User Information

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

EXHIBIT   DESCRIPTION

  D1   Tune-Up Procedure

  D2   User / Operational Manual

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 10 of the document "MOTOTRBO™ SLR 8000 Repeater Basic Service and Installation Manual" (part number MN002253A01-AH, November 2022) is included in the following pages.

Chapter 10

SLR 8000 Programming and Tuning

10.1
Programming and Tuning Introduction

This section provides an overview of the MOTOTRBO Customer Programming Software (CPS) 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 8000 Base Station/ Repeater.

10.2
Customer Programming Software Setup

The Customer Programming Software setup, shown in Figure 50: Customer Programming Software Setup on page 97 is used to program the base station/repeater. See Figure 51: Front view of SLR 8000 Base Station/Repeater on page 98 and Figure 52: Rear view of SLR 8000 Base Station/ Repeater on page 98 for the actual connectors on the front and rear panels of the base station/ repeater.
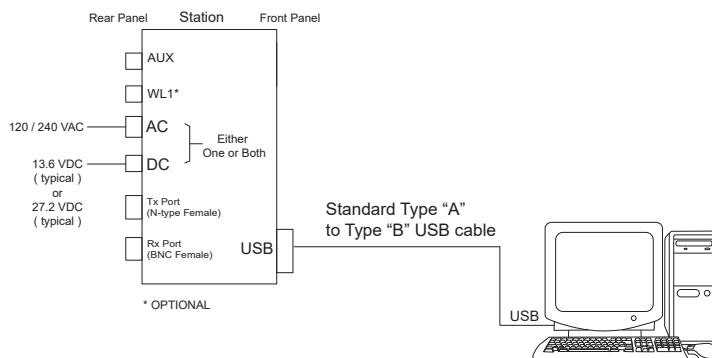
> **NOTE:** See appropriate program on-line help files for the programming procedures.

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

Figure 50: Customer Programming Software Setup

Figure 51: Front view of SLR 8000 Base Station/Repeater

Table 49: Callout Legend

Label	Description
1	Microphone Connector
2	USB Connector

Figure 52: Rear view of SLR 8000 Base Station/Repeater
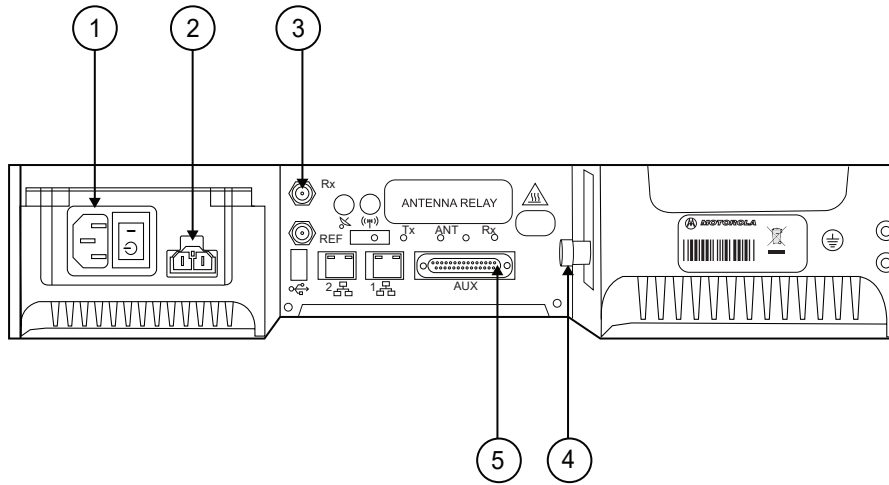
Table 50: Callout Legend

| Label	Description
1	AC Inlet Connector
2	DC Inlet Connector
3	Rx RF Connector
4	Aux Connector
5	Tx RF Connector

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10.3
Tuning the Reference Oscillator Alignment

This feature is used to adjust the reference oscillator of the SLR 8000 Base Station/Repeater. This alignment process should be done as maintenance schedules and regulations require or if the Modem FRU has been replaced in the base station/repeater.

