



LXN 500

Installation

Configuration and

Operation Guide

DECEMBER 2017

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- Before any software reload.
- To confirm troubleshooting results and analysis before removing and replacing a Field Replaceable Unit (FRU) and Field Replaceable Entity (FRE) to repair the system.

For...	Phone
United States Calls	800-221-7144
International Calls	302-444-9800

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Document History

Version	Description	Date
MN003563A01-A	Release release of the LXN 500	07/2017
MN003563A01-B	Update to LXN 500 O&M configuration section	10/2017

FCC Information

This device complies with Part 15 of the FCC rules:

Operation is subjected of 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 user is cautioned that changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

FCC ID: AZ492FT7102

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About LXN 500

This manual provides functional overview and procedures for the LXN 500.

What is Covered in This Manual

This manual contains the following chapters:

- [Overview on page 1-11](#) provides overview of the LXN 500 system and its features.
- [Vehicle Installation on page 3-47](#) contains procedures for installing LXN 500 hardware components.
- [Operation and Configuration on page 2-17](#) contains procedures for powering up and configuring the LXN 500.
- [Troubleshooting and Maintenance on page 4-59](#) provides an overview of LXN 500 management and solutions to common problems.

Helpful Background Information

Motorola Solutions offers various courses designed to assist in learning about the system. For information, go to <http://www.motorolasolutions.com/training> to view the current course offerings and technology paths.

Related Information

Unless otherwise specified, the Motorola documents listed here are available from Motorola Online at <http://businessonline.motorolasolutions.com>. If you are new to Motorola Online, follow the on-screen instructions to sign up for an account. To access Public Safety LTE infrastructure manuals, select **Resource Center** → **Product Information** → **Manuals** → **Private Broadband Solutions** and select the appropriate release. The Resource Center also provides a Search function.

Customers outside of the Americas can contact Motorola Solutions for the documentation listed here. Refer to the following documents for information about this product:

Related Documentation

Related Information	Purpose
Administration Guide WAVE 5000 R5.12	Explains how to operate, administer, and maintain the WAVE 5000 Push-To-Talk (PTT) system available from Motorola Solutions.
DragonForce Maps Server Documentation https://www.drakontas.com/?p=academy	Explains how to configure DragonForce server for user tracking on maps (street map view & satellite views) - see where you and your team members are located.
Public Safety LTE Glossary	Lists abbreviations for Public Safety LTE terms.
Product Safety Guide (multilingual) - Motorola Solutions P/N 6866537D37	RF Energy Exposure and Product Safety Guide for Mobile Two-Way Radios installed in Vehicles or as Fixed Site Control Stations
LXN 500 Quick Start Guide - Motorola Solutions P/N MN003599A01	First time use of the LXN 500.

Overview

The LXN 500 is an ultra deployable LTE system designed for on-demand coverage and public safety applications. The solution consists of a single standalone portable unit that operates from within a vehicle.

Figure 1-1 The LXN 500



The LXN 500 enables a rapid deployment of a tactical communication network, within a limited geographical area and used by up to 100 subscribers.

The LXN 500 may include the WAVE™ 5000 Mobile Communicator and DragonForce - Drakontas mobile collaboration applications.

The WAVE 5000 Mobile Communicator enable the mobile devices connected to LXN 500 to a multi-channel Push-To-Talk (PTT) handsets for fully secure, real-time PTT voice communication. WAVE 5000 also connects the LXN 500 subscribers to Land Mobile Radio (LMR) users to provide unified voice, text messaging and presence in a single and easy-to-use application.

DragonForce is a mobile collaboration application that allows teams to create and share information more rapidly, accurately and effectively. The application includes secure, real-time, team-based information such as: user tracking on maps (street map view & satellite views), team members location, images or maps, whiteboards, text messaging to individuals and teams, customizable shared forms. You can also capture data in the field and share with other users, distribute documents, images, and other files.

LXN 500 is a self-managed mobile network based on standard 4G LTE cellular communication on bands: 14, 20, 28B and does not require any human intervention during operation.

LXN 500 Front Panel Features

Figure 1-2 shows and Table 1-1 describes the features of the LXN 500 front panel.

Figure 1-2 Front Panel Features

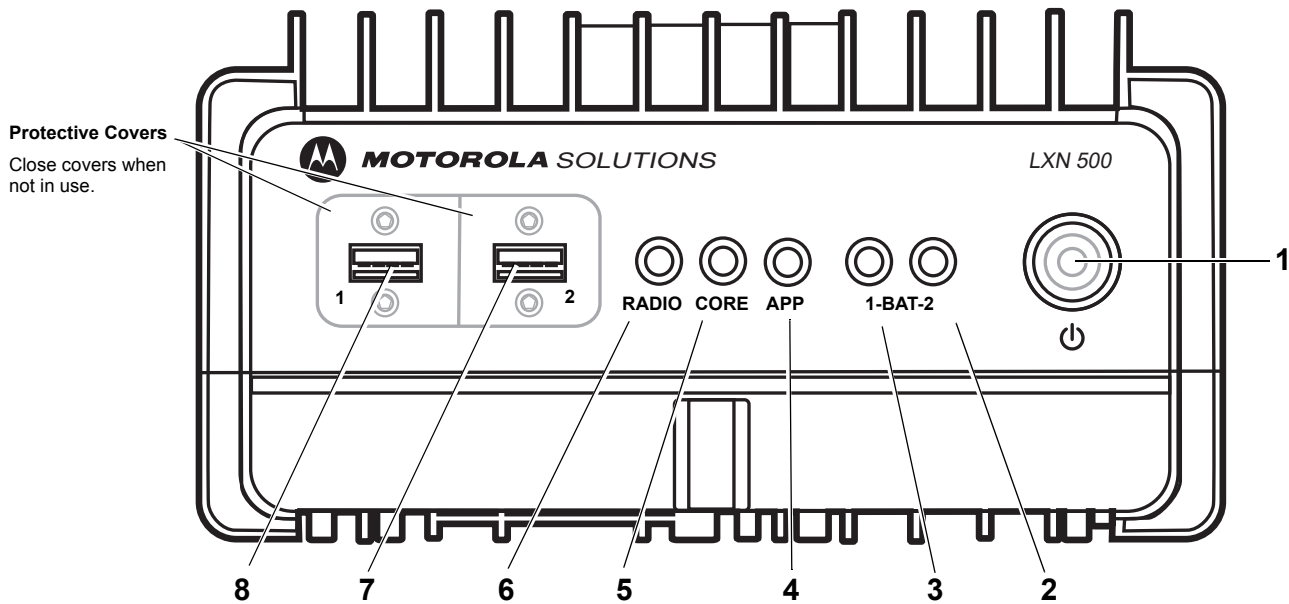


Table 1-1 Features of LXN 500 Front Panel

	Item	Description
1		Power button. To power on; hold pressed for four seconds. To start shutdown sequence; hold pressed for four seconds. To force power off; hold pressed for more than 15 seconds. When the LXN 500 is powered by batteries (Future option of the LXN 500), one second press of the Power button switches between active and standby battery.
2	BAT2	Status LED of battery 2 (Future option of the LXN 500). NOTE To switch between active and standby battery, press the Power button for one second and release. • LED OFF - No battery or battery is disconnected • GREEN - Battery is active and its capacity is more than 50% • BLINKING GREEN - Battery is in Standby mode and its capacity is more than 50% • ORANGE - Battery is active and its capacity is 10% to 50% • BLINK ORANGE - Battery is in Standby mode and its capacity is 10% to 50% • RED - Battery s active and its capacity is less than 10% • BLINKING RED - Battery is in Standby mode and its capacity is less than 10%

Table 1-1 Features of LXN 500 Front Panel (Continued)

	Item	Description
3	BAT1	Status LED of battery 1(Future option of the LXN 500). NOTE To switch between active and standby battery, press the Power button for one second and release. • LED OFF - No battery or battery is disconnected • GREEN - Battery is active and its capacity is more than 50% • BLINKING GREEN - Battery is in Standby and its capacity is more than 50% • ORANGE - Battery is active and its capacity is 10% to 50% • BLINK ORANGE - Battery is in Standby mode and its capacity is 10% to 50% • RED - Battery is active and its capacity is less than 10% • BLINKING RED - Battery is in Standby mode and its capacity is less than 10%
4	APP	APP is a status LED used to diagnose and troubleshoot the LXN 500. Refer to Troubleshooting and Maintenance whenever the LED shows orange or red color. The APP (Application Server) stores the applications used by the LXN 500. The optional applications provided with the LXN 500 are the WAVE 5000 that enables full interoperability between LTE and land mobile radio systems and the DragonForce software. • LED OFF - OFF • GREEN - All applications are running • BLINKING GREEN - Applications startup in progress • ORANGE - Not all applications are running. At least one application is down and one is running • BLINKING ORANGE - Applications shutdown in progress • RED - Failure: All applications are down • BLINKING RED - Fatal Error: Cannot connect to application server
5	CORE	CORE is a status LED used to diagnose the CORE (Evolved Packet Core - EPC). The CORE is a framework for providing converged of voice and data including HTTP web server on a 4G LTE network. Refer to Troubleshooting and Maintenance whenever the LED shows orange or red color. • LED OFF - OFF • GREEN - All EPC processes are running and S1 (Communication between eNodeB and EPC) is up • BLINKING GREEN - EPC startup in progress • ORANGE - One or more EPC processes are down and one or more are active or S1 is down • BLINKING ORANGE - EPC shutdown in progress • RED - Failure. All EPC processes are down • BLINKING RED - Fatal error. Cannot connect to EPC

Table 1-1 Features of LXN 500 Front Panel (Continued)

	Item	Description
6	RADIO	RADIO is a status LED used to diagnose and troubleshoot the eNodeB transceiver that enables the LXN 500 to communicate directly with end-user devices. Refer to Troubleshooting and Maintenance whenever the LED shows orange or red color. LED OFF - OFF GREEN - L1 and L2 and L3 are running BLINKING GREEN - Startup eNodeB startup in progress ORANGE - One or more eNodeB processes are down and one or more are active BLINKING ORANGE - eNodeB Shutdown in progress RED - Failure - L1, L2, and L3 are down BLINKING RED - Fatal Error - No connection to eNodeB board
7	1	USB 2.0 port for connecting peripheral devices such flash-disks to the LXN 500. The USB port is covered by a protective cover.  IMPORTANT - To enable a successful boot-up, remove all USB devices connected to the LXN 500 before powering on. - The LXN 500 supports only FAT32 file system disks.  NOTE To ensure proper communication, use USB extension cable shorter than 9.8 feet (3 meters).
8	2	USB 2.0 port for connecting peripheral devices such flash-disks to the LXN 500. The USB port is covered by a protective cover.  IMPORTANT - To enable a successful boot-up, remove all USB devices connected to the LXN 500 before powering on. - The LXN 500 supports only FAT32 file system disks.  NOTE To ensure proper communication, use USB extension cable shorter than 9.8 feet (3 meters).

LXN 500 Back Panel Features

Figure 1-3 shows and Table describes the features of the back panel of the LXN 500.

Figure 1-3 LXN 500 Back Panel Features

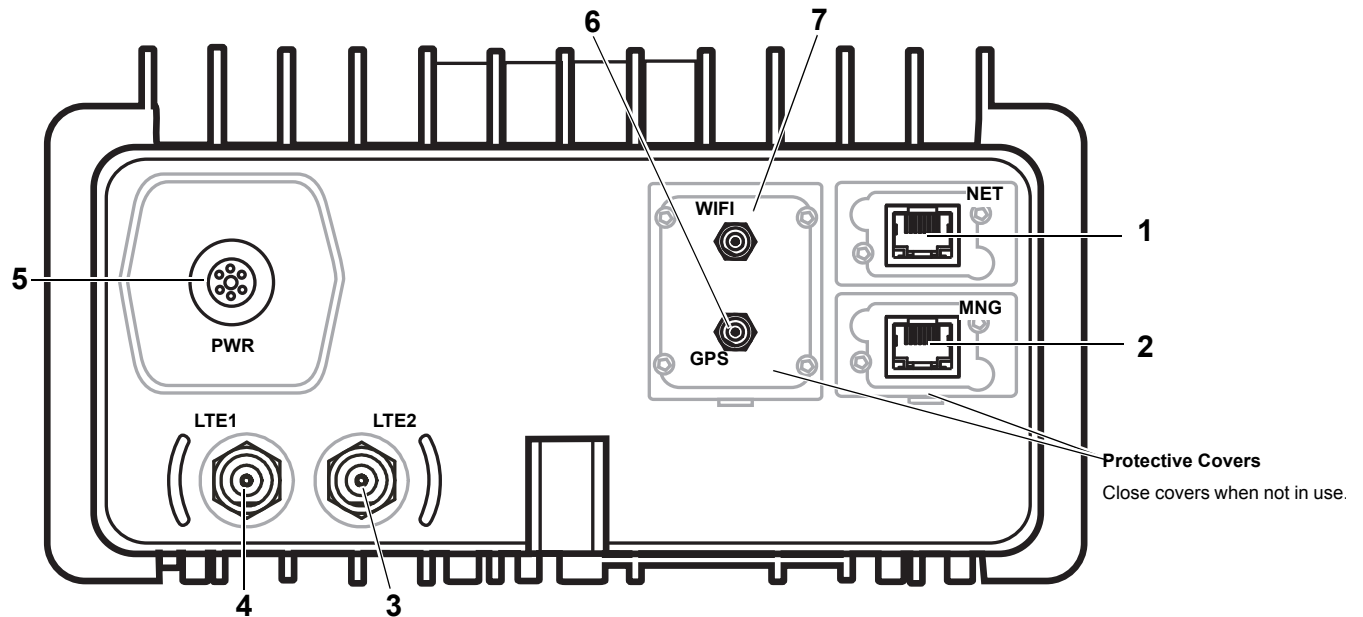


Table 1-2 Back Panel Features

Connector	Description
1 NET	Network (NET) 1 GBit/s LAN port. This port is used for connecting the LXN 500 to a Local Area Network (LAN) infrastructure or an external application server. When maintenance is required, this port enables access to the servers and eNodeB of the LXN 500.
2 MNG	Management (MNG) 1 GBit/s LAN port. This port is used for connecting an external laptop for configuration, management and maintenance tasks.
3 LTE2	LTE antenna connector.
4 LTE1	LTE antenna connector.
5 PWR IN	9 to 33 VDC input power from car battery (Future option of the LXN 500).  IMPORTANT Do not remove the power cable before shutting down the LXN 500. Verify that the all LEDs on the front panel are off.
2 GPS	GPS antenna connector.
3 WiFi	Wireless LAN antenna connector.

