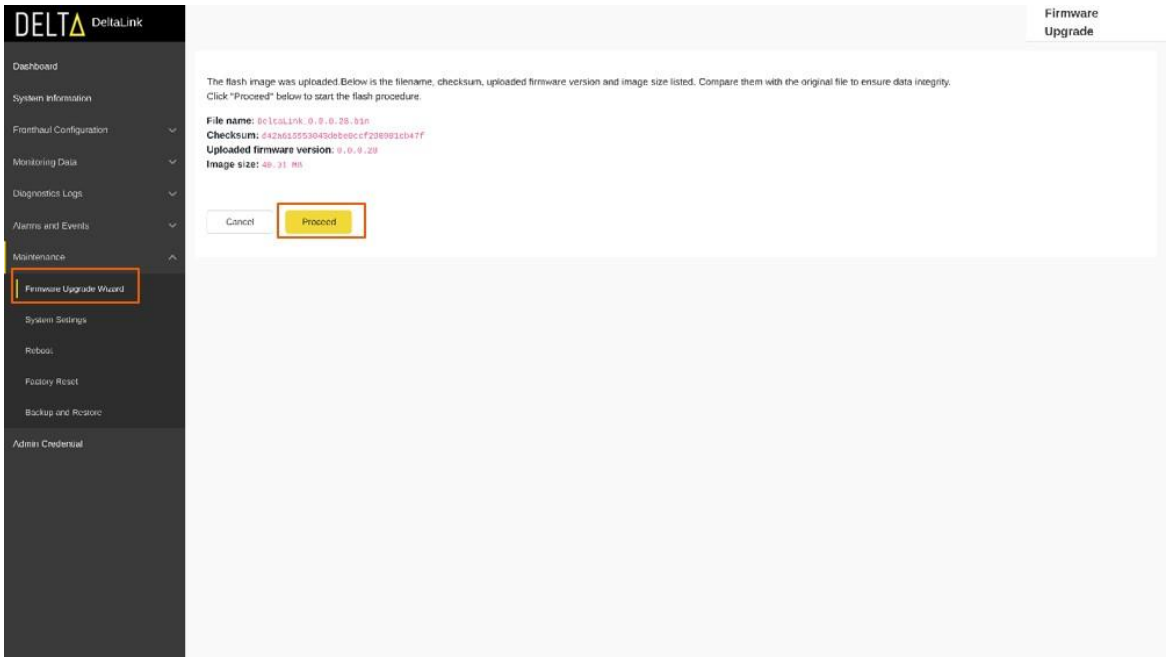

Figure 53 Firmware Upgrade Wizard - 2

5.11.2 System Settings

a) To view/configure device settings, navigate to “Maintenance” and select “System Settings” from the expanded menu as shown in the Figure 54 below.

b) Configure “System Name”, “Country”, and “Time Zone” and select “Save” to apply the new configurations.

