

**User Information**

*User Information*

Tune-up and user / operational manual information are provided in the following exhibits.

<b><u>EXHIBIT</u></b>	<b><u>DESCRIPTION</u></b>
D1	Tune-Up Procedure
D2	User / Operational Manual

**APPLICANT: MOTOROLA SOLUTIONS**

**EQUIPMENT TYPE: ABZ99FT4100B  
109AB-99FT4100B**

**Tune-Up Procedure**

*Tune-Up Procedure*

A procedure to ensure that the device is tuned to the correct frequency / frequency range and that it is operating at the proper level. This exhibit is only required for licensed transmitters.

Content from Chapter 8 of the document "MOTOTRBO™ SLR 1000 Repeater Basic Service and Installation Manual" (part number MN003557A01-AL, June 2022) is included in the following pages.

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Chapter 8 : SLR 1000 Programming and Tuning

## Chapter 8

# SLR 1000 Programming and Tuning

### 8.1

## Programming and Tuning Introduction

This section provides an overview of the MOTOTRBO Radio Management (RM) and the MOTOTRBO Tuner application for use on Windows 7, Windows 8, or Windows 8.1. These two MOTOTRBO applications are used for the configuration and alignment of the SLR 1000 Repeater .

### 8.2

## Radio Management Setup

The Radio Management (RM) is used to program the SLR 1000 Repeater.

See [Figure 20: Radio Management Setup on page 64](#) and [Figure 11: SLR 1000 Repeater Transceiver Board Connector Locations on page 45](#) for the connectors on the repeater.

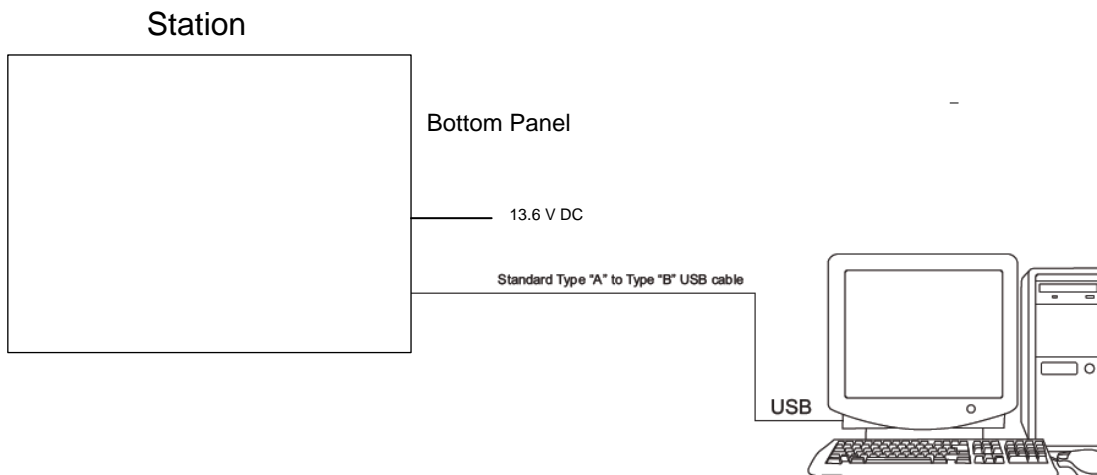


**NOTE:** See the *Radio Management (RM) Online Help* for the programming procedures.



**CAUTION:** Computer USB ports can be sensitive to Electronic Discharge. Use proper ESD practices (wrist strap, grounding, and so on.) and do not touch exposed contacts on cables when connected to a computer.

**Figure 20: Radio Management Setup**



### 8.3

## Repeater Tuning Setup

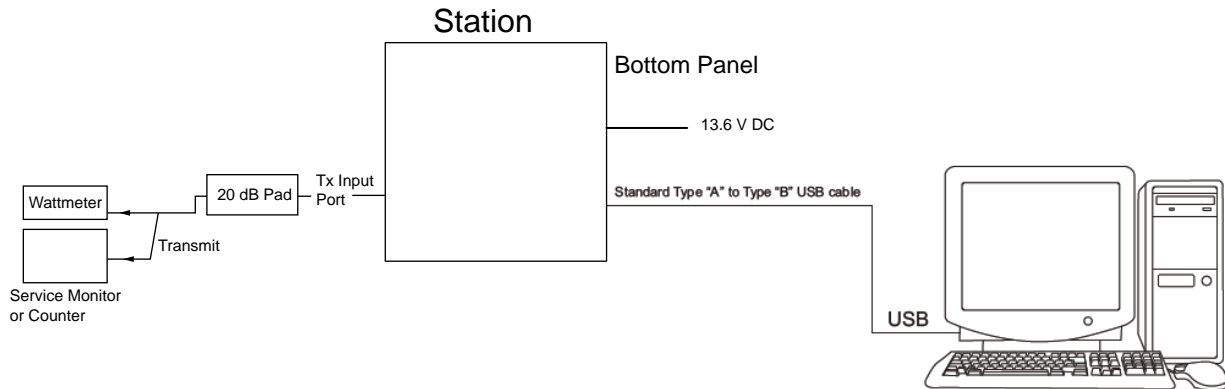
A personal computer (PC) with a Windows operating system, and the MOTOTRBO Tuner application are required to align the SLR 1000 Repeater. To perform the tuning procedures, the repeater must be connected to the PC and the test equipment setup as shown in [Figure 21: SLR 1000 Repeater Tuning](#)