Operation and Configuration

This chapter describes the initial operation and configuration of the LXN 500 system.



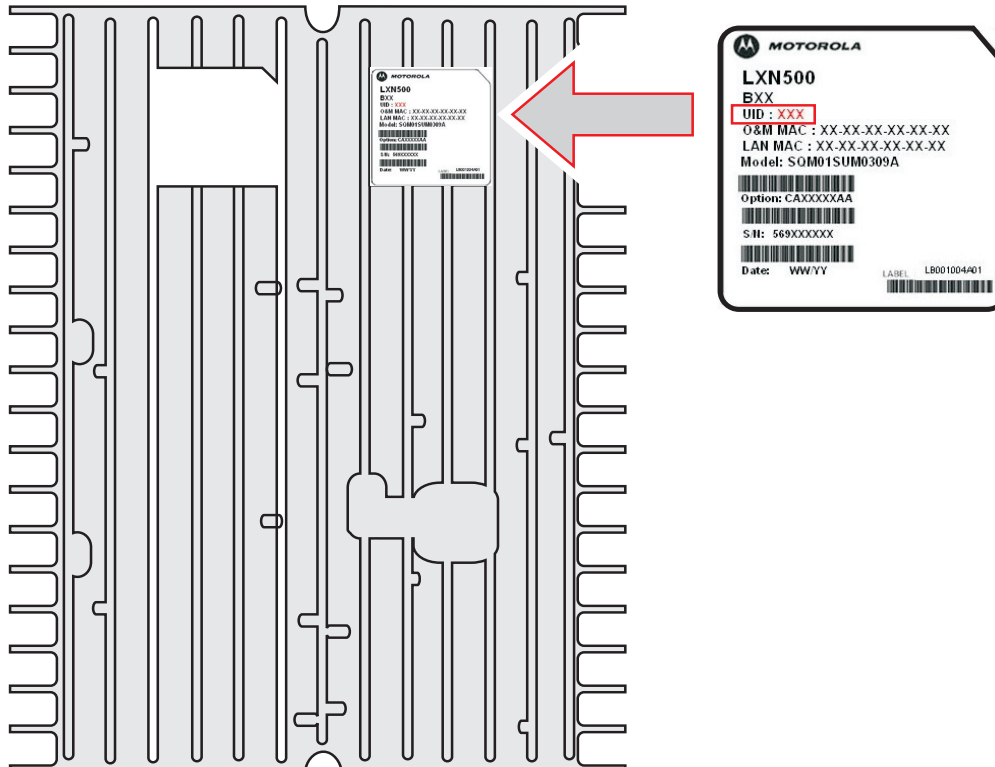
WARNING! During operation the LXN 500 enclosure surface can become hot. Before using the LXN 500, refer to the touch hazard warning label located on the upper side of the enclosure.

Getting Started

Obtaining the Unit Identification (UID) Number

The Unit Identification (UID) number is required throughout the configuration process of the LXN 500. The UID can be found on the information label at the bottom side of the LXN 500.

Figure 2-1 LXN 500 Information Label



Powering On

1. Start the car engine.
2. Press and hold the Power button  for four seconds and release when all LEDs begin to blink green.
Result: During boot-up, all LEDs blink green for about four minutes and then remain steady green indicating a successful boot.



IMPORTANT - When using the LXN 500 inside a vehicle, power on only after engine start.
- To enable a successful boot-up, remove all USB devices connected to the LXN 500 before powering on.

Powering Off

Starting Shutdown Sequence

1. Press and hold the Power button  for four seconds.
Result: all LEDs on the front panel blink orange, to indicate power down, and then turn off.

Forcing Power Off

1. Press and hold the Power button  for 15 seconds.
Result: all LEDs on the front panel turn off.

What is Required for Configuration

Before starting to configure the LXN 500, obtain the following:

1. LXN 500 power supply unit.
2. Ethernet cable.
3. USIM cards for your mobile devices with information list that includes: identity, authentication, operator code etc.
4. Operation information given by your authorities: frequency band, bandwidth, either downlink central frequency in MHz or DL EARFCN, physical and logical cell ID and PLMN.
5. Laptop computer (With Google Chrome browser installed), mouse and keyboard.

Connecting the LXN 500 to a Laptop

The LXN 500 is configured by using Google Chrome to browse and access the LXN 500 Operation & Management (O&M) site on the LXN 500.

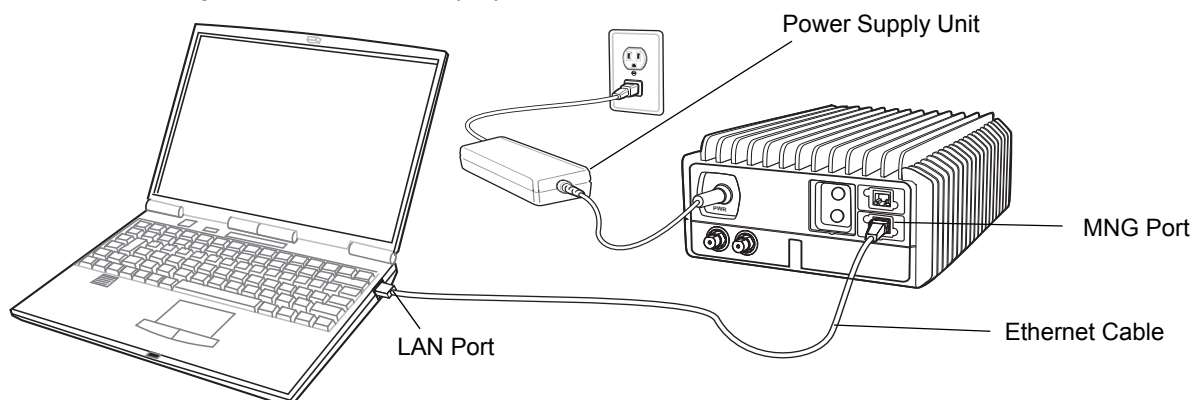
IMPORTANT Before connecting the LXN 500 to a laptop, verify the laptop is disconnected from any wired LAN connections and disable all wireless LAN connections.

Perform this procedure to connect the LXN 500 to a laptop.

Procedure:

1. Obtain the LXN 500 **UID** number from the information label on the LXN 500 (See [Figure 2-1](#)).
2. Set the parameters of the Local Area Connection of the laptop as described below.
For example: in Windows 10; in the search box on the taskbar, type **view network connections**, and then select **View network connections** → **Properties** → **Networking** tab → under **This connection uses the following items**, select **Internet Protocol Version 4 (TCP/IPv4)** → **Properties** → and set the following:
 - **Use the following IP address:** 10.98.66.2
 - **IP address, Subnet mask:** 255.255.0.0
 - **Default gateway:** 10.98.66.<UID>
3. Connect an Ethernet Cable between the **LAN** Port of a laptop and the **MNG** Port on the LXN 500.
4. Connect the Power Supply Unit to the LXN 500.
5. Power on the LXN 500 (See [Powering On on page 18](#)).

Figure 2-2 Connecting the LXN 500 to a Laptop



- On the laptop, launch Google Chrome and log-on to: `https://10.1.<UID>.8`
Result: The *LXN 500 O&M Configuration - Sign In* screen is displayed (See [Figure 2-3](#)).



NOTE On first connection, you may be required to follow a self signed certificate warning that appears on the browser screen. When a warning appears on the screen, click **ADVANCED** and then click **Proceed to** and the ip address shown.

Signing In

Perform this procedure to sign-in to the LXN 500 O&M Management site.

Procedure:

- Connect the LXN 500 to a laptop (See [Connecting the LXN 500 to a Laptop on page 19](#)).

In the LXN 500 O&M Configuration - Sign In Screen, enter **User** and the corresponding **Password** and click **Sign In**.



IMPORTANT When signing in for the first time, sign in with the default Administrator password - enter:
User: admin
Password: M0t0r0laAdm1n1!

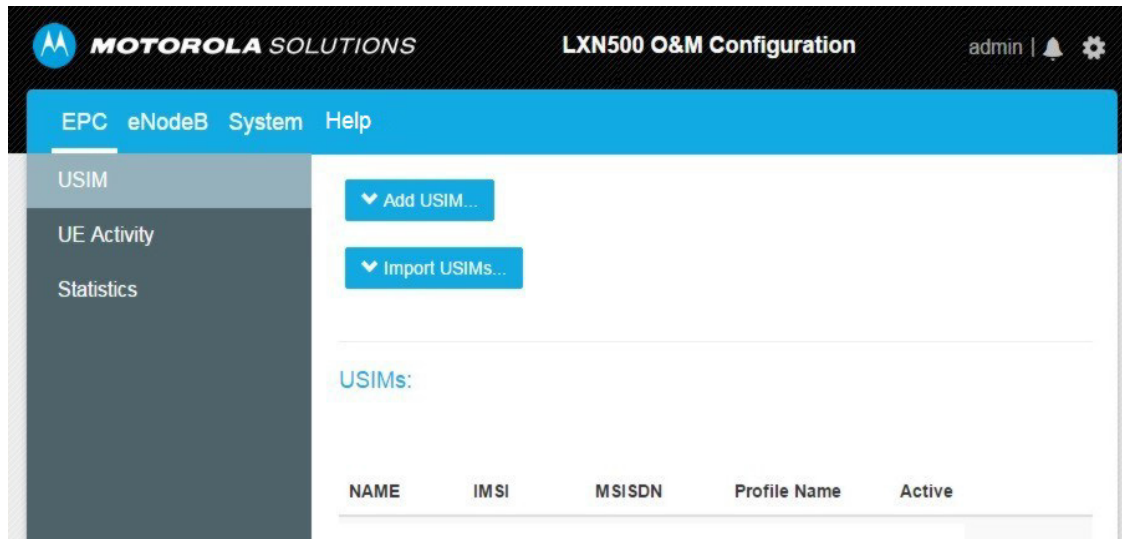
Change the default password upon signing in for the first time.

Figure 2-3 LXN 500 O&M Configuration - Sign In Screen

The screenshot shows the login interface for the LXN500 O&M Configuration. At the top, there is a black header with the Motorola Solutions logo. Below this is a blue banner with the text "LXN500 O&M Configuration - Sign In". The main content area is white and contains two input fields. The first field is labeled "User" and contains the text "admin". The second field is labeled "Password" and contains the text "M0t0r0laAdm1n1!". Below these fields is a blue button labeled "Sign In".

Result: The **EPC** tab of the **LXN 500 O&M Configuration** screen is displayed showing `admin` on the upper right side of the screen.

Figure 2-4 EPC Tab



Viewing System Notifications

During operation, users are notified of incoming events or alerts by LXN 500 management system.

Upon an incoming event or alert, the bell icon  on the upper right side of the screen, change color from gray to red. To view details on event or alert, click the bell and follow a link.

Signing Out

Perform this procedure to sign-out from the LXN 500 O&M Configuration site.

Procedure:

1. Click on  and select **Logout**.
Result: The Log In screen is displayed.

Account Management

LXN 500 O&M Configuration is managed by an administrator.

The administrator assigns access password to a set of management permissions to each user role.

User Roles and Management Permissions

The LXN 500 supports the following user roles:

- Administrator: user who can administrate, configure, set subscribers and modify the system on an agency level.
- Technician: user who can view diagnose and set technical aspects of the system on an agency level.
- Operator (default): user who operate the LXN 500 on an agency level and can monitor system data.

[Table 2-1](#) describes the management permissions assigned to each user role in the LXN 500.

Table 2-1 Management Permissions Assigned to Each User Role in the LXN 500

Action	Management Permissions		
	Administrator	Technician	Operator
USIM (Add, Change Status, Import, Delete, Delete all) (See Adding a Single Subscriber (UEs) on page 24)	Yes	Yes	No
View Logs/Statistics of Subscriber (UE) Activity (See UE Activity on page 28)	Yes	Yes	Yes
Set the eNodeB Configuration (See Setting the eNodeB on page 30)	Yes	Yes	No
View Logs/Statistics of EPC (See Statistics on page 29)	Yes	Yes	Yes
View PLMN in System Configuration (See PLMN Settings on page 31)	Yes	Yes	No
Change Configuration of PLMN (See PLMN Settings on page 31)	Yes	Yes	No
View System Configuration (See Setting the System on page 31)	Yes	Yes	Yes
View Communication Diagnostics (See PLMN Settings on page 31)	Yes	Yes	No
Perform Communication Ports Diagnostics (See Communication Diagnostics on page 33)	Yes	Yes	No
View System Health Diagnostics (See PLMN Settings on page 31 and Performing Diagnostics on page 33)	Yes	Yes	Yes
Backup/Restore LXN 500 servers	Yes	No	No
View Battery Diagnostics Info (See Battery Diagnostics on page 38)	Yes	Yes	Yes
Perform LED Test (See LEDs Test on page 41)	Yes	Yes	No
View Logs/Statistics of System Diagnostics (See System Logging on page 41)	Yes	Yes	Yes
Restart the LXN 500 (See Resetting the LXN 500 on page 62)	Yes	Yes	No
Restart the eNodeB (See Resetting the eNodeB on page 63)	Yes	Yes	No

Passwords

The LXN 500 requires a sign in password to monitor, configure, administrate and service the LXN 500.

Passwords are based on three type of user roles and are not granted on personal bases.

Each user role is initially assigned with a default password that can only be changed by an administrator.



IMPORTANT To avoid a security breach, it is recommended to change passwords upon signing in for the first time. Change passwords frequently and establish a security policy that determines a maximum password duration.

[Table 2-2](#) shows the default password assigned to each user role.

Table 2-2 Default Password Assigned to Each User Role

User Role	Administrator	Technician	Operator
User	admin	tech	user
Password	M0t0r01aAdm1n1!	M0t0r01aT3ch12!	MotorolaLXN5001!

Changing the User Password

Perform this procedure to change a password to a user role:

Procedure:

1. Log in as an Administrator.
2. Click on  and select **Change Password**.
3. Select the **User** → enter the old password → enter a new password → reconfirm the new password and click **Change**.