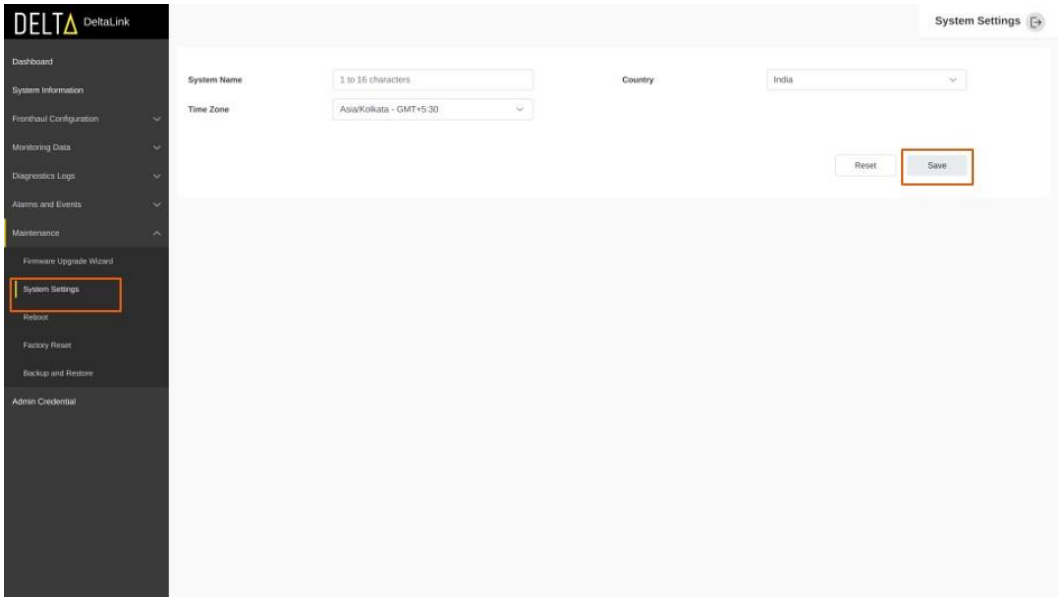

Figure 54 System Settings

5.11.3 Reboot

a) For reboot options, navigate to “Maintenance” and select “Reboot” from the expanded menu as shown in the Figure 55 below.

b) Select “Perform Reboot” to reboot the device.

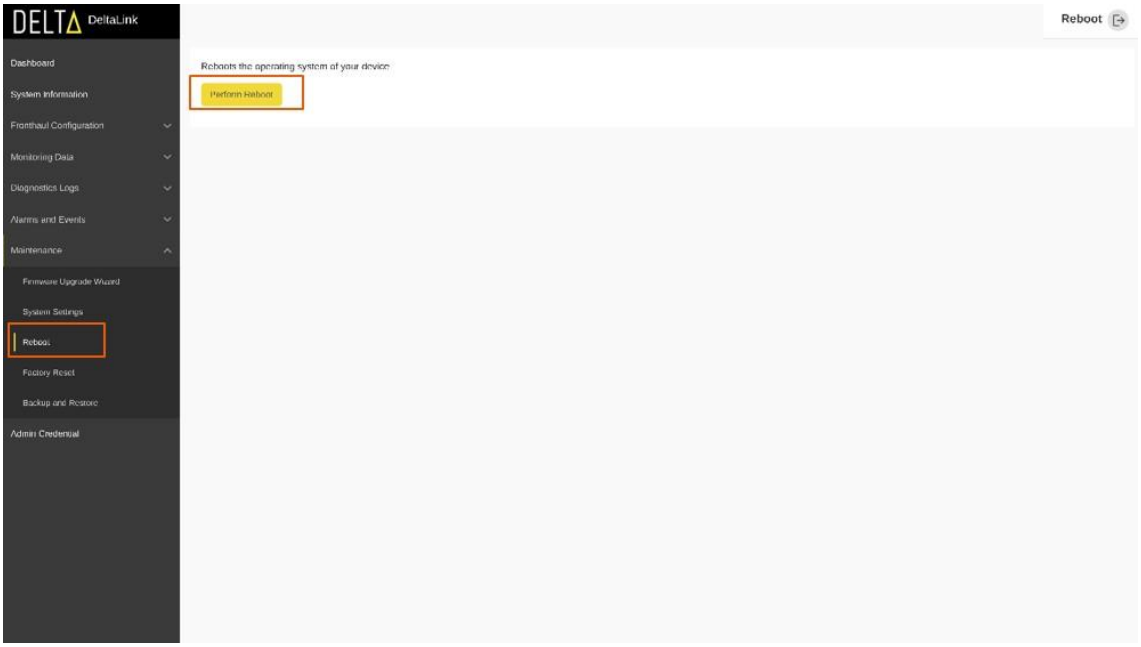

Figure 55 Reboot

5.11.4 Factory Reset

a) To factory reset the device, navigate to "Maintenance" and select "Factory Reset" from the expanded menu as shown in the Figure 56 below.
b) Select "Perform Factory Reset" to perform a full factory reset of the device.
c) After a successful factory reset, the device will be reset to the factory default configurations.