Equipment Setup on page 65 and Figure 11: SLR 1000 Repeater Transceiver Board Connector Locations on page 45 for the connectors on the repeater.



**CAUTION:** The high-speed solid-state antenna switch is only operable in Extended Range Direct Mode (ERDM) mode. Enable all channels as Extended Range Direct Mode before using the MOTOTRBO Tuner application, or possible damage to the antenna switch board may occur.

**Figure 21: SLR 1000 Repeater Tuning Equipment Setup**



## 8.4

### Tuning the Reference Oscillator

The reference oscillator of the SLR 1000 Repeater provides the timing reference used for all frequency synthesizers and ensures their frequency accuracy.

This procedure is used to adjust the alignment of the reference oscillator. This alignment procedure should be done as maintenance schedules and regulations require. See [Repeater Tuning Setup on page 64](#) for the repeater tuning equipment setup.

**Prerequisites:** Obtain the following:

- Wattmeter (Communication Analyzer)
- Service monitor or counter
- 20 dB pad
- Standard Type A to Type B USB cable
- Personal computer

**Procedure:**

- 1 Connect the repeater transmitter antenna port to a Communication Analyzer.
- 2 Power the repeater from either an AC or DC source.
- 3 Launch the Tuner application, and click **Read** to begin reading the repeater tuning software values.
- 4 In the tree view, select **TX**, then select **Ref Oscillator**.
- 5 Configure the currently operating frequency into the Communications Analyzer.
- 6 To key up the repeater, click **PTT Toggle**.
- 7 Adjust the working softpot value until the frequency is within the performance specifications (+/- 40 Hz for UHF) from the frequency point.
- 8 To de-key the repeater, click **PTT Toggle**.
- 9 To save the tuned softpot value into the repeater codeplug, click **Write**.

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## 8.5

# Tuning the Rx Audio Level Set

The procedure outlined in this section is used to set the receive output audio level from the repeater for a given RF deviation of the received RF signal. Perform this procedure any time the Rx audio level requires adjustment.

**Prerequisites:** Obtain the following:

- Wattmeter (Communication Analyzer)
- Service monitor or counter
- 20 dB pad
- Standard Type A to Type B USB cable
- Personal computer

**Procedure:**

- 1 Connect the repeater receiver antenna port to the Communication Analyzer.
- 2 Power the repeater from either an AC or DC source.
- 3 Launch the Tuner application and click **Read** to read the softpot values.
- 4 In the tree view, select **RX**, then select **Rx Rated Volume**.
- 5 Set the Communication Analyzer to output a -47 dBm RF signal modulated with a 1 kHz tone at 60% of full deviation on the tuning frequency.

The tuning frequency is the value displayed on the Tuner GUI under the heading **Frequency Points**.



**NOTE:** The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If Radio Management (RM) is set for 25 kHz operation, the repeater automatically scales the deviation by a factor of two when it is outside the Tuner environment.

Programmed TPL and DPL squelch requirements are automatically disabled for the tuning frequency while in the Tuner environment.

- 6 Adjust the softpot value until the desired receive audio level is achieved at Pin 7 (in reference to ground) on the Aux connector. The ground connection provided by the Aux connector is Pin 4.

**Figure 22: Auxiliary Connector**

**NOTE:** Optimally, load Pin 7 with the application loading used during normal operation of the repeater.

- 7 To save the new tuned softpot value into the repeater codeplug, click **Write**.

## 8.6

### Tuning the Tx Audio Level Set

This procedure is used to allow adjustment of the transmitter audio level the repeater is expecting at the Aux connector. Adjusting this level set has the same effect as increasing or decreasing RF signal deviation for a given transmit audio level. Perform this procedure any time the transmitter audio level requires adjustment.

**Prerequisites:** Obtain the following:

- Wattmeter (Communication Analyzer)
- Service monitor or counter
- 20 dB pad
- Standard Type A to Type B USB cable
- Personal computer

**Procedure:**

- 1 Connect the repeater transmitter antenna port to the Communication Analyzer.
- 2 Power the repeater from a DC source.
- 3 Apply a 1 kHz signal at the desired input level to Pin 1 (in reference to ground) on the Aux connector. The ground connection provided by the Aux connector is Pin 4. See [Figure 22: Auxiliary Connector on page 67](#)



**NOTE:** Optimally, load Pin 1 with the application source impedance used during normal operation of the repeater.

- 4 Launch the Tuner application and click **Read** to read the softpot values.