When changing a password note that a valid password must comply with the following rules:

- Use at least 15 characters in length password
- Use at least one uppercase character
- Use at least one lower-case character
- Use at least one numeric character
- Use at least one special character
- When changing a password, change at least 8 of the total number of characters.



IMPORTANT Changing a user role password does not effect other access permissions or application passwords in the LXN 500.

Adding a Single Subscriber (UEs)

Perform this procedure to add a new subscriber (User Equipment-UEs) to the LXN 500.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. In the LXN 500 O&M Configuration screen, on the **EPC** tab, click the **Add USIM...** button.
Result: The add USIM fields are displayed.

Figure 2-5 Add USIM Fields

The screenshot shows the 'LXN500 O&M Configuration' web interface. At the top, there's a navigation bar with 'EPC', 'eNodeB', 'System', and 'Help' tabs. The 'EPC' tab is selected. On the left, a sidebar menu shows 'USIM' (selected), 'UE Activity', and 'Statistics'. The main content area displays the 'Add USIM...' form. The form includes fields for NAME, IMSI, K, OP, MSISDN, and Profile Name. The 'NAME' field contains 'Name', 'IMSI' contains '325111001001507', 'K' contains '000102030405060708090A0B0C0D0E0F', 'OP' contains 'DBC59ADCB6F9A0EF735477B7FADF8374', 'MSISDN' contains '001001507', and 'Profile Name' is set to 'Default'. At the bottom of the form are 'Add USIM' and 'Clear' buttons.

3. Enter the information of the USIM.

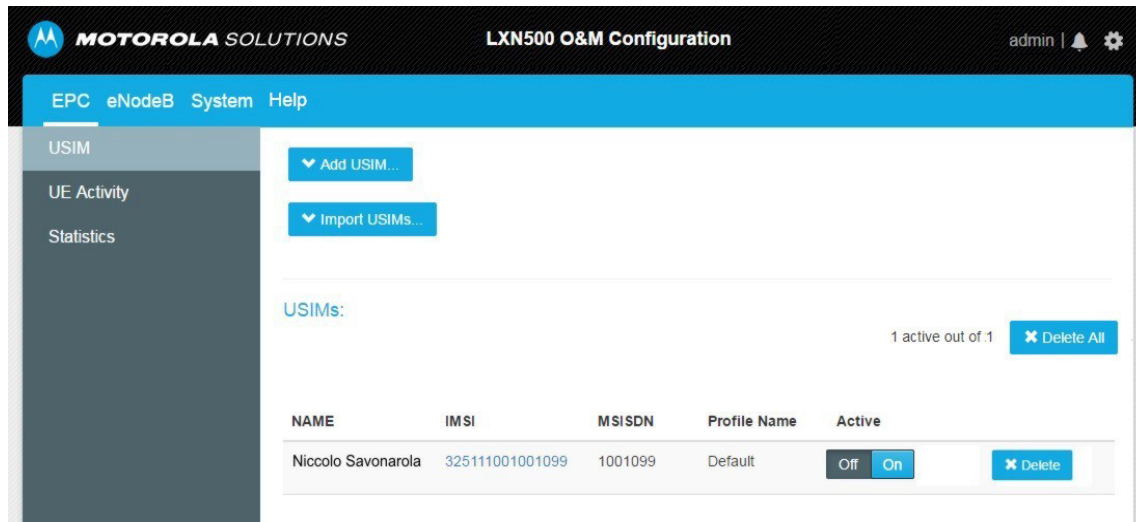


NOTE The USIM information is usually provided by your USIM cards provider with the USIM cards package.

- In the **NAME** field, enter the logical name of the USIM
- In the **IMSI** field, enter the unique identifier of the USIM
- In the **K** field, enter transport key
- In the **OP** field, enter the operator code
- In the **MSISDN** field, enter the Mobile Station International Subscriber Directory Number (up to 15 digits)
- In the **Profile Name** field, set to `Default`.

4. Click **Add USIM** to add another USIM to the LXN 500 or **Clear** to clear the current information displayed in the fields.
Result: The newly added USIM is displayed in the table on the **EPC** tab.

Figure 2-6 USIM is Displayed in a Table on the EPC Tab Screen



5. Turn off your mobile device, install the USIM card and turn on the mobile device.
6. Refer to [Provisioning the Mobile Device \(UE\) on page 45](#) to set your mobile device to operate with the LXN 500.

Deactivating/Activating Subscriber

The deactivation of a subscriber temporary deny service to that subscriber.

Perform this procedure to deactivate or activate a subscriber.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. On the **EPC** screen, click the **Off / On** switch in the **Active** column of the relevant USIM.

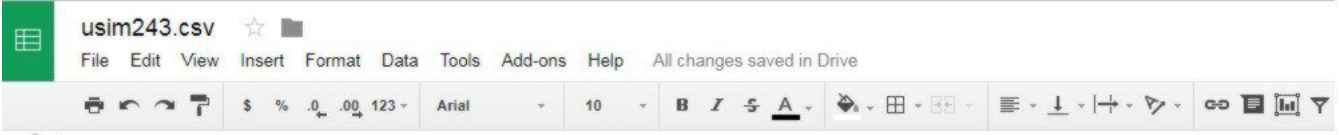
Importing Subscribers From .csv File

Perform this procedure to import a list of subscribers from a .csv file.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click **Import USIMs...**
3. Click **download template** to download an empty template .csv file to your hard drive.
4. Open the .csv file using Microsoft Office Excel or any text editor.
5. Edit the respective information for each USIM (See [Adding a Single Subscriber \(UEs\) on page 24](#)) and save the .csv file on your hard drive.

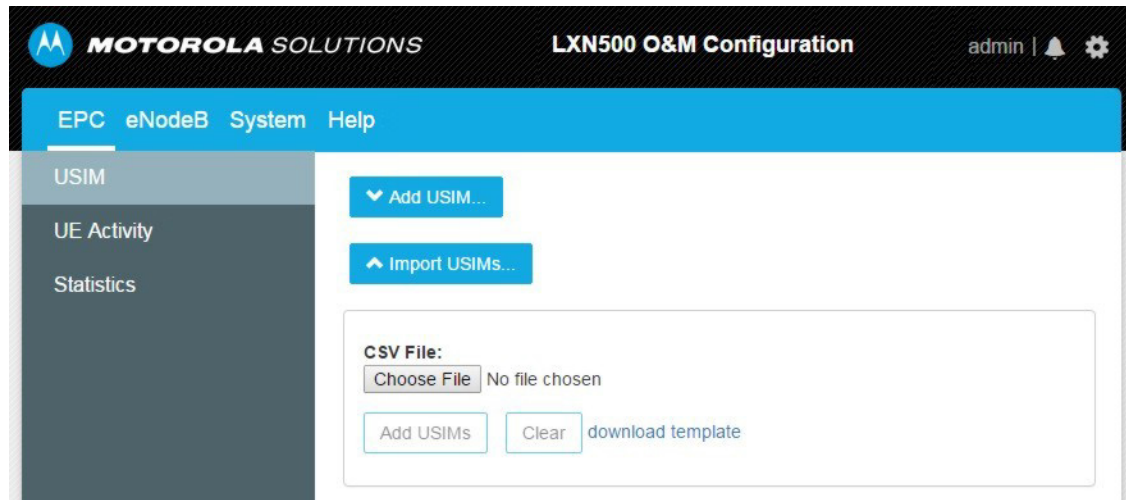
Figure 2-7 An Example of .csv file with list of USIMs



	A	B	C	D	E	F
1	name	imsi	k	op	msisdn	profile
2	USIM_101	445228905757 201	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093201	Default
3	USIM_102	445228905757 202	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093202	Default
4	USIM_103	445228905757 203	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093203	Default
5	USIM_104	445228905757 204	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093204	Default
6	USIM_105	445228905757 205	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093205	Default
7	USIM_106	445228905757 206	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093206	Default
8	USIM_107	445228905757 207	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093207	Default
9	USIM_108	445228905757 208	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093208	Default
10	USIM_109	445228905757 209	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093209	Default
11	USIM_220	445228905757 210	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093210	Default
12	USIM_221	445228905757 222	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093222	Default
13	USIM_222	445228905757 212	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093212	Default
14	USIM_223	445228905757 213	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093213	Default
15	USIM_228	445228905757 218	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093218	Default
16	USIM_225	445228905757 215	Cec86ba6eb707eb08905757b1bb21b8C	CBC59A7CB6C9A0EC735566B7CB7C3489	1093215	Default

6. On the **EPC** tab, click the **Import USIMs...** button.

Figure 2-8 *Importing Subscribers from .csv File*



7. Click the **Choose File** button, navigate to the .csv file and click **Open**.

Result: The list of USIMs appears on the screen.



NOTE USIM fields with invalid information are highlighted in red. Duplicated records are highlighted in blue.

8. Add the USIMs by clicking the **Apply** button.
9. Click the save icon or **Delete All** to remove all USIM entries.
10. Turn off your mobile devices, install the USIM cards and turn on the mobile devices.
11. Set your mobile devices to operate on 4G (LTE) network.

Deleting Subscriber

Perform this procedure to remove existing USIM from the LXN 500.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. On the **EPC** tab, click the **X Delete** button to delete a USIM.
3. Click **Ok** to confirm the delete operation.

Deleting All Subscribers

Perform this procedure to remove all existing USIM from the LXN 500.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. On the **EPC** tab, click the **Delete All** button to delete all USIMs.
3. Click **Ok** to confirm the delete operation.

UE Activity

The UE Activity option displays a historical summary of communication activities performed by a subscriber.

Perform this procedure to display a historical summary of communication activities performed by a subscriber.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. On the EPC tab, click **UE Activity**.
3. Select a subscriber from the **Select Active IMSI:** drop list.
4. In the **from last** field, enter a number and select **hours** or **days**.
5. Click the **Get IMSI activity** button to display a historical summary of communication activities.

Figure 2-9 UE Activity Screen

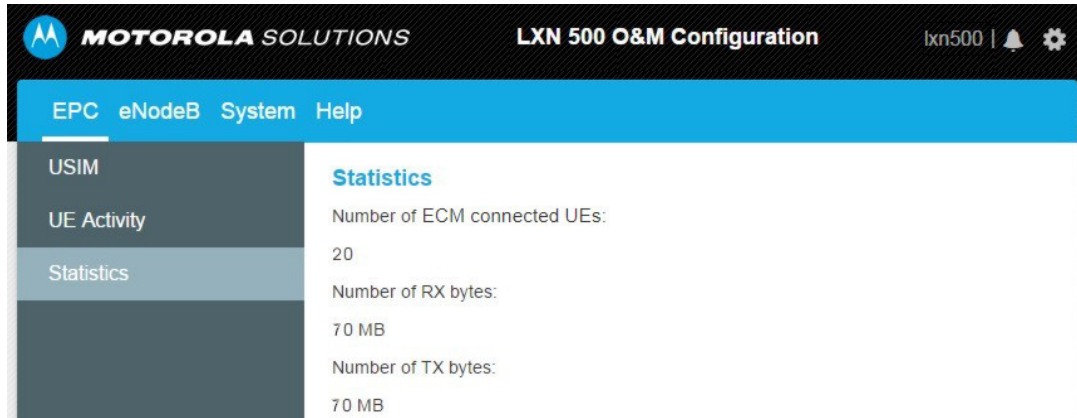
The screenshot shows the 'UE Activity' screen within the 'LXN 500 O&M Configuration' application. The top navigation bar includes the Motorola Solutions logo, the title 'LXN 500 O&M Configuration', and user information 'lxn500'. Below this is a blue navigation bar with tabs for 'EPC', 'eNodeB', 'System', and 'Help'. A left sidebar contains a menu with 'USIM', 'UE Activity' (highlighted), and 'Statistics'. The main content area is titled 'UE Activity' and contains a form with the following elements: a 'Select Active IMSI:' label followed by a dropdown menu showing '325111001001501'; a 'from last' label followed by a text input field and a unit dropdown menu showing 'hours'; and a blue 'Get IMSI activity' button.

Statistics

The statistics screen displays the following information:

- Number of ECM connected UEs currently linked to LXN 500
- The accumulated bytes received by the LXN 500 from time of manufacture.
- The accumulated bytes transmitted by the LXN 500 from time of manufacture.

Figure 2-10 *Statistics Screen*



Setting the eNodeB

The eNodeB is the part of the LXN 500 that sends and receives radio transmissions and signaling from and to the mobile devices. The eNodeB process the LTE analogue and digital over-the-air interface signals.

Perform this procedure to configure the eNodeB.

Procedure:

- 1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
- 2. Click the eNodeB tab.
Result: The eNodeB screen is displayed.

Figure 2-11 eNodeB Screen

The screenshot displays the 'eNodeB' configuration page within the 'LXN 500 O&M Configuration' application. The page is divided into three main sections: Band, Antenna, and Cell ID. The Band section features a dropdown for 'Band' (set to 14), a 'Bandwidth (MHz)' dropdown (set to 10), and input fields for 'DL Central Frequency' (762 MHz) and 'UL Central Frequency' (792 MHz), each with a corresponding 'Calculate' button. Below these are fields for 'DL EARFCN' (5320) and 'UL EARFCN' (23320). The Antenna section shows 'Tx power (mW)' for 'LTE-1' (400 mW) and 'LTE-2' (1000 mW), with '26(dBm)' and '30(dBm)' respectively. The Cell ID section includes 'Physical Cell id' (7) and 'Logical Cell id' (41). Each section has 'Set' and 'Get' buttons. The top navigation bar includes 'EPC', 'eNodeB', 'System', and 'Help' tabs, with 'eNodeB' currently selected.

- 3. In the **Bandwidth** field, select the required bandwidth.

Table 2-3 eNodeB Band Configuration

Band	Bandwidth (MHz)	Uplink / Downlink Frequency Range
14	5, 10	UL:788 - 798, DL: 758 - 768
20	5, 10, 20	UL: 832 - 862, DL: 791 - 821
28	5, 10, 20	UL: 723 - 748, DL: 778 - 803

NOTE The range of band 28, according to 3GPP standard is 45 Mhz. The LXN 500 supports a partial range of 25 Mhz of the full range.