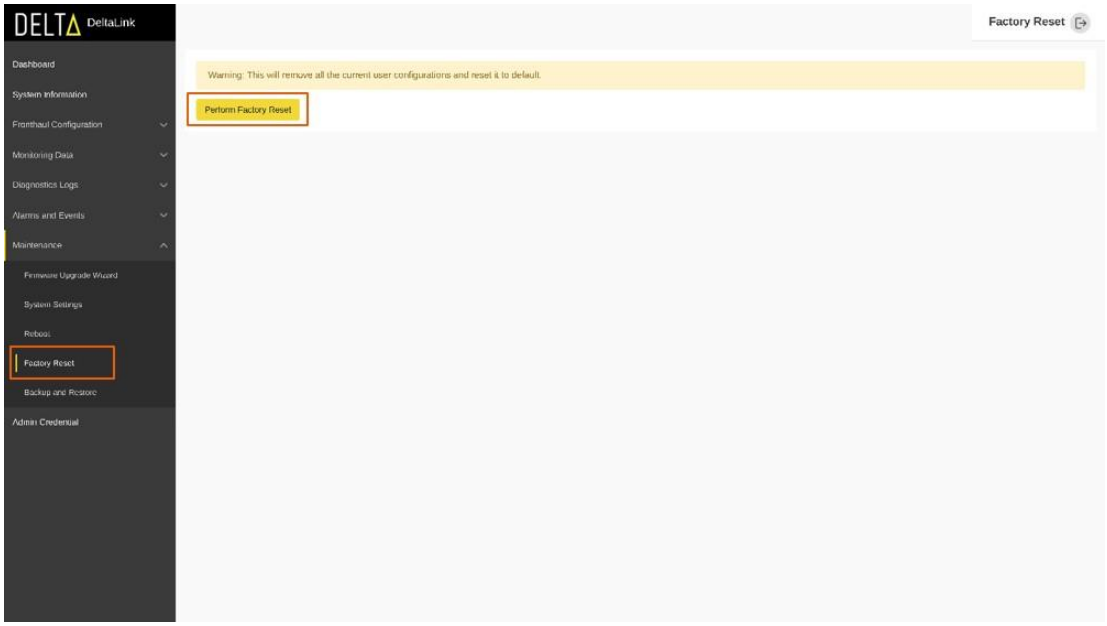

Figure 56 Factory Reset

5.11.5 Backup and Restore

a) To backup or restore configurations, navigate to "Maintenance" and select "Backup and Restore" from the expanded menu as shown in the Figure 57 below.

b) The "Backup and Restore" page provides options to backup the current device configurations or restore configurations from a previous backup.

c) To backup the current configurations, select "Generate archive" and download the device's current configurations as a ".tar" file. The file will be downloaded to the user selected location on their local computer drive.

d) To restore a previous backup, click "Choose file" and select the configuration backup file to upload from your laptop/PC.

e) Then select "Upload Archive" to replace the current configurations with the previous backup configurations.

f) Upon a successful restore, the device will reboot with the updated configurations.