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- 5 In the tree view, select **TX**, then select **Tx Audio Level**.
- 6 Enter the tuning frequency into the Communication Analyzer (the value displayed in the Tuner application under the heading **Frequency Points**).
- 7 To key up the repeater, click **PTT Toggle**.
- 8 Adjust the softpot value until the desired receive audio level is achieved at Pin 7 (in reference to ground) on the Aux connector.

The ground connection provided by the Aux connector is Pin 4.



**NOTE:** The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If Radio Management (RM) is set for 25 kHz operation, the repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.

- 9 To de-key the repeater, click **PTT Toggle**.
- 10 To save the new tuned softpot value into the repeater codeplug, click **Write**.

## 8.7

## Modulation Limit Alignment

Modulation is a change or alteration in the signal. Any aspect of the signal can be changed, such as amplitude, frequency, phase, timing or repetition rate of pulses. Aligning the modulation limit sets the RF carrier wave of the frequency bandwidth of the SLR 1000 Repeater.



**NOTE:** A modulation limit alignment is always required when the repeater is in digital mode. This alignment is not required if the repeater is used in repeat mode.

## 8.7.1

### Tuning the Modulation Limit (with no Tx Data and no PL)

**Prerequisites:** Obtain the following:

- Wattmeter (Communication Analyzer)
- Service monitor or counter
- 20 dB pad
- Standard Type A to Type B USB cable
- Personal computer

**Procedure:**

- 1 Connect the repeater antenna port to the attenuation pad, if necessary, before connecting to the Communication Analyzer.
- 2 Power the repeater from a DC source.
- 3 Apply a 1 kHz signal at 1.2 Vrms to Pin 1 of the Aux connector.  
Signal ground is Pin 4 of the Aux connector.
- 4 Launch the Tuner application.
- 5 To read the softpot values, click **Read**.
- 6 In the tree view, select **TX**, then select **Modulation Limit**.
- 7 Enter the tuning frequency into the Communication Analyzer (the value displayed on the Tuner application).
- 8 To key up the repeater, click **PTT Toggle**.

- 9 Adjust the softpot value until the maximum deviation is 92% of the rated system deviation (RSD).

This adjustment is tested in a 12.5 kHz channel spacing, so 92% of 2.5 kHz is 2.3 kHz.

- 10 Set the modulation limit to 92% so that any additional deviation incurred by the transmitter VCOs over temperature is compensated for.

Channel Spacing (kHz)	RSD (kHz)	92% of RSD (kHz)	Tolerance (Hz)
12.5	2.5	2.3	+0/ -50

- 11 To de-key the repeater, click **PTT Toggle**.

- 12 To save the new tuned softpot value into the repeater codeplug, click **Write**.

### 8.7.2

## Verifying the Modulation Limit (with no Tx Data and no PL)

**Prerequisites:** Obtain the following:

- Wattmeter (Communication Analyzer)
- Service monitor or counter
- 20 dB pad
- Standard Type A to Type B USB cable
- Personal computer

**Procedure:**

- 1 Connect the repeater antenna port to the attenuation pad, if necessary, before connecting to the Communication Analyzer.
- 2 Power the repeater from a DC source.
- 3 In Radio Management (RM), program the repeater with any frequency within the specified range of the repeater under test, and set the repeater for low power and disable the repeat path.
- 4 Apply a 1 kHz signal at 1.2 Vrms to Pin 1 of the Aux connector.

Signal ground is Pin 4 of the Aux connector.

- 5 Key up the repeater by grounding Pin 2 of the Aux connector and measuring the deviation



**NOTE:** Radio Management must have Pin 2 configured as an active low with the PTT function.

- 6 De-key the repeater.

The deviation should meet the limits shown in the following table.

Channel Spacing (kHz)	Relative Standard Deviation (RSD) (kHz)	92% of RS (kHz)	Tolerance (Hz)
12.5	2.5	2.3	+0/-50
20.0	4.0	3.68	+0/-80



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Channel Spacing (kHz)	Relative Standard Deviation (RSD) (kHz)	92% of RS (kHz)	Tolerance (Hz)
25.0	5.0	4.6	+0/-100

**NOTE:**

- The repeater is factory-tuned in accordance to this procedure and specification.
- Verification is performed outside of the Tuner application, such as in normal mode.

## 8.8

## Tuning a Duplexer Module

The duplexer module is shipped untuned. Before installing the duplexer into the repeater, it must be tuned specifically to the transmit and receive frequency pairs of the repeater.

The duplexer module is composed of three low-pass/high-notch cavities and three high-pass/low-notch cavities. Each set of three cavities provides bandpass filtering for either the transmit RF signal or the receive RF signal. In general, the duplexer must be tuned so that the transmit cavity set passes the transmit signal and rejects the receive signal. Concurrently, the receive cavity set must be tuned to pass the receive signal and reject the transmit signal.