4. Enter the **DL** (Downlink) central frequency MHz (in 0.1 MHz precision) or **DL EARFCN** and click the **Calculate** button to automatically populate all center frequency fields.
5. Click the **Set band info** button to save changes or **Get band Info** to populate the field with the last saved values.
6. In the **Antenna** section of the **eNodeB** tab, set identical **Tx power** (Transmit power in mW) to **LTE1** and **LTE2** antenna ports (See [Figure 1-3 on page 1-16](#)).

NOTE Tx power range can be set from 1 to 1000 mW RMS (0 to 30 dBm).

7. Click the **Set antenna info** button to save changes **Get antenna Info** to populate the field with the last saved values.
8. In the **Physical Cell ID** field, enter the Physical Cell ID of the LXN 500 (Range 0–503) and click the **Set** to save changes or **Get** to restore the last saved value.

CAUTION Physical Cell ID is generally unique number used to identify each base transceiver station (BTS) within a LTE network. When using more than one LXN 500 in a LTE network, DO NOT set identical Physical Cell ID to two LXN 500s or any linked base station that may have overlapping radio coverage area.

9. In the **Logical Cell ID** field. Enter the Logical Cell ID and click the **Set** to save changes or **Get** to restore the last saved value.

Setting the System

The System tab is used by administrators and technicians to diagnose, troubleshoot and show status of the LXN 500 hardware and software.

PLMN Settings

A public land mobile network (PLMN) is a network that is established and operated by an administration for the specific purpose of providing land mobile telecommunications services to the public.

A PLMN is identified by the Mobile Country Code (MCC) and the Mobile Network Code (MNC). Each operator providing mobile services has its own PLMN. When the LXN 500 is interconnect other networks, the PLMN interconnect with other PLMNs to create links between providers.

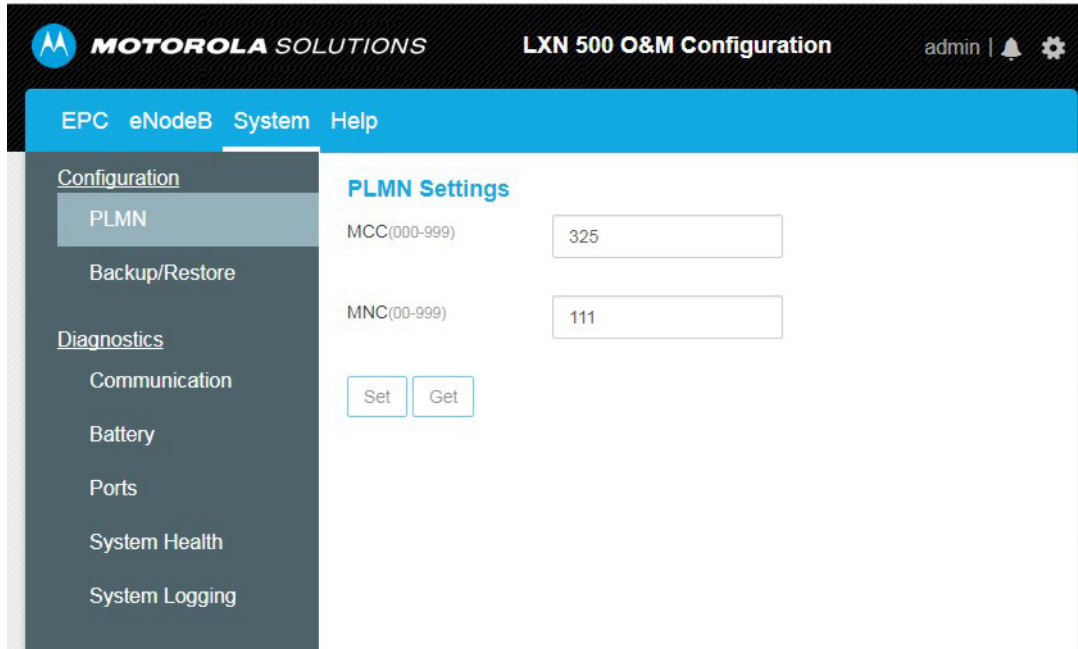
Perform this procedure to set the PLMN of the LXN 500:

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **System** tab.
3. Click **PLMN**.
Result: The **PLMN Settings** screen is displayed.
4. In the **MCC** field, enter the MCC number
5. In the **MNC** field, enter MNC number
6. Click the **Set** button to save changes or **Get** to populate the field with the last saved values.
Result: After setting a new PLMN value and clicking **Set**, the eNodeB restarts. This procedure takes

a few minutes and ends when all LEDs illuminate steady green. The restart process can also be tracked on the **System Health** page (See [System Health on page 40](#)).

Figure 2-12 PLMN Settings Screen



Backing-up and Restoring

During operation, servers or applications of the LXN 500 might fail to power-up or get stuck as a result of improper system shutdown or data corruption.

Backing-up and restoring enables the system to recover the last backed up version of servers and applications to restore operation.

Perform this procedure to Back-up and Restore servers and applications of the LXN 500.

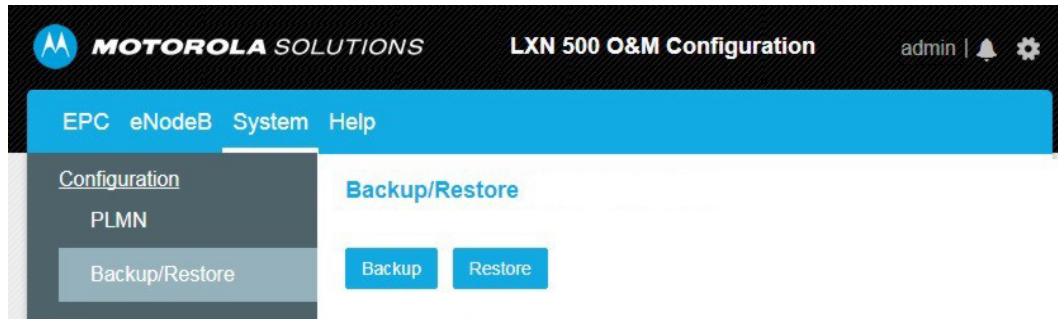
Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **System** tab.
3. Click **Backup/Restore**.

Result: The **Backup/Restore** screen is displayed.

4. Click **Backup** to backup parameters you configured using the Q&M (excluding IMSIs) or **Restore** to use the last saved settings of your servers and applications.

Figure 2-13 *Backing-up and Restoring Servers and Applications*



Performing Diagnostics

Follow procedures below to perform diagnostics to the LXN 500 unit.

Communication Diagnostics

The communication diagnostics is used for testing the 4G (LTE) communication with the LXN 500.

The test is performed between the LXN 500 and any available LTE mobile device connected to the LXN 500.

To perform communication diagnostics, the LXN 500 is using the Iperf application.

Iperf application is a cross-platform tool used for network performance measurement.

Iperf application must also be installed on the mobile device used for the test. The iperf application is securely distributed through the Google Play store.

Iperf has client and server functionality, and creates data streams to measure the throughput between the two ends - the mobile device functions as a server and the LXN 500 as client.

Figure 2-14 Communication Diagnostics

The screenshot displays the 'LXN 500 O&M Configuration' web interface. On the left is a sidebar with 'Diagnostics' selected, containing sub-links for 'Communication', 'Battery', 'Ports', 'System Health', and 'System Logging'. The main panel has a top navigation bar with 'EPC', 'eNodeB', 'System', and 'Help'. Below this, the 'Communication' section is active. It features two radio buttons: 'Built In Test' (selected) and 'Custom Test'. Under 'Built In Test', there are radio buttons for 'Short' and 'Continuous (Hours)', followed by input fields for 'IP Address' and 'Port'. The 'Custom Test' section has an 'iperf command' input field containing 'iperf -c 127.0.0.1 -i 1 -u -t 30'. A 'Start new test' button is located below the command field. The 'Result' section shows a log of test results, including connection details and throughput data. At the bottom of the result log are 'Get Log' and 'Clear Log' buttons.

Built in Test

The Built in Test is a preset network performance test performed between the LXN 500 and the mobile device. The test diagnose the UDP capacity between the LXN 500 and the mobile device at 5mbps.

Perform this procedure to test the LXN 500 communication.

Procedure:

1. Click **Communication** to test the LXN 500 communication.
Result: The **Communication** test screen is displayed.
2. Check **Built in Test**.
3. Check **Short** for a quick 10 seconds communication test or **Continuous (Hours)** and enter the required duration of the test.
4. In the **IP Address** field, enter the IP address of the mobile device used for the test.
NOTE Most Android devices display the IP address of the device under: **Settings** → **About** → **Status** → **IP Address**.
5. Enter the number of communication port used for the test (Default port number is 5001).
NOTE If you do not know the port number, leave this field empty.

6. Click the **Start new test** button and wait for the results to appear in the **Result** window.
Result: The test results are displayed in the **Result** window. The output contains a time-stamped report of the amount of data transferred and the measured throughput.
7. Click **Get Log** to download a file with the latest test output or **Clear Log** to erase the log file created for the last test and clear the screen.

Figure 2-15 Communication Test Screen

The screenshot shows the LXN 500 O&M Configuration web interface. The top navigation bar includes the Motorola Solutions logo, the title 'LXN 500 O&M Configuration', and a user profile 'admin'. Below this is a secondary navigation bar with 'EPC', 'eNodeB', 'System', and 'Help'. A left sidebar lists 'Diagnostics' (selected), 'Communication', 'Battery', 'Ports', 'System Health', and 'System Logging'. The main content area has two tabs: 'Built In Test' and 'Custom Test'. The 'Custom Test' tab is active, showing a text input field for the 'iperf command' with the value 'iperf -c 127.0.0.1 -i 1 -u -t 30'. Below the input is a 'Start new test' button. The 'Result' section displays a log of test output, including connection details and performance metrics. At the bottom of the result section are 'Get Log' and 'Clear Log' buttons.

Custom Test

The Custom Test is a network performance diagnostics between the LXN 500 and a mobile device. The diagnostics is built out of a selection of tests configured by a command line. The custom test command also supports pinging between LXN500 and mobile devices to test the connection.

 **NOTE** Before starting the Custom Test, make sure the mobile device is using iPerf2 client application.

Perform this procedure to test the LXN 500 communication.

Procedure:

1. Click **Communication** to test the LXN 500 communication.
Result: The **Communication** test screen is displayed.
2. Check **Custom Test**.

3. In the **iperf command** field, edit the iperf default command line to customize the communication tests using the following command line arguments:

Command Line Structure

```
iperf [-s|-c <Host>] [-u] [-p <Port>] [-B <Interface>] [-c] [-b <Bandw>[kKmM]] [-l <Length>] [-t <Time>] [-d] [-r] [-L <Port>] [-h]
```

Table 2-4 *iperf Command Line Options*

Command Line Option	Description
Client/Server	
-u, --udp	Uses UDP instead of TCP.
-p, --port <Port>	Connects with or expects data packets on this port (default: 5001).
-B, --bind <Interface>	Permits the connection only via the specified interface (IP address or interface name).
Server Specific	
-s, --server	Starts iPerf in server mode and waits for an iPerf client to contact it.
Client specific	
-c, --client <Host>	Starts iPerf in client mode and connects with the iPerf server <Host> (IP address or DNS name).
-b, --bandwidth <Bandw>{kKmM}	Limit the [down]/up-stream bandwidth when analyzing a UDP connection. This is specified as kilobytes (kK) or megabytes (mM) per second (default: 1 Mbps).
-l, --len <Length>	Sets the length of the UDP data packets.
-t, --time <Time>	Sets the duration of the connection in seconds (default: 10 seconds).
-d, --dualtest	The test is bidirectional: the iPerf server and client send and receive at the same time.
-r, --tradeoff	The test is sequential: the iPerf server and client send and receive one after the other.
-L, --listenport <Port>	Specifies the port where the device in bidirectional mode expects to receive data packets from the remote iPerf server (default: 5001).
Miscellaneous	
-h, --help	Outputs the help text.
Using ping	
Ping Command Line Structure:	
ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS] [-r count] [-s count] [[-j host-list] [-k host-list]] [-w timeout] [-R] [-S srcaddr] [-4] [-6] target_name	

Command Line Option	Description
Client/Server	
-u, --udp	Uses UDP instead of TCP.
-p, --port <Port>	Connects with or expects data packets on this port (default: 5001).
-B, --bind <Interface>	Permits the connection only via the specified interface (IP address or interface name).
Server Specific	
-s, --server	Starts iPerf in server mode and waits for an iPerf client to contact it.
-t	Ping the specified host until stopped. - To see statistics and continue - type Control-Break; - To stop - type Control-C.
-a	Resolve addresses to hostnames
-n count	Number of echo requests to send.
-l size	Send buffer size.
-f	Set Don't Fragment flag in packet (IPv4-only).
-i TTL	Time To Live.
-v TOS	Type Of Service (IPv4-only).
-r count	Record route for count hops (IPv4-only).
-s count	Timestamp for count hops (IPv4-only).
-j host-list	Loose source route along host-list (IPv4-only).
-k host-list	Strict source route along host-list (IPv4-only).
-w timeout	Timeout in milliseconds to wait for each reply.
-R	Trace round-trip path (IPv6-only).
-S srcaddr	Source address to use (IPv6-only).
-4	Force using IPv4.
-6	Force using IPv6.

4. Start the iPerf application on the mobile device.
5. Click the **Start new test** button and wait for the results to appear in the **Result** window.
Result: The test results is displayed in the **Result** window. The output contains a time-stamped report of the amount of data transferred and the throughput measured.
6. Click **Get Log** to display the results of the last test or **Clear Log** to remove the log

Battery Diagnostics

The Battery Diagnostics section enables to view the current status of each of the batteries (Future option of the LXN 500).

Perform this procedure to view the current status of the LXN 500 batteries.