Procedure:

1   Connect the base station/repeater's transmitter antenna port to the Communication Analyzer.

2   Power the base station/repeater from either an AC or DC source.

3   Launch the Tuner application.

4   To begin reading the base station/repeater's tuning softpot values, click **Read**

5   Under the **TX** menu in the tree view, select **Ref Oscillator**

Figure 53: Tx Menu Tree (Ref. Oscillator)
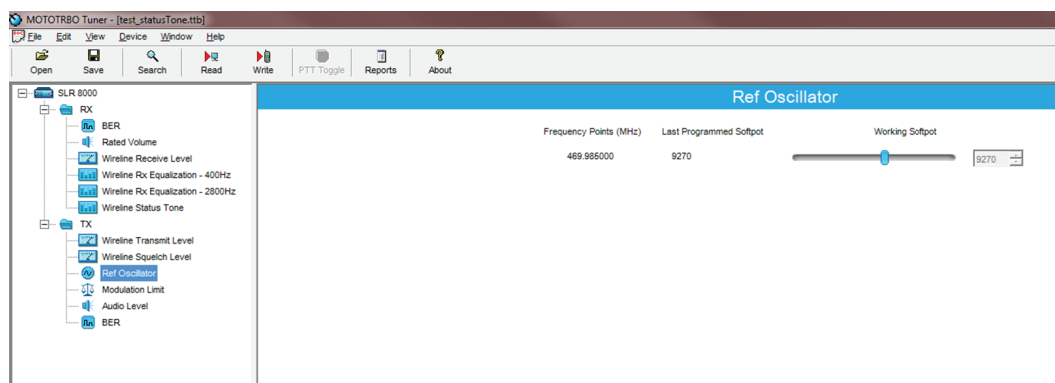
6   Configure the current operating frequency into the Communications Analyzer.

7   To key up the base station/repeater, click **PTT Toggle**

8   Adjust the working softpot value until the frequency is within the performance specifications (+/-40 Hz for UHF and VHF) from the frequency point.

9   To de-key the base station/repeater, click **PTT Toggle**

10 To save the tuned softpot value into the base station/repeater codeplug. click **Write**

10.4
Base Station/Repeater Tuning Setup

A personal computer (PC), Windows™ operating system, and the MOTOTRBO Tuner application are required to align the base station/repeater.

To perform the tuning procedures, the base station/repeater must be connected to the PC and test equipment setup as shown in the following figure.

Figure 54: SLR 8000 Base Station/Repeater Tuning Equipment Setup

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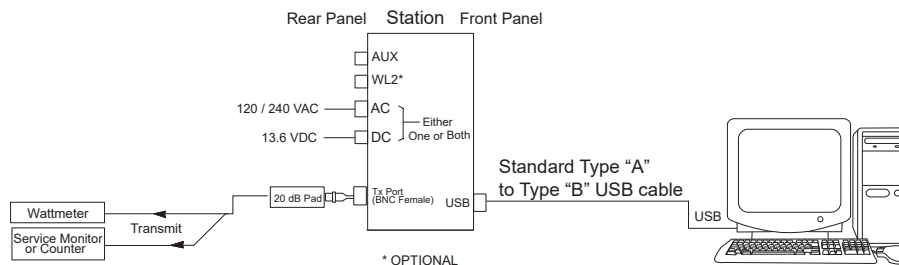
10.5

Tuning the Rx Audio Level Set

The procedure outlined in this section is used to set the receive output audio level from the SLR 8000 Base Station/Repeater for a given RF deviation of the received RF signal. Perform this procedure any time the Rx audio level needs adjustment.

> **NOTE:** The sequence of steps in this procedure is crucial in order to observe the effect of softpot setting on the Rx output at pin #7 during the adjustments.

Procedure:

1 Connect the base station/repeater's receiver antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 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 of "Frequency Points".