Tuning is performed by injecting RF signals and making tuning adjustments (using the tuning rods and trimmer screws) while monitoring for maximum or minimum readings on the RF millivoltmeter. Field tuning the duplexer module requires the following general adjustments:

- Tune high-pass/low-notch cavities for maximum pass and reject response
- Tune low-pass/high-notch cavities for maximum pass and reject response
- Check high-pass/low-notch and low-pass/high-notch cavities for insertion loss
- Check high-pass/low-notch and low-pass/high-notch cavities for isolation



**NOTE:** If the duplexer module is tuned and the specifications are within a large margin of error, the duplexer must be returned to the Motorola Solutions Support Center (SSC) for repair.

**Prerequisites:** Obtain the following test equipment:

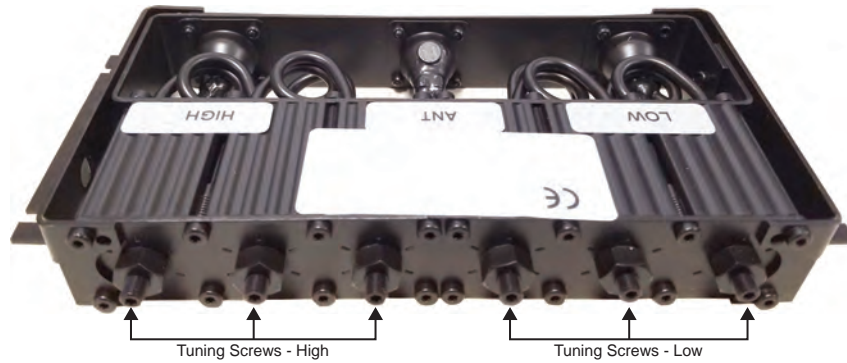
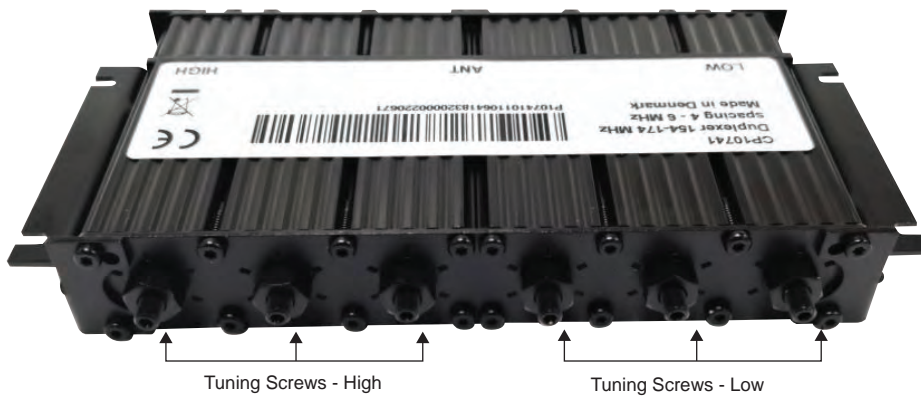
- 2-port network analyzer
- Network analyzer cables
- Open/short/load calibration kit
- Two SMA female to MCX adapters
- N-male to SME female adapter
- Small crescent wrench
- T10 TORX bit and driver

**Procedure:**

- 1 Determine the transmit and receive frequencies, as follows:

The less of the two frequencies is the LOW frequency and the greater of the two is the HIGH frequency. Choose a duplexer that includes both of these frequencies in its tuning range as indicated on the duplexer label.

- a Loosen the tightening nut on the three cavities for each section (six total). See [Figure 23: SLR 1000 UHF Repeater Band Reject \(Notch\) Duplexer on page 71](#) and [Figure 24: SLR 1000 VHF Repeater Band Reject \(Notch\) Duplexer on page 71](#)

**Figure 23: SLR 1000 UHF Repeater Band Reject (Notch) Duplexer****Figure 24: SLR 1000 VHF Repeater Band Reject (Notch) Duplexer**

- a On the network analyzer (or equivalent) set the start frequency to a LOW frequency – 3 MHz, and set the stop frequency to a HIGH frequency + 3 MHz.
- b Using the sweep menu, adjust the power out to as high as possible, presumably 10 dBm.
- c Perform a 2-port calibration.
- 2 View the s11 log mag return loss, as follows:
  - a Connect the LOW port on the duplexer to port 1 on the network analyzer.
  - b Connect the ANT port on the duplexer to port 2 on the network analyzer.
  - c Connect a 50 ohm load to the HIGH port on the network analyzer.
  - d Set marker 1 (M1) as the low frequency and marker 2 (M2) as the high frequency.
  - e Using the three T10 tuning screws on the LOW side, tune M1 for best return loss, s11.  
The results should be better than -12 dB. The lower the number is best (such as, -20 dB is preferable than -10 dB). Shorter screws (turned clockwise) are for a lower frequency and longer screws (turned counterclockwise) are for a higher frequency. Keep all three screws for each port at about the same depth when tuning each section. Later in this tuning procedure, you may notice that the three LOW port screws are shorter than the three HIGH port screws.
  - f Connect the HIGH port on the duplexer to port 1 on the network analyzer.
  - g Connect a 50 ohm load to the LOW side on the duplexer.
  - h Tune the three screws on the HIGH side for a best return loss on M2.
- 3 View the s21 log mag insertion loss and rejection, as follows:

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The goal is to keep M2 better than -1.7 dB (for example, -1.3 dB) and M1 less than -65 dB (for example, -67 dB). See [Figure 25: Example for HIGH Port Tuning of the UHF Duplexer on page 72](#).

**Figure 25: Example for HIGH Port Tuning of the UHF Duplexer**



- a** Using the three T10 tuning screws on the LOW side, tune M2 for best insertion loss, s21, while keeping the isolation (M1) better than 65 dB.

The results should be better than -1.7 dB. Shorter screws (turned clockwise) are for a lower frequency and longer screws (turned counterclockwise) are for a higher frequency. Keep all three screws for each port at about the same depth when tuning each section. Later in this tuning process you may notice that the three LOW port screws are shorter than the three HIGH port screws.

- b** Connect the LOW side cable of the duplexer to port 1 on the network analyzer.  
**c** Connect a 50 ohm load to the HIGH side of the duplexer.

The goal is to keep M1 better than -1.7 dB and M2 better than -65 dB. See [Figure 26: Example for LOW Port Tuning of the UHF Duplexer on page 73](#).

**Figure 26: Example for LOW Port Tuning of the UHF Duplexer**

- d Using the three T10 tuning screws on the HIGH side, tune M1 for best insertion loss, s21, while keeping the isolation (M2) better than 65 dB.

The results should be better than -1.7 dB. Shorter screws (turned clockwise) are for a lower frequency and longer screws (turned counterclockwise) are for a higher frequency. Keep all three screws for each port at about the same depth when tuning each section. Later in this tuning process you may notice that the three HIGH port screws are shorter than the three LOW port screws.

- 4 View the rejection of each port, as follows:
- Connect the LOW side of the duplexer to port 1 on the network analyzer.
  - Connect the HIGH side of the duplexer to port 2 on the network analyzer.
  - Connect a 50 ohm load to the ANT port on the duplexer.
  - The results should be similar to [Figure 27: Rejection of Each Port for UHF Duplexer on page 74](#)

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Figure 27: Rejection of Each Port for UHF Duplexer



## 5 Complete the tuning procedure, as follows:

- a If the results are similar to [Figure 27: Rejection of Each Port for UHF Duplexer on page 74](#) with better than -65 dB isolation between the LOW and HIGH ports of the duplexer, carefully tighten the nuts on the six T10 torque screws.

Tighten them slightly snug, not all the way. Be careful not to accidentally change the tuning of those screws.

- b Observe the tuning so that the two DIPs are deeper than -65 dB. If so, continue to tighten the tuning nuts.

The duplexer is now tuned.

**User / Operational Manual**

*Operational or User's Manual*

The manual should include instruction, installation, operator, or technical manuals with required 'information to the users'. This manual should include a statement that cautions the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The manual shall include RF Hazard warning statements, if applicable.

Content from the document "MOTOTRBO™ SLR 1000 Repeater Series Base Station Repeater QUICK START GUIDE" (part number MN003581A01-AA, June 2017) has been included as part of this filing package.

Upon request, published manuals will be sent to the commission and/or telecommunication certification body (TCB). All of the descriptions, block diagrams, and schematics that are included in this filing package are current as of the package submittal date.

PROFESSIONAL DIGITAL TWO-WAY RADIO

# MOTOTRBO™ SLR 1000 Repeater



## QUICK START GUIDE

en-US

fr-CA









## MOTOTRBO™ SLR 1000 Repeater Quick Start Guide

### Notations Used in This Manual

Note and caution notations are used throughout the text in this publication. These notations are used to emphasize that safety hazards exist, and due care must be taken and observed.



CAUTION indicates a potentially hazardous situation which, if not avoided, **might** result in equipment damage.

Caution



WARNING indicates a potentially hazardous situation which, if not avoided, **could** result in death or injury.

WARNING



This symbol indicates areas of the product that pose potential burn hazards.

## General Safety and Installation Standards and Guidelines




WARNING



**WARNING:** For safe installation, operation, service and repair of this equipment, follow the safety precautions and instructions described below, as well as any additional safety information in Motorola's product service and installation manuals and the Motorola R56 Standards and Guidelines for Communications Sites manual. To obtain copies of these materials, please contact Motorola as directed at the end of this section. After installation, these instructions should be retained and readily available for any person operating or servicing this repeater or working near it.