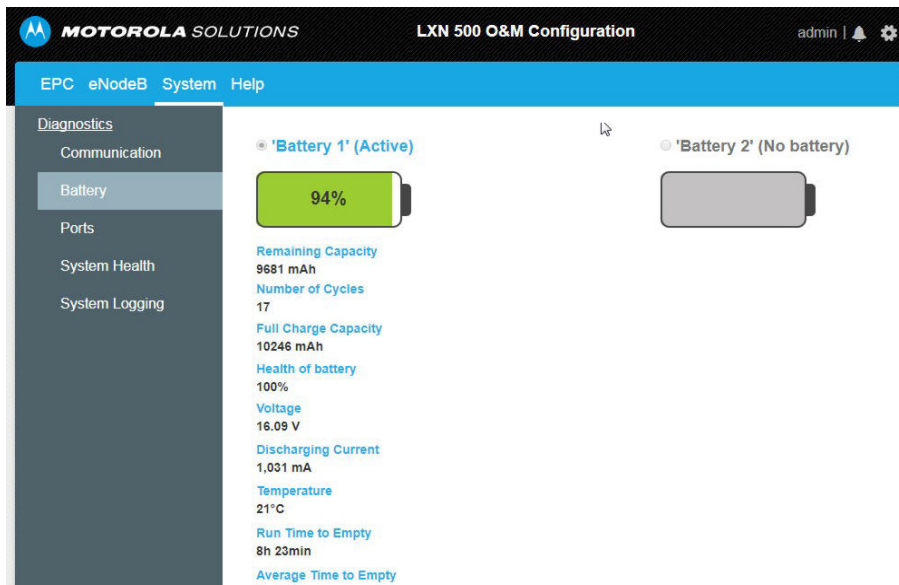
Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **System** tab.
3. From the **Diagnostics** menu, select **Battery**.
4. Click '**Battery 1**' or '**Battery 2**' to switch and view each battery status.

Result: The following battery indications may display:

- OFF - No battery or depleted battery
- **GREEN** - Battery is active and its capacity is more than 50%
- **ORANGE** - Battery capacity is 10% to 50%
- **RED** - Battery capacity is less than 10%

Figure 2-16 Battery Diagnostics



Ports Test

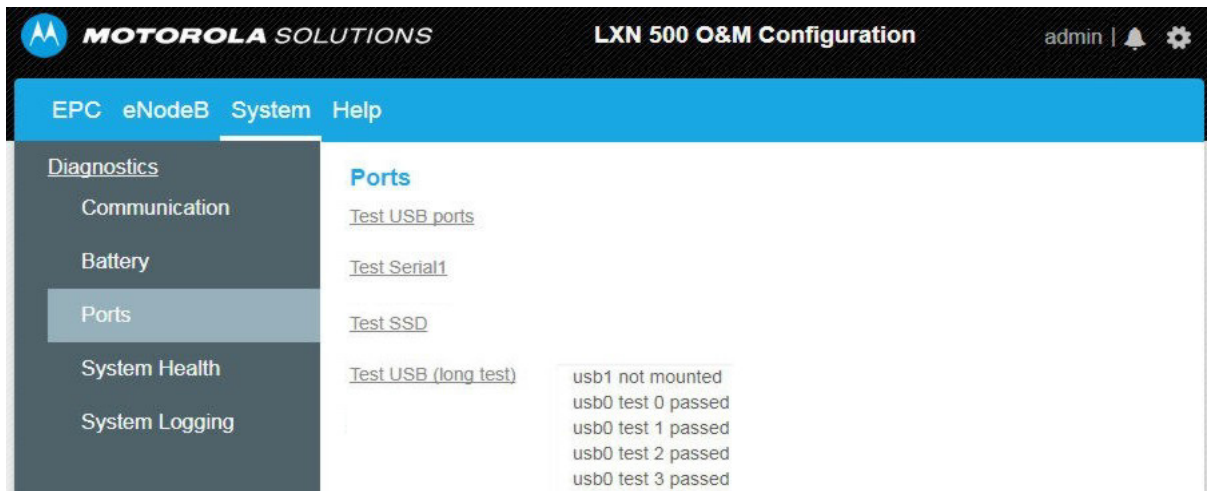
Perform this procedure to test the LXN 500 communication ports.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **System** tab.

3. Click **Ports**.
Result: The **Ports** screen is displayed.

Figure 2-17 Ports Test Screen



4. Click on each of the following port tests to start:
 - **Test USB ports:** This test briefly checks the external USB ports of the LXN 500.
 1. To perform this test, on the front panel of the LXN 500, remove the four screws that hold the protective covers of the USB ports (See [Figure 1-2](#)).
 2. Plug-in a mass storage flash drive(s) to the USB port.
 3. Click **Test USB ports**.
Result: The LXN 500 exchanges data for 10 seconds with the storage device and indicates SUCCESS or FAIL.
 - **Test Serial1:** This test checks the internal RS232 communication ports that interconnect boards inside the LXN 500.
 - **Test SSD:** This test checks the hard drives of the LXN 500. Click **Test SSD** and wait for SUCCESS or FAIL indication.
 - **Test USB (long test):** This test extensively checks the USB ports of the LXN 500.



IMPORTANT This test may last up to one hour and once started cannot be stopped.

1. To perform this test, on the front panel, remove the four screws that hold the protective panels of the USB ports.
2. Plug-in a FAT32 only flash drive(s) to the USB port.
3. Click **Test USB ports**.
Result: The LXN 500 exchanges data for one hour with the storage device and indicates SUCCESS or FAIL.
4. Reinstall the four screws that hold the protective panels of the USB ports.

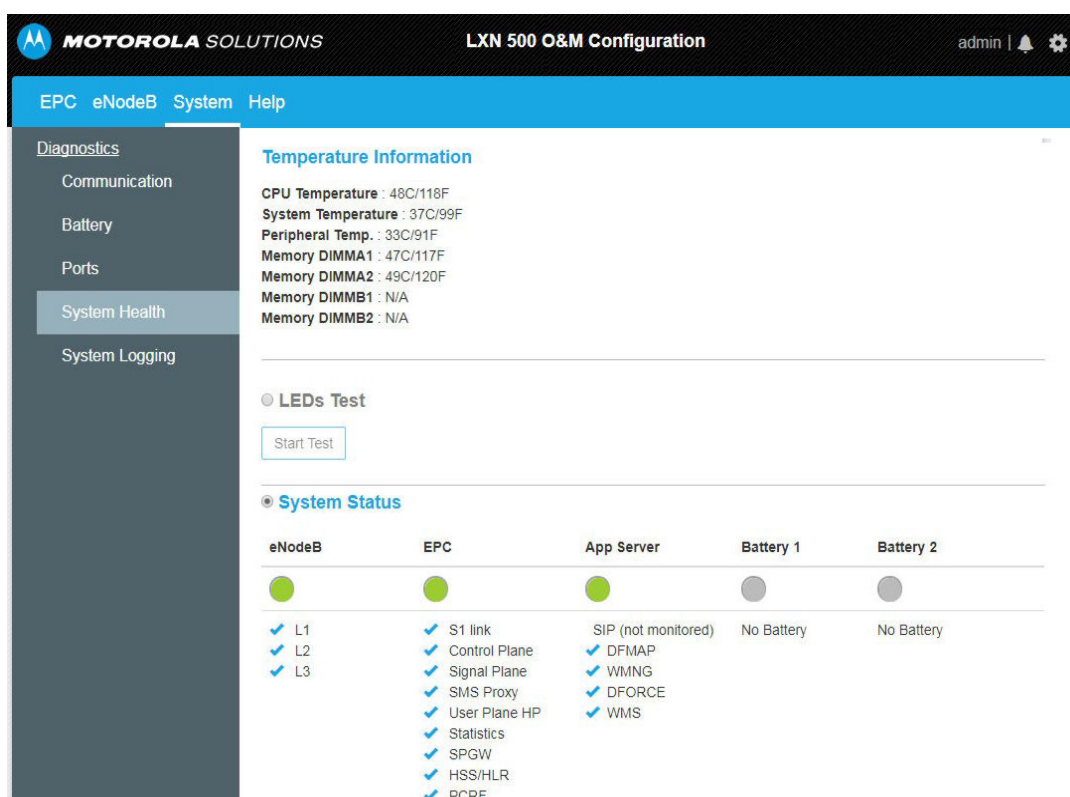
System Health

The System Health screen is used to provide LXN 500 temperature information and system status. Perform this procedure to check the LXN 500 system health.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
 2. Click the **System** tab.
 3. Click **System Health** to test the LXN 500 system health.
- Result:** The System Health screen is displayed.

Figure 2-18 System Health Screen



Temperature Information

The Temperature Information section displays the temperature of critical components inside the LXN 500. Temperature Information readings are mostly used by maintenance and installation personnel to troubleshoot the LXN 500.



NOTE Ambient temperatures beyond 140°F (60°C) will force the LXN 500 to shutdown.

LEDs Test

The LEDs Test enables to test the illumination of the front panel LEDs. During this test, the LEDs will not display the current status of the LXN 500.

Perform this procedure to test the front panel LEDs of the LXN 500.

Procedure:

1. On the **System Health** screen, check **LEDs Test**.
2. Click on a color button.

Result: The front panel LEDs illuminate in the selected color.

Figure 2-19 LEDs Test



System Status

The System Status section displays technical information related to the LXN 500 system health.

The indications shown on this section are identical to these of the status LEDs on the front panel of the LXN 500. Detailed health status of related software or hardware sections is listed below each LED.

Functioning components are marked by ✓ and faulty by ✗.

The System Status information is mostly used by maintenance personnel to perform component level troubleshoot of the LXN 500.

Figure 2-20 System Status

System Status				
RADIO	CORE	APP	BAT1	BAT2
✗ L1	✗ S1 link	SIP (not monitored)	No Battery	No Battery
✗ L2	✓ Control Plane	✓ DFMAP		
✗ L3	✓ Signal Plane	✓ WMNG		
	✓ SMS Proxy	✓ WMS		
	✓ User Plane HP	✓ DFORCE		
	✓ Statistics			
	✓ SPGW			
	✓ HSS/HLR			
	✓ PCRF			

System Logging

The LXN 500 includes an automatic logging service that registers the following system information:

- Error Events
- Warnings
- General Information
- Developers Debug Information

Perform this procedure to generate, view and manage an event log.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **System** tab.
3. Click **System Logging**.
Result: The System Logging screen is displayed.
4. Click the **Get System Logs** button.
Result: The system log is generated and displayed.

Once a log is displayed:

- Check the type of records to display (**FATAL** errors, **ERRORS**, **WARNING**, **INFORMATION**, **DEBUG**).
 - Use the **Filter Message** field to search for a string of text within the log or click on **Severity** or **Time** to display events by severity or time.
 - Use **First**, **Previous**, **Next** and **Last** buttons to view up to five past logs.
5. Click **download logs file** to download .zip file with text logs.

Figure 2-21 System Logging Screen

The screenshot shows the LXN 500 O&M Configuration web interface. The top navigation bar includes 'EPC', 'eNodeB', 'System', and 'Help'. The 'System' tab is selected, and the 'System Logging' option is highlighted in the left sidebar. The main content area features a 'Refresh view' button and a 'download logs file' link. Below these are checkboxes for log severity: FATAL, ERROR, WARNING, and INFO, all of which are checked. A pagination control shows 'First', 'Previous', '1' (selected), 'Next', and 'Last'. A 'Filter Message' input field is also present. The log entries are displayed in a table with the following data:

Name	Severity	Time	Message
O&M	INFO	2017-08-03T15:23:12.210Z	All monitored EPC processes are running and S1 link is established
O&M	INFO	2017-08-03T15:23:07.161Z	All monitored applications are running
O&M	INFO	2017-08-03T15:23:03.772Z	PSC Info:{"version":"4.0.6","state":"Main","kitId":2,"trackId":2138731357,"

About LXN 500

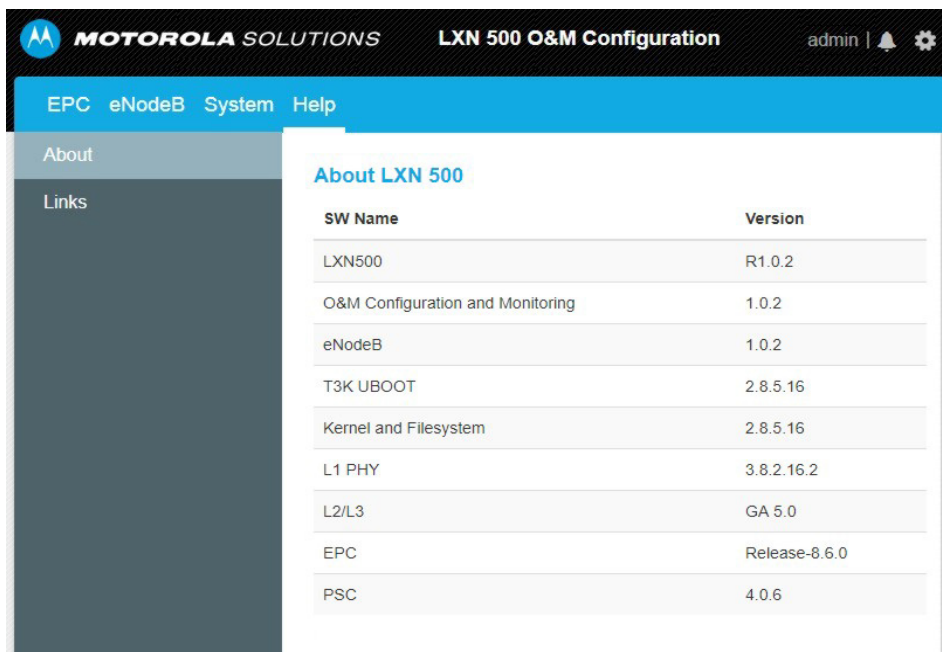
The **About** screen enables system administrators and technicians to identify the vendors and version of software components within the LXN 500.

Perform this procedure to generate view and manage an event log.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **About** tab.

Figure 2-22 About LXN 500 Screen



Configuring the DragonForce Server

Perform this procedure to Configure the DragonForce Server.

Procedure:

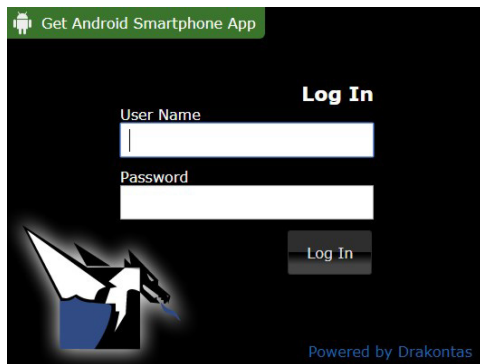
1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **Help** tab.
3. Click **Links** → **DF**.
4. Enter **User Name:** admin and **Password:** [DF]Motorola1
5. Click **Log In**.

Result: The DragonForce Log In screen is displayed.