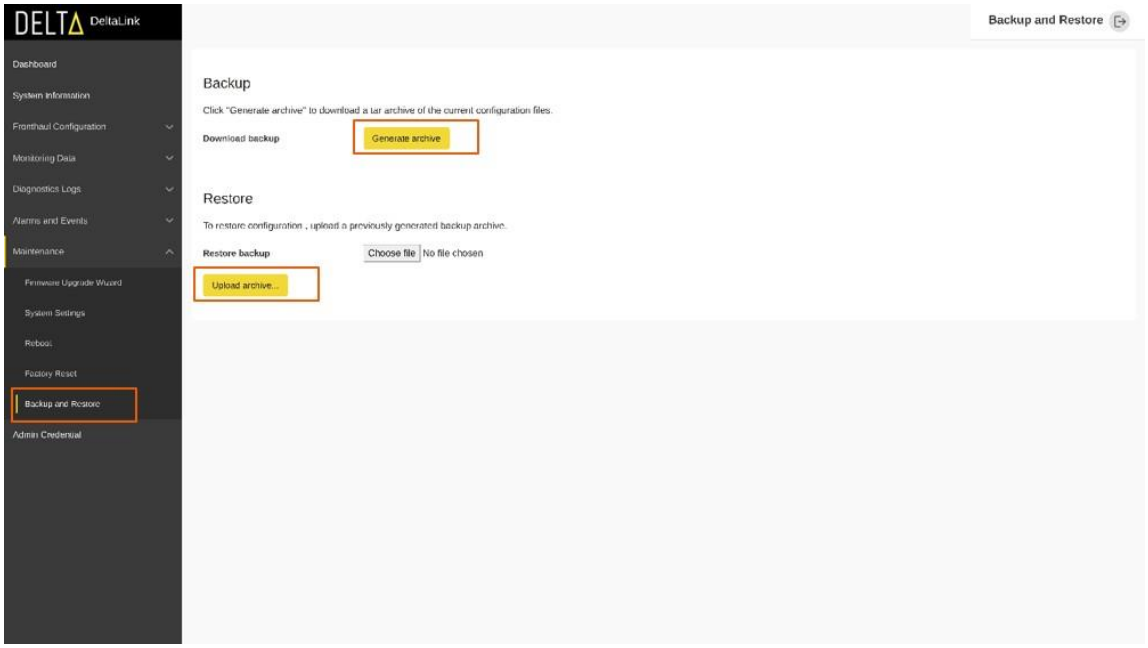

Figure 57 Backup and Restore

5.12 Admin Credential

a) To change the login password, select the "Admin Credentials" page.

b) Enter the new password and select "Update" as shown in the Figure 58 below.

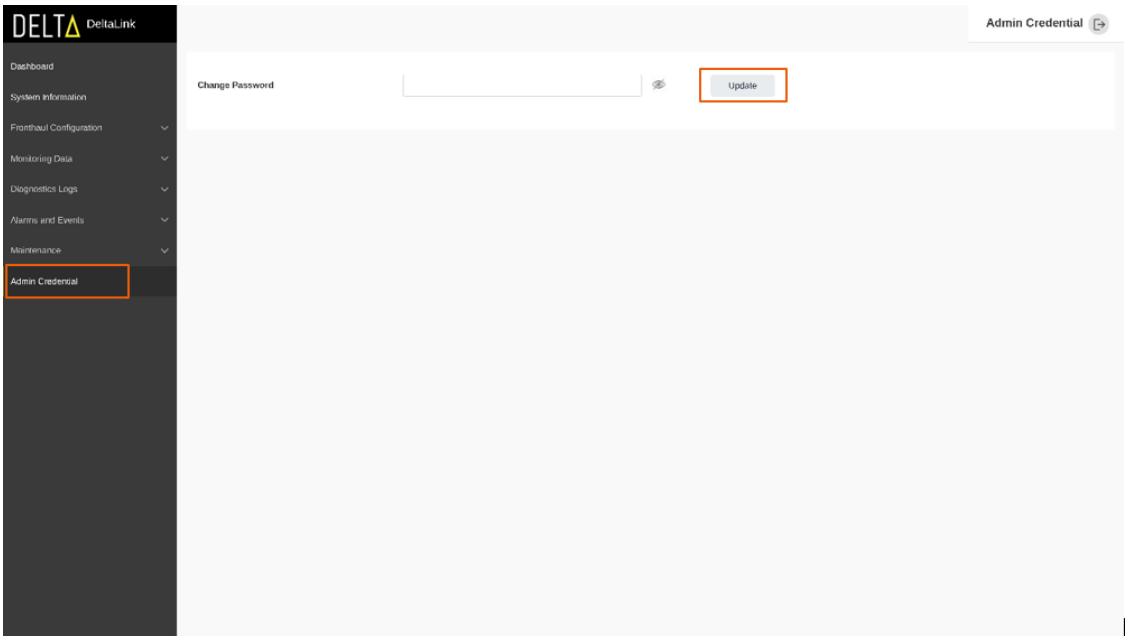

Figure 58 Admin Credential