Failure to follow these safety precautions and instructions could result in serious injury or property damage. The installation process requires preparation and knowledge of the site before installation begins. Review installation procedures and precautions in the Motorola R56 manual before performing any site or component installation. Personnel must use safe work practices and good judgment, and always follow applicable safety procedures, such as requirements of the Occupational Safety and Health Administration (OSHA), the National Electrical Code (NEC), and local codes.

The following are additional general safety precautions that must be observed:

- To continue compliance with any applicable regulations and maintain the safety of this equipment, do not install substitute parts or perform any unauthorized modifications.
- All equipment must be serviced by Motorola trained personnel.
- If troubleshooting the equipment while the power is on, be aware of live circuits which could contain hazardous voltage.
- Do not operate the radio transmitters unless all RF connectors are secure and all connectors are properly terminated.
- All equipment must be properly grounded in accordance with the Motorola R56 and specified installation instructions for safe operation.
- Openings between the fins on the chassis are provided for ventilation. Do not block or cover openings between the fins that protect the devices from overheating.
-  Some equipment components can become extremely hot during operation. Turn off all power to the equipment and wait until sufficiently cool before touching.
- Maintain emergency first aid kits at the site.
- Never store combustible materials in or near equipment. The combination of combustible material, heat and electrical energy increases the risk of a fire hazard.
- Equipment shall be installed in a site that meets the requirements of a "restricted access location," per (UL60950-1 & EN60950-1), which is defined as follows: "Access can only be gained by service persons or by users who have been instructed about the reasons for the

restrictions applied to the location and about any precautions that shall be taken; and access is through the use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location." Ensure that the installation area can safely support the weight on the repeater.

-  Burn hazard. The metal housing of the product may become extremely hot. Use caution when working around the equipment.
- RF energy burn hazard. Disconnect power to prevent injury before disconnecting and connecting antennas.
- Shock hazard. The outer shields of all Tx and Rx RF cables outer shields must be grounded per Motorola R56 manual.
- Shock hazard. DC input voltage shall be no higher than 15.6 VDC. This maximum voltage shall include consideration of the battery charging "float voltage" associated with the intended supply system, regardless of the marked power rating of the equipment.
- All Tx and Rx RF cables shall be connected to a surge protection device according to Motorola R56 manual. Do not connect Tx and Rx RF cables directly to an outside antenna.
-  Compliance with National and International standards and guidelines for human exposure to Electromagnetic Energy (EME) at Transmitter Antenna sites generally requires that persons having access to a site shall be aware of the potential for exposure to EME and can exercise control of exposure by appropriate means, such as adhering to warning sign instructions. See this installation manual and Appendix A of Motorola R56.

This product complies with the requirements set forth by the European Radio Equipment Directive (RED) regulations and applicable CENELEC standards concerning human exposure to Electromagnetic Energy (EME) at Transmitter Antenna sites. "Appendix E" of the SLR 1000 Repeater Basic Service and Installation Manual includes an EME exposure analysis of a typical system configuration for this product.

For a different system configuration than the typical configuration, compliance with applicable EME exposure standards (current versions of the EN50384 and EN50385 IEC/IEEE 62704-2, and United States Federal Communication Commission, "Evaluating compliance with FCC guidelines for human exposure to radio frequency electromagnetic fields," OET Bulletin 65 (Ed. 97-01), August 1997. Supplement C (Edition 01-01) to US FCC OET Bulletin 65 (Edition 97-01), "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio frequency Emissions," June 2001 standards for occupational and general public exposure, respectively) can be evaluated by either employing the method illustrated in the typical system configuration EME exposure analysis included in "Appendix E" in the SLR 1000 Repeater Basic Service and Installation Manual, or employing another suitable method among those described in the current version of the EN50383 standard.

Once the occupational and general public compliance boundaries are determined, means to ensure that workers and people are outside the respective boundaries, for instance using appropriate signage or restricted access, should be implemented; if this is not possible or practically achievable for the specific system configuration, the configuration should be modified in order to make it possible. The R56 Standards and Guidelines for Communications Sites manual provides examples of signage that can be used to identify the occupational or general public compliance boundaries.

Refer to product specific manuals for detailed safety and installation instructions. Manuals can be obtained with product orders, downloaded from <https://businessonline.motorolasolutions.com> or purchased through the Motorola Aftermarket & Accessory Department.

This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

## **MOTOTRBO SLR 1000 Repeater Supplemental Safety and Installation Requirements**

### **ATTENTION!**

The MOTOTRBO SLR 1000 Repeater can be installed in a suitable in-building location, or suitable outdoor location. A restricted access location is required when installing this equipment into the end system.

When installing the equipment, all requirements of relevant standards and local electrical codes must be fulfilled.