IMPORTANT To avoid a security breach, it is recommended to change the password upon signing in for the first time. For changing the password, refer to DragonForce documentation.

Figure 2-23 DragonForce Log In Screen



6. To configure users and groups, refer to DragonForce documentation.

Configuring the WAVE 5000 Server

Perform this procedure to Configure the WAVE 5000 Server:

Procedure:

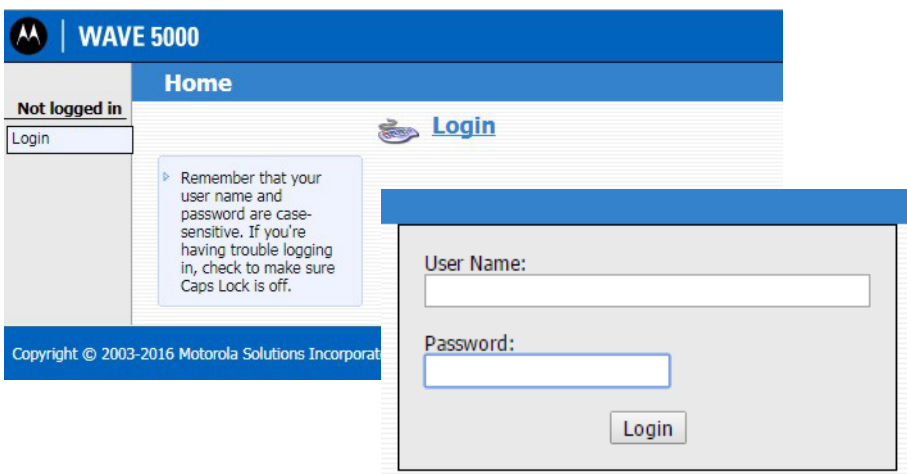
1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click the **Help** tab.
3. Click **Links** → **WAVE**.
4. Click **Login**.

Result: The WAVE Server Login screen is displayed.



IMPORTANT To avoid a security breach, it is recommended to change the password upon signing in for the first time. For changing the password, refer to WAVE 5000 Server documentation.

Figure 2-24 WAVE 5000 Server Log In Screen



5. Enter **User Name:** administrator and **Password:** LXN500M0t0r0law5k!
6. Click **Login**.
7. To configure users and talkgroups, refer to WAVE server documentation.

Provisioning the Mobile Device (UE)

Perform this procedure on the mobile device to connect the mobile device to the LXN 500.

Procedure:

1. From the home screen of the mobile device, click **Settings** → **...More** → **Cellular networks** → **Access Point names** → ⊕ → Edit access point → set **Name** to `internet` set **APN type** to `default` → ⋮ → **Save**.
2. From the home screen of the mobile device, click **Settings** → **...More** → **Cellular networks** → **Network Mode** → select **LTE Only**.
3. From the home screen of the mobile device, click **Settings** → **Security** → **Install from SD Card** → **Network Operators** → set **PLMN ID** as in the LXN 500 → **Connect**.
4. Contact Motorola Solution Support Center to download and install WAVE Push-to-Talk (PTT) application on the mobile device.
5. Download and Install WAVE 5000 certificate:
 - Contact Motorola Solution Support Center to download and save the **w5kext.cer** file on the mobile device.
 - From the home screen of the mobile device, click **Settings** → **Security** → **Install from SD card** → search and click on the **w5kext.cer** file → **OK**.
6. Download and Install DForce Client application:
 - Contact Motorola Solution Support Center to download and save the **DForce *.apk** file on the mobile device.
 - From the home screen of the mobile device, click **Settings** → **Security** → **Install from SD card** → search and click on the **DForce *.apk** file → **OK**.

Vehicle Installation

This section describes the tools and equipment, planning requirements and product inspections necessary for a smooth installation of the LXN 500 system.

Proper planning will help to ensure that the installation is completed without difficulty and that no damage occurs to the units or the vehicle.

✓ **NOTE** The LXN 500 is a reliable product when installed correctly. However, performance can be seriously impaired if it is not installed correctly. Thoughtful planning can make the difference. Product to be installed by a service person. Before the installation, please see rating label which is located on base of the unit.

Unpacking

Unpack your shipment and check the contents to ensure that you have received all the specified items.

Thoroughly inspect the equipment for shipping damage as soon as possible after delivery. Report any damage you find to your Motorola Solutions Customer Service representative immediately.

Save the packing box and plastic bags for storage and shipping. Both the shipping box and the bags protect the LXN 500 components from physical and electrostatic damage.

The following optional parts can be used to mount the LXN 500:

- LXN 500
- Four mounting brackets with 12 screws
- 13.1 feet (4 meter) power cable with 20A fuse
- One dome antenna or two diversity antennas
- Power protection and back-up unit (Optional)
- Quick start guide and related documentation.

Configuration Options of Antenna Installation

The LXN 500 can be installed inside a vehicle trunk using one of the two antenna configuration options.

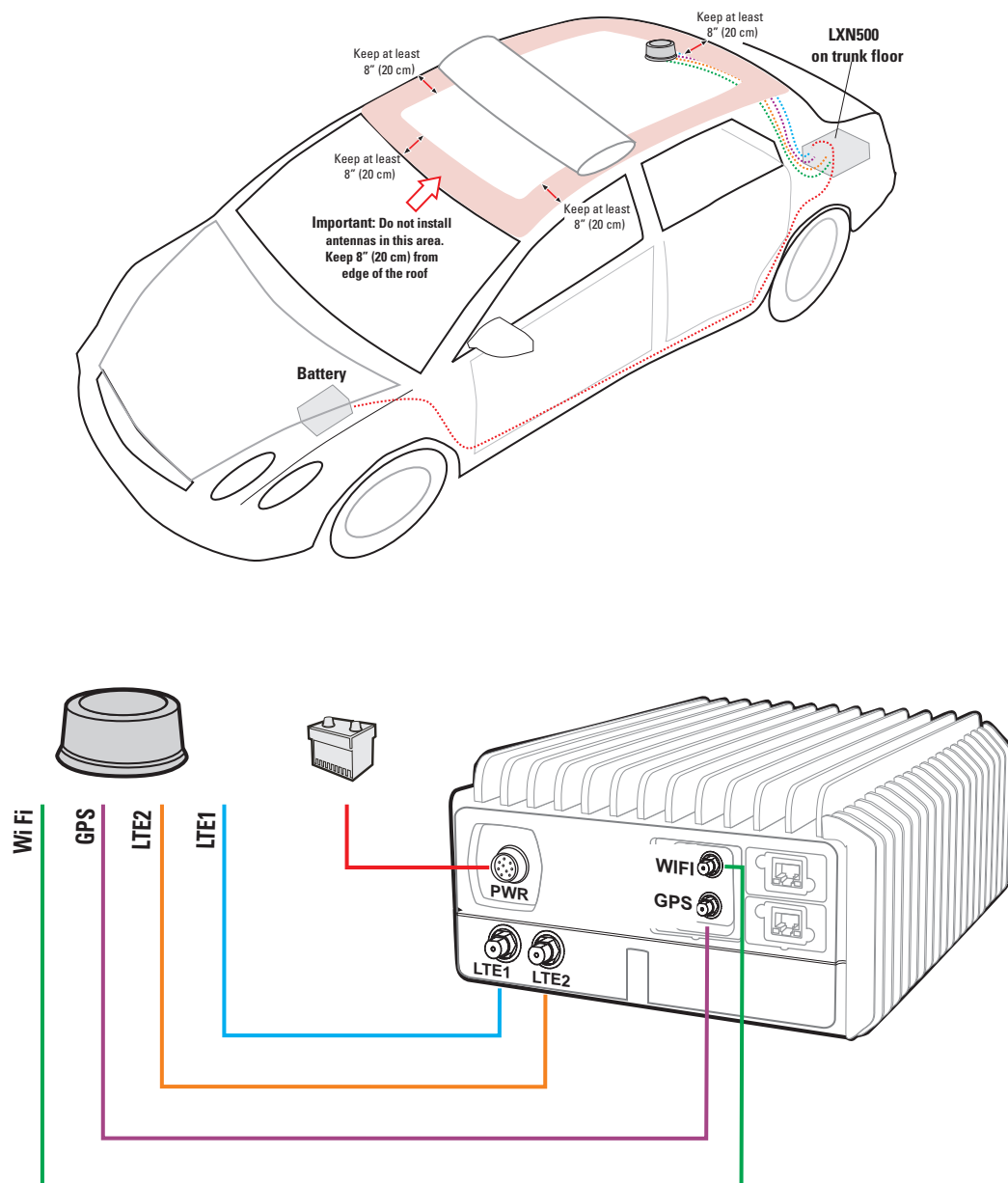
Dome Antenna Configuration

Fixed-mounted 4 ports antenna for use in public safety vehicular applications. The antenna requires a hole in the car roof.

The antenna consists of 4 separate dedicated antennas for LTE Main (LTE1) LTE Div. (LTE2), WiFi and GPS.

The antenna is provided with four short, flexible coaxial cables (threads) coming out of the antenna bottom side. The 12-ft coaxial cables are provided to connect between these threads and the LXN 500 connectors. The cables are connected to the LTE1, LTE2, WIFI and GPS ports of the LXN 500.

Figure 3-1 Dome Antenna



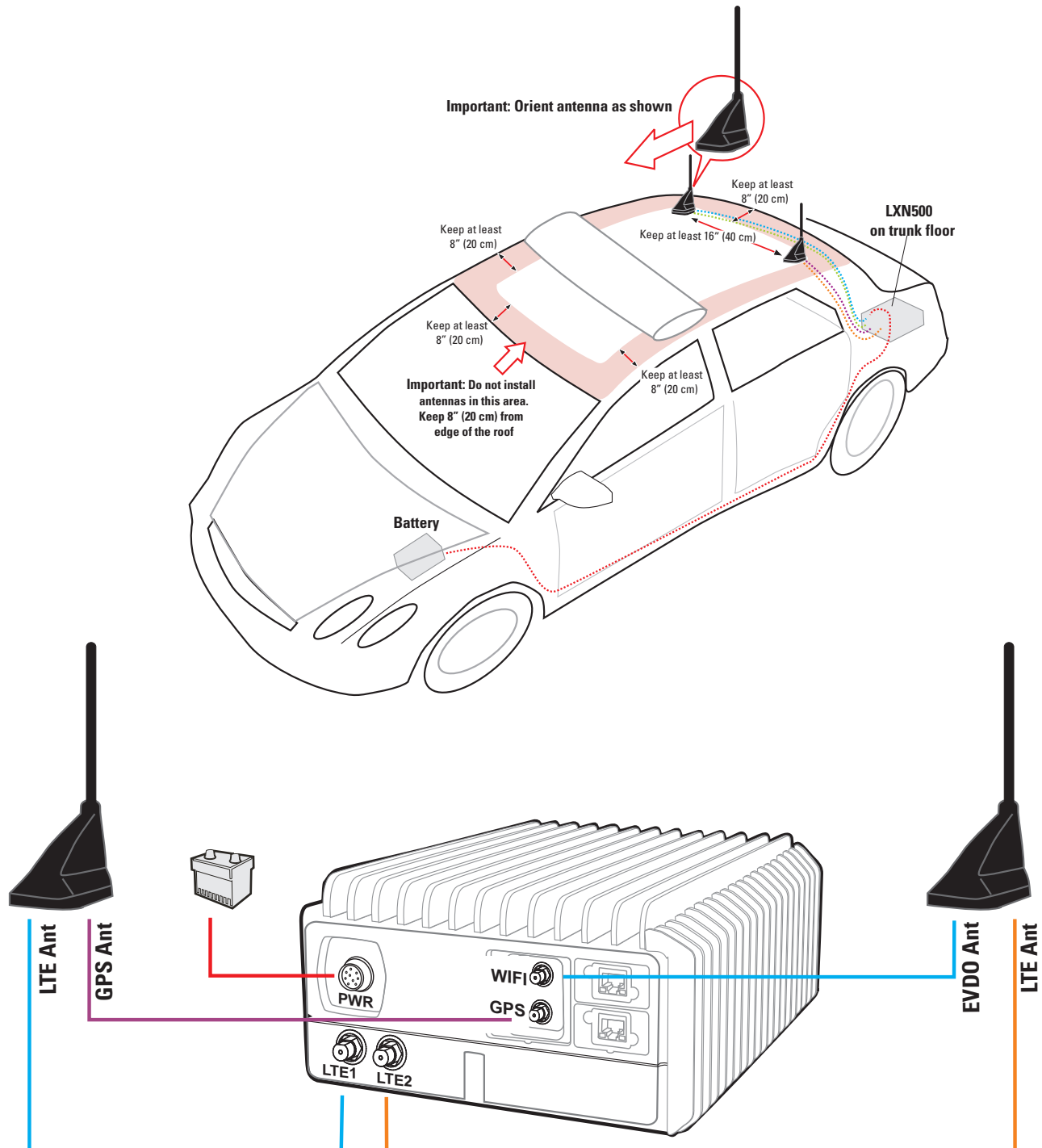
Dual Diversity Antenna Configuration

The dual diversity antenna is a layout of two diversity antennas connected in MIMO (Multiple Input, Multiple Output) configuration.

Each antenna is provided with three short, flexible 12-ft coaxial cables (threads) coming out of the antenna bottom side.

In one antenna, the cables are connected to the LTE1 and GPS ports of the LXN 500. In the second antenna, the cables are connected to the LTE2 and WIFI ports of the LXN 500.

Figure 3-2 Dual Diversity Antenna



Preparing to Install the LXN 500

Tools

The following tools and service aids are recommended for installation:

- Set of Phillips and flat head screwdriver bits
- T-6 through T-25 torx bits
- Battery / air operated drill
- Set of high speed drill bits (including 6mm bit for bracket holes)
- Ratchet with extensions
- Socket torque wrench
- Socket set (Metric & Imperial)
- Wrenches (Metric & Imperial)
- Utility knife
- Wire cutter
- Volt-Ampere-Ohm meter
- Automotive test light
- Wire Crimp Tool
- CAT-5e cable tester
- Measuring tape
- Flashlight

Materials

The hardware required to install the LXN 500 in a vehicle consists of:

- Tie wraps
- Electrical tape
- Wire taps
- Rubber grommets
- Spare wire (8-22 gauge)
- Variety of self tapping screws and bolts
- Wire connectors / wire terminals / wire lugs / eyelets

Planning

Be sure to consider the following issues when planning the installation:

- Installation location away from air bag deployment zones
- Environmental considerations
- Electrical guidelines

- Liquid Propane (LP) gas warning
- Usability by driver/operator
- Vehicle vendor instructions
- Local vehicle authority regulations/design rules
- LXN 500 Mounting Location



CAUTION When installing the LXN 500, make sure that the LXN 500 is tightly anchored to the vehicle structure. Unstable mounts can damage the unit.

Correct positioning of the components will ensure that the LXN 500 system meets the following requirements:

- The LXN 500 is installed inside a ventilated compartment or inside a trunk. To cool the LXN 500, allow sufficient space around the LXN 500 for free air flow (See [Figure 3-3](#)).
- It will not injure the operator or passenger in case of an accident.
- It does not interfere with the driver's vision or hinder the driver when driving the vehicle.
- Place the LXN 500 so that it can be easily removed for servicing.
- Do not mount the LXN 500 system units and route cables where they can be kicked by the driver's or other passenger's feet.
- Verify that the mounting surface is able to support the weight of the units.
- Select a location that permits routing the RF antenna cables as directly as possible.
- Do not mount units on a flat or concave surface where the unit could become partially submersed in water.

Ventilation

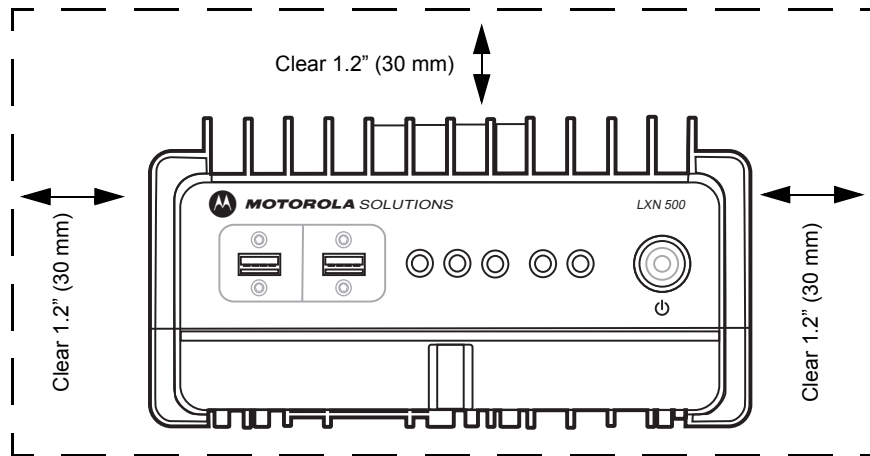
The LXN 500 is designed to operate properly in an ambient temperature range of -20°C to 60°C (-4°F to 149°F). The LXN 500 must be installed in an unobstructed location to allow proper air flow and away from heat generating equipment such as: radio transmitters, power amplifiers or a cabin heater (See [Figure 3-3](#)).



CAUTION

- To avoid overheating of the LXN 500, do not place any object on the LXN 500.
- To prevent overheat damage to the LXN 500, the unit is designed to automatically shut down at 60°C (149°F)

Figure 3-3 Recommended Clear Ventilation Area Around the LXN 500



Electrical Guidelines

The power range requirement for operating the LXN 500 is 9 to 33VDC. The maximal power consumption of the LXN 500 is 70 Watts.



CAUTION The LXN 500 is installed in a vehicle with a negative-ground electrical system. DO NOT install the LXN 500 in a vehicle with a positive-ground electrical system.

Be sure that the vehicle's electrical system is in good condition. Faults in the alternator and ignition system can be a source of severe Radio Frequency Interference (RFI) and can result in LXN 500 system operating problems. Correct any problems in the alternator output, ignition system, and battery condition before beginning the installation.

The vehicle must have an alternator that can produce a high-current output at low speed (below 18 m.p.h. or 29 km/h) and in an idle state. It also needs the highest rated heavy-duty battery available for the vehicle.

If used, the input power cable of the Optional Power Protection and Back-up Unit must be directly connected to the (+) terminal of car battery and the (-) to the car chassis (See [Figure 3-6](#)).

Ground Polarity

The LXN 500 system will only operate in negative ground electrical systems. Check the ground polarity of the vehicle before starting the LXN 500 system installation to verify that the polarity is correct. Accidentally reversing the polarity will not damage the LXN 500, but will cause the fuse of the power cable to blow.

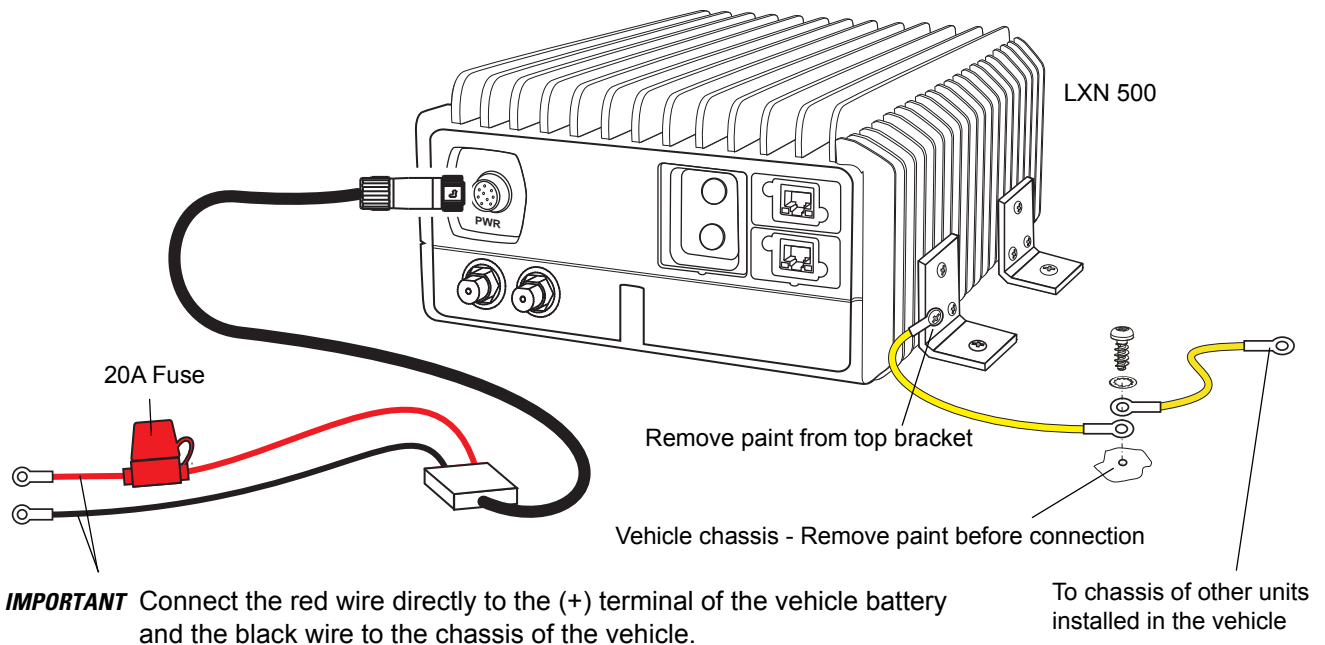
Due to advanced vehicle assembly techniques, different parts of the vehicle chassis may not be connected to the battery negative terminal. Connecting the ground leads of several devices with a common power supply at different locations on the chassis, may cause GROUND potential differences between these locations and damage the LXN 500 system or any other installed equipment.

FIRST CHECK that the vehicle chassis point to which you are about to connect the negative lead is properly connected to the battery negative terminal. If the chassis is not properly grounded, connect the negative lead directly to the battery's negative terminal.

When the LXN 500 and the mobile workstation are mounted on a mount or next to each other, use a 10AWG ground wire to connect between the body of the LXN 500 and other units. The ground wire ring lugs must be connected, on one side, to one of the screw holes used to secure the LXN 500 to the mounting bracket and on the other side to the vehicle chassis.

IMPORTANT Vehicle common ground points (chassis) should be measured against the vehicle battery negative terminal for no more than 1/2 Ohm.

Figure 3-4 Connecting the LXN 500 to Power and Ground



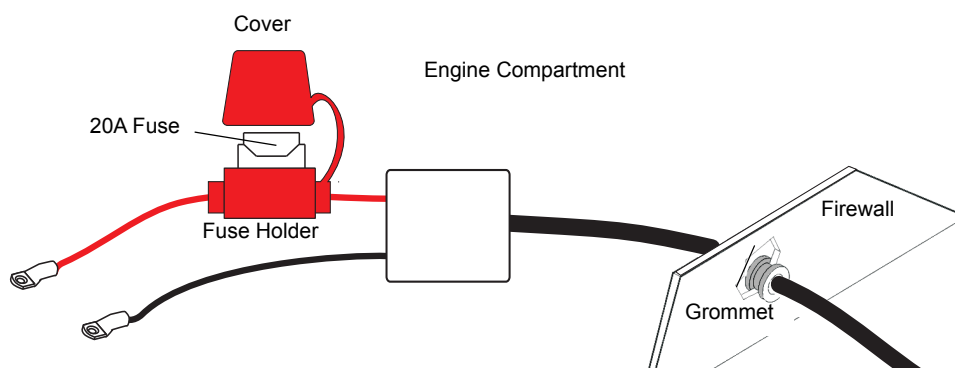
Installing the Power Cable

Perform this procedure to install the LXN 500 power cable.

Procedure:

1. Determine a routing plan for the power cable, taking into consideration the location at which the unit is to be mounted, and the location of the vehicle battery.
2. To pass the power cable through the fire wall and into the engine compartment, locate an existing hole with a grommet in the vehicle fire wall, or drill an access hole at the desired location. Insert a grommet inner diameter into the access hole to avoid damage to the cable (See [Figure 3-5](#)). Take special care not to damage any existing vehicle wires.

Figure 3-5 Cable Routing into Engine Compartment



3. From inside the vehicle, route the red and black power cable leads (without lugs attached) through the access hole into the vehicle's engine compartment, using accepted industry methods and standards.
4. Locate the nearest available vehicle chassis ground mounting point and shorten the black lead to remove excess cable length.
5. Install the supplied Ring Lugs onto the stripped end of the black and red lead at the end cable.
6. Position the fuse holder as close as possible to the battery, ensuring that it is not close to any hot engine component.
7. Connect the black lead to the vehicle chassis ground. DO NOT connect the black lead directly to the battery's negative (–) terminal.
8. Remove the Fuse from the Fuse Holder and connect the red lead of the power cable to the positive (+) battery terminal. Verify that the adapter cable is connected to the red lead of the main power cable.
9. Plug the fuse into the fuse holder.



CAUTION Failure to mount the red lead of the power cable directly to the battery may result in severe alternator whine interference.

Cable Routing

- Before a wire is run or a hole is drilled, inspect the vehicle and determine how and where you intend to mount the LXN 500, antennas and other parts.
- Plan wire and cable routing to provide maximum protection from overheating, battery acid, moving parts and sharp edges.
- Keep cables away from ignition circuits to reduce noise pickup in the radio equipment.
- Verify that the cables are of sufficient length. Do not connect two short lengths with a connector; doing so will result in signal loss. Refrain from loose excess in the cables, but leave enough slack to allow reconnecting if necessary.
- Do not run cables externally or underneath floor mats.
- Do not locate cables where they can be kicked by the driver or passengers or where they can interfere with operation of the driver's foot pedals.
- When routing the cable, refrain from creating sharp bends or kinks.
- Cables must be routed through special UL listed conduit/duct for electrical cables. This conduit/duct must fully enclose the cable along its whole length.

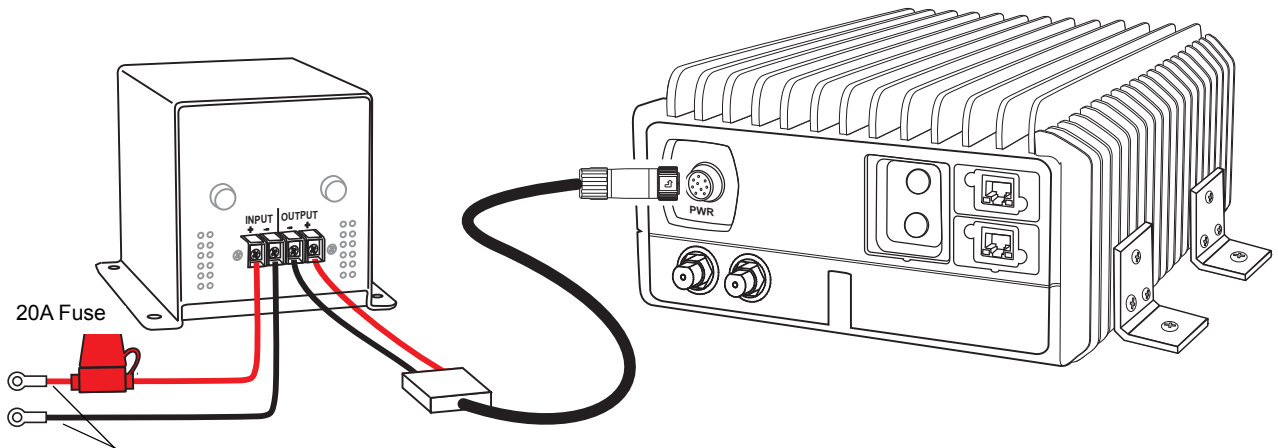
Installing the Optional Power Protection and Back-up Unit

The Power Protection and Back-up Unit (NAV-PAC) is an optional unit that protects the LXN 500 from Voltage spikes during engine cranking, power surges, momentary power losses, abrupt voltage changes and noise interference on incoming from the vehicle power system.

The NAV-PAC includes a back-up battery pack that acts as a power reservoir and is charged from the vehicle battery. In the event of a drop in DC Voltage due to engine cranking or total power interruption, the battery maintains power to LXN 500 for a limited period of time. This is essential for preventing brutal shut-down, and memory or data loss.

The NAV-PAC has two available models: NP-12 NAV-PAC for 12 Volt vehicle and NP-24 NAV-PAC for 24 Volts vehicles.

Figure 3-6 *Installing the Optional Power Protection and Back-up Unit*



IMPORTANT Connect the red wire directly to the (+) terminal of the vehicle battery and the black wire to the chassis of the vehicle.