The maximum operating ambient temperature of this equipment is 60 °C, at sea level. Operating altitudes up to 5000 meters above sea level are supported, but maximum operating temperature shall degrade by 1°C /1000 m elevation. Operation above 5000 may be feasible but operating specifications, and parameters are not guaranteed and reduced performance may result.

## **General Installation**

Proper installation ensures the best possible performance and reliability of the repeater equipment. Pre-installation planning is required. This includes considering the mounting location of the equipment in relation to input power, antennas, and system interfaces. Also to be considered are site environment conditions, the particular mounting method (several available), and the required tools and equipment.

If this is the first time installing this type of equipment, it is highly recommended that the user read the following:

- Chapter 10 of the SLR 1000 Repeater Basic Service and Installation Manual before beginning the actual installation.

## **Pre-Installation Overview**

The following information is an overview for installing the SLR 1000 Repeater:

## **List of Supplied Items**

- SLR 1000 Repeater
- Mounting hardware
- Quick Start Guide

**NOTE:** Save the repeater shipping container and its components to facilitate possible future repeater shipping needs.

### Environmental Conditions at Intended Installation Site

The SLR 1000 Repeater is a rugged, compact repeater suited for indoor and outdoor locations where moisture and dust may be common. The repeater may be installed in any suitable location meeting the restricted access criteria and not exceeding the equipment specifications for temperature and environmental exposure (ingress).

### Operating Temperature Range

-30 °C (-22 °F) to +60 °C (+140 °F).

### Ingress or Environmental Exposure or Resistance

Ingress Rating: IP65, dust and spraying water, and NEMA 4.

The Motorola Quality Standards Fixed Network Equipment Installation manual, R56; specifically refer to the information on ground connection for lightning protection and power requirements.

### Mechanical Installation

The repeater may be mounted on a wall or pole with the fins oriented vertically. Alternately, the SLR 1000 Repeater can be ceiling mounted with the fins facing towards the ceiling.

### Mounting the SLR 1000 Repeater to a Wall or Ceiling

When mounting the SLR 1000 Repeater on wall or ceiling, use the mounting hardware included with the repeater. Obtain four #10/32 lag bolts, which are not included in the mounting hardware.

### Procedure:

1. Attached the bracket to either the wall or ceiling using the four #10/32 lag bolts. See Figure 1.

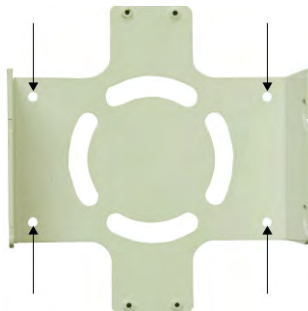


Figure 1: Bracket Mounting Holes

- From the mounting hardware, insert the four M6 screws into the repeater chassis side fins and partially tighten. See Figure 2.



Figure 2: Location of M6 Screw Mounts

- Place the repeater chassis into the bracket by sliding the M6 screws into the receiving slots on the bracket. Torque to 60 in-lbs. See Figure 3.

### Mounting the SLR 1000 Repeater to a Pole

When mounting the SLR 1000 Repeater to a pole, obtain the PMLN7213\_Pole Mount Kit, and the wall mounting bracket and four M6 screws included with the repeater mounting hardware. An additional four M4 screws are used for a power supply.

There are two possible options for the pole mount installation:



Figure 3: Bracket Receiving Slots

- Using a U-bolt with two  $\frac{1}{2}$  in. washers and four  $\frac{1}{2}$  in. nuts for poles with a diameter between 2-2.75 in.
- Using two band clamps for poles of any diameter. The band clamps are not included in the pole mount kit.

#### Procedure:

- If using the U-bolt for installation, perform the following actions:
  - Thread two of the  $\frac{1}{2}$  in. nuts onto the U-bolt.
  - Place the U-bolt onto the pole and slide the pole mount bracket onto the U-bolt.
  - Slide the wall mount bracket onto the U-bolt, with the receiving slots facing upwards, and place the two  $\frac{1}{2}$  in. washers, then the two  $\frac{1}{2}$  in. nuts onto the U-bolt, one on each thread. Torque the outer nuts to 150 in/lb. See Figures 4 and 5.



Figure 4: U-Bolt and Pole Mount Bracket Assembly

- d. Tighten the inner nuts against the pole mount bracket and torque to 300 in/lb.
- 
2. If using the band clamps for installation, perform the following actions:
    - a. Slide the band clamps through the slots on the pole mount bracket and attach the bracket to the pole. See Figure 6.
    - b. Attach the wall mount bracket to the pole mount bracket, with the receiving slots facing upwards, using two ½ in. bolts and two ½ in. nuts. Torque to 300 in/lb. See Figure 7.
  3. If using a power supply, see the SLR 1000 Basic Service Manual for detailed instructions.
- 



Figure 5: U-Bolt and Pole Mount Bracket Assembly



Figure 6: Band Clamps and Pole Mount Bracket



Figure 7: Wall Mount Bracket Attached to Pole Mount Bracket

4. Insert the four M6 screws, supplied in the repeater package, into the repeater chassis side fins and partially tighten. See Figure 2.
5. Place the repeater chassis into the bracket by sliding the M6 screws into the receiving slots on the bracket. Torque to 60 in-lb. See Figure 3.