For detailed information on the LXN 500 installation, refer to the NAV-PAC INSTALLATION AND OPERATION MANUAL provided with the NAV-PAC.

Installing the LXN 500

The LXN 500 should be mounted inside the vehicle so that cables coming from all peripheral devices can be connected easily to the connectors on the back panel. The LXN 500 is designed to be mounted on a flat surface in any position as long as the rear and front panels are accessible.

The LXN 500 is mounted by four mounting brackets (See [Figure 3-7](#) and [Figure 3-4](#)). The mounting brackets of the LXN 500 enable to mount the LXN 500 on a flat horizontal or vertical surface. The unit is usually installed inside a trunk of a vehicle, or on tray or any fixed mounting board (See [Figure 3-7](#)).



CAUTION When installed inside a vehicle trunk, be aware that ventilation of the trunk may be necessary to keep the LXN 500 within ambient temperature limits of -4°F to 140°F (-20°C to +60°C). If necessary, add fans to control the ambient temperature inside the trunk.

IMPORTANT To prevent overheat damage to the LXN 500, the unit is designed to automatically shut down above 60°C (149°F).

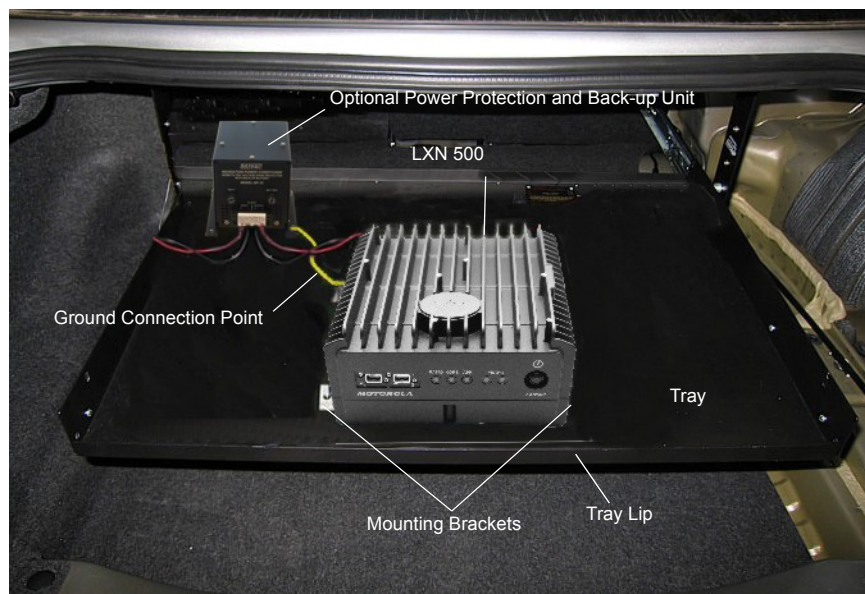


Figure 3-7 LXN 500 Installed Inside a Trunk of a Vehicle

To install the LXN 500:

1. Connect the four brackets to the LXN 500 using the provided 4mm Allen screws. Torque the screws to 60.7 inch-pounds (70 kg-cm).
2. Ground the LXN 500 to the vehicle chassis (See [Ground Polarity on page 52](#)).

✓ **NOTE** The LXN 500 Mounting Bracket must be connected to the vehicle chassis through a low impedance ground connection. Bolt the Mounting Bracket directly to the vehicle chassis or connect it to the vehicle chassis by Ground wire or copper braided ground strap.

3. Secure the LXN 500 to the mounting surface using four 1/4" self-drilling tap screws.
4. Connect the antenna cables to the connectors on the back panel of the LXN 500 (See [Figure 3-1](#) and [Figure 3-2](#)).
5. Connect the power cable to the **PWR** connector at the back panel of the LXN 500 (See [Figure 3-4](#) and [Figure 3-6](#)).

IMPORTANT To avoid possible shut down of the LXN 500 during engine cranking, a Power Protection and Backup unit should be used (See [Installing the Optional Power Protection and Back-up Unit on page 54](#)).

Installing Antennas

Vehicle RF antennas must be installed external to the vehicle and in accordance with:

- Requirements of the antenna manufacturer/supplier.
- Instructions provided by the installation manual of other radio devices installed next to the LXN 500.



IMPORTANT To assure optimum performance and compliance with RF Energy Safety standards, these antenna installation guidelines and instructions are limited to metal-body vehicles with appropriate ground planes and take into account the potential exposure of back seat passengers and bystanders outside the vehicle. For detailed product safety and RF exposure, refer to Safety and General Information leaflet, Motorola Solutions publication number: 6866537D37.

Mounting Guidelines

Installation guidelines for antennas:

1. Use only antennas supplied with the LXN 500.
2. Use the installation instructions provided with the antenna by manufacturer/supplier.
3. If possible, the antenna location must not be obstructed by any structure or object. When installing antennas on a vehicle roof, ensure that antennas are installed at least 8" (20 cm) from any edge of the roof.
4. Ensure that the installation surface is grounded by connecting grounding straps between the surface and the vehicle chassis.

Troubleshooting and Maintenance

This chapter describes the maintenance operations available for the LXN 500 system.

Troubleshooting is the process of identifying the source of a fault. This process must be developed by user to detect a fault as quickly as possible. This guide covers only the high-level troubleshooting process performed by the LXN 500 users.

Troubleshooting should start from the least invasive and easy-to-do activities and progress to the more difficult. The following provides a high-level sequence of troubleshooting escalation:

1. Reading LED indications:
The state of the LEDs (See [Table 1-1 on page 1-12](#)) is a result of the device's power-on self test and on-going operation. Reading the LEDs should be done during operation. In most cases, restarting the LXN 500 may resolve problems.
2. Performing PTT calls and data exchange between devices connected to the LXN 500 to test communication.
3. Checking the mobile devices connected to the LXN 500 for proper operation, USIM installation and 4G (LTE) settings.
4. Performing point-to-point communication diagnostics between the LXN 500 and a mobile device:
This step requires you to physically test communication at various points throughout the coverage area using a diagnostic application running on one of the mobile devices connected to LXN 500 (See [Communication Diagnostics on page 33](#)).
5. Running diagnostic on the LXN 500:
The LXN 500 has a built-in diagnostic option (See [Performing Diagnostics on page 33](#)). Using Ethernet wire connection to a laptop and a web browser, the LXN 500 O&M Management can display details about faulty sections of the LXN 500 and provide detailed log of activity.
6. Checking the configuration: This step requires you to have all relevant system information with you to ensure that the LXN 500 is configured correctly. If your LXN 500 is configured as stated in this guide, then you may have to verify that your configuration information is correct.
7. Contacting Motorola Solutions Customer Service for remote connection and troubleshooting of the LXN 500.

Troubleshooting

Table 4-1 Troubleshooting

Problem/Indication	Possible Cause	Remedy
LXN 500 does not power up	1. Power button not pressed properly 2. Ambient temperature is out of limits 3. Power cable not connected properly 4. Power cable fuse is blown	1. Press and hold the Power button until the LEDs on the front panel start to illuminate (Powering On on page 18). 2. Verify that the LXN 500 is properly ventilated and resume operation (See Ventilation on page 51) 3. Verify that the power cable is plugged and secured to the PWR connector on the back panel 4. Replace the fuse of the power cable (See Figure 3-4)
10 minutes after startup the CORE or RADIO LED do not show steady green	Internal synchronization failed. (Core and Radio synchronization failure)	Perform soft restart using the Power button (See Soft Resetting using the Power Button on page 62)
Mobile device (UE) unable to detect LXN 500	1. Internal Radio and/or Core failure 2. LXN 500 antenna is disconnected 3. Low strength of transmitted signals 4. PLMN ID or LXN Unit ID are incorrectly set 5. Subscriber device is out of coverage area	1. Verify that the RADIO and CORE LEDs show steady green. If not - soft reset the system (See Soft Resetting using the Power Button on page 62). If 10 minutes after reset LEDs does not show steady green, contact support. 2. Verify that LTE1 and LTE2 antenna cables are connected to the LXN 500 (See Configuration Options of Antenna Installation on page 48) 3. Verify that the LXN 500 power settings are configured properly (See Setting the eNodeB on page 30). 4. Verify that PLMN ID or LXN Unit ID are correctly set in the LXN 500. 5. Try to change the location of the mobile device. Move closer to LXN 500 and avoid places that block radio waves like metal objects. Also check: • In the mobile device, verify or set APN Name to <code>Internet</code> and APN type to <code>default</code> • Verify the subscriber's USIM is registered and activated in the system (See Deactivating/Activating Subscriber on page 25)

Table 4-1 *Troubleshooting (Continued)*

Problem/Indication	Possible Cause	Remedy
Mobile device unable to connect to LXN 500	1. APN of LXN 500 is not configured properly in mobile device 2. USIM is not provisioned or disabled in the LXN 500	1. In the mobile device, verify or set APN Name to <i>Internet</i> and APN type to <i>default</i> 2. Verify the USIM of the mobile device is listed correctly in the LXN 500 Adding a Single Subscriber (UEs) on page 24 3. Soft reset the mobile device to re-connect (See Soft Resetting using the Power Button on page 62)
Mobile device unable to login to one of the applications (No PTT, messaging or location services)	1. User is not defined in the WAVE 5000 or Dragon Force applications or incorrect password 2. WAVE 5000 certificate is missing in mobile device 3. Certified APK version is missing in mobile device 4. WAVE 5000 and/or Dragon Force application is not enabled in LXN 500	1. Verify that User Names and Passwords are defined in the mobile device for the WAVE 5000 and/or Dragon Force applications 2. Install WAVE 5000 certificate on mobile device 3. Install certified APK version 4. Verify that WAVE 5000 or Dragon Force are installed and can be accessed (See Configuring the DragonForce Server on page 43 and Configuring the WAVE 5000 Server on page 44)
After modifying the EARFCN in the LXN 500, mobile devices cannot detect and connect to the LXN 500.	1. The mobile device fails to detect the LXN 500.	1. In the mobile device, perform a search for cellular networks - the required network will not be shown. 2. Restart the mobile device - after the restart, the phone should connect automatically. If not the mobile device does not connect automatically, search for cellular networks and select the APN name of the LXN 500.

Software Update

The LXN 500 supports easy software update via a flash drive connected to a USB port. Verify that the used flash drive is formatted with FAT32 file system.

Perform this procedure to update the LXN 500 software:

1. Contact Motorola Solution support and download the LXN 500 software update file.
2. Copy the update file to : \Update folder on USB flash drive.
3. Power on the LXN 500 and wait until all LEDs show steady green (See [Powering On on page 18](#)).
4. Remove the protective cover and insert the flash drive into one of the USB ports on the front panel of the LXN 500.
Result: Once the flash drive is inserted, the LXN 500 automatically starts the software update process and the front panel LEDs illuminate orange in a repeated sequence.
5. Wait until all LEDs show steady green and remove the USB flash drive. Install the protective cover on the USB port.

Resetting the LXN 500

Soft Resetting using the Power Button

Soft reset is a restarting of the LXN 500 such as a personal computer (PC). The action closes all applications and clears any data. Applications and settings are not affected.

Perform this procedure to soft reset the LXN 500 using the Power button.

Procedure:

1. Press and hold the **Power** button  for four seconds.
Result: all LEDs on the front panel blink orange, to indicate power down, and then turn off.
2. Press and hold the **Power** button  for four seconds and release when all LEDs begin to flash green. Wait until all LEDs are steady green.

Soft Resetting via O&M

This operation re-boots the LXN 500 the same as soft resetting using the **Power** button.

Perform this procedure to reset the LXN 500 from the O&M.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).
2. Click on  and select **Reset the LXN 500**.
Result: The LXN 500 re-boots.

Hard Resetting

Hard reset is required when the LXN 500 stops to respond and soft reset does not work. Hard reset immediately removes power from the LXN 500 and restarting the computer is required.

Perform this procedure to hard reset the LXN 500.

Procedure:

1. Press and hold the **Power** button  for more than 15 seconds.
Result: all LEDs on the front panel turn off.
2. Press and hold the **Power** button  for four seconds and release when all LEDs begin to flash green. Wait until the LEDs are steady green.

Resetting the eNodeB

Use the **Reset the eNodeB** option when performing configuration and the LXN 500 fails to operate (one or more RADIO LED illuminate orange or red).

Perform this procedure to reset the LXN 500.

Procedure:

1. Sign in to the LXN 500 O&M Configuration site (See [Signing In on page 20](#)).

Click on  and select **Reset the eNodeB**.

Result: The eNode re-boots and RADIO LED illuminates green.

Technical Specifications

4G LTE

Release	3GPP Release 10
Band Class	• 4G (LTE) Band 14 • 4G (LTE) Band 20 • 4G (LTE) Band 28b Single band supported per each LXN 500 Bandwidth: 5 MHz, 10 MHz, 20 Mhz
Output Power	2 x 30 dBm (1 W) effective radiated power (ERP)
Bandwidth	5 MHz, 10 MHz, 20 Mhz

CONNECTIVITY

Wi-Fi Connectivity (Requires software update)	802.11b/g 2.4 GHz Device can act as access point or client Up to 6 Wi-Fi devices 164 ft (50 m) line-of-sight
Wired Connectivity	2 Ethernet ports (1Gbit/s, RJ-45) 2 USB 2.0 port
WLAN Security	WPA, WPA2
GPS	Autonomous GPS, 1 external antenna Supports NMEA, TAIP-PV

ENVIRONMENTAL

Operating Temperature	Vehicle Configuration -22°F to 140°F (-20°C to 60°C) Battery Configuration -22°F to 131°F (-20°C to 55°C) (Future option of the LXN 500)
Storage Temperature	-40°F to 185°F (-40°C to 85°C)

MANAGEMENT AND SUPPORT

Field-upgradable	Via USB/WiFi/Ethernet
Regulatory	CE and FCC

STANDARDS

Durability	IP54
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PHYSICAL CHARACTERISTICS

Dimensions	Height: 4.6 in (119 mm) Width: 9.2 in (231 mm) Length: 11.6 in (295 mm)
Weight	12.67 lb (5.75 kg)

MN003563A01-B
Technical Specifications

POWER	
Power	9 - 33 VDC
Max Current	10 A
Max Power Consumption	70 Watts