All connections to power are at the bottom of the repeater. Terminated cables are passed through the cable openings with the connectors added (system only), and then connected to the connector on the repeater. The sealing cap is then tightened to complete the seal.

### Power Input Requirements

After the repeater equipment has been mechanically installed, electrical connections must be made. This involves making the following connections to:

- When applicable, AC input power cabling: 100–240 Volts (47–63 Hz) at 1 A maximum.
- When applicable, DC input power cabling: 10.8 VDC to 15.6 VDC at 4 A maximum.

**Note:** AC power supply accessories must be ordered separately.



Caution

The base station/repeater is to be connected to a battery supply that is in accordance with the applicable electrical codes for the end use country; for example, the National Electric Code ANSI/NFPA No.70 for the U.S.



WARNING

Ensure that the appropriate voltage is connected with a nominal 13.6 VDC (11–14.4 VDC).

### Grounding

Connect a bonding wire from the repeater ground screw to the site ground point. The size of the bonding wire used for this connection must be 6 AWG minimum.



Caution

Refer to Motorola Quality Standards Fixed Network Equipment Installation manual, R56 for complete information regarding lightning protection.



**NOTE:** Follow all applicable electrical codes for the end use country and locality.

## ■ Connections

Figure 9 illustrates the position of the connectors located on the repeater. Table 1 identifies the connector types as well as the primary function of the connector.

**Table 1: Connector Type and Primary Function**

NO	Connector	Function(s)
1		Transmitter RF (Tx) Output Board Connection
2		Pressure Equalizer Vent
3		Receiver RF (Rx) Input Board Connection
4	N-Type – Female	Transmitter RF (Tx) Output Cable Port
5		Jumper Connection to enable external on/off function
6	M6 TORX Screw	Bonding Ground Connection
7	2.1 X 5.5 OD Barrel Connector	DC Power Inlet
8		Header Connection for optional antenna switch
9	RJ-45 – Aux/ Accessory	Rx Audio, Tx Audio, PTT, 1 PPS, and GPIO
10	RJ-45 – Ethernet	Network
11	Type B USB Socket	Programming Interface

**Table 1: Connector Type and Primary Function**

12	Option Dependent	Option Dependent 1 and 2
13		Expansion Board Connection (future use)
14	N-Type – Female	Receiver RF (Rx) Input Cable Port
15		Front Panel Flex Connector

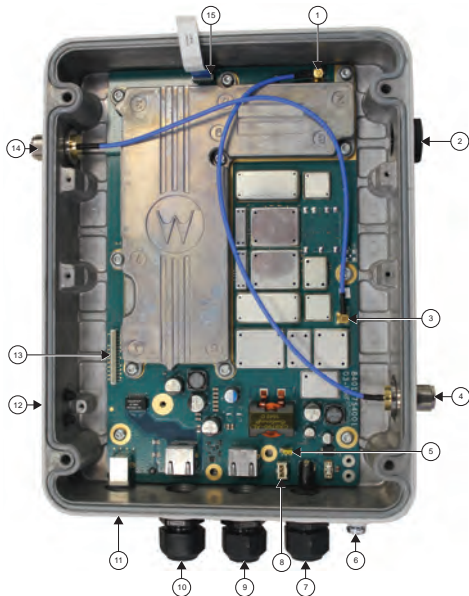


Figure 9: SLR 1000 Repeater Connections

## ■ Post-Installation Checklist

### Applying Power

After the SLR 1000 Repeater has been mechanically installed and all electrical connections have been made, power may now be applied and the repeater checked for proper operation.

### Front Panel LEDs

After turning on the repeater power, the three LEDs on the repeater cover:

- Light for approximately one second to indicate that they are functional, then
- Go off for one second, then
- Indicate the operational status of the repeater.

### Verifying Proper Operation

Operation of the repeater can be verified by:

- Observing the state of the three LEDs located on the front panel, and
- Exercising radio operation.



Caution

Some repeater components can become extremely hot during operation. Turn off all power to the repeater and wait until it is sufficiently cool before touching the repeater.

### Archiving

#### *Copying the Repeater Codeplug Data to a Computer*

Proceed to the Radio Management (RM) configuration procedures to customize the repeater parameters (such as, operating frequency, PL, codes, and so on). Backup the codeplug data of the SLR 1000 Repeater using the RM application.

The repeater connection to facilitate the RM configuration is the USB Type-B host connection located on the bottom side of the repeater.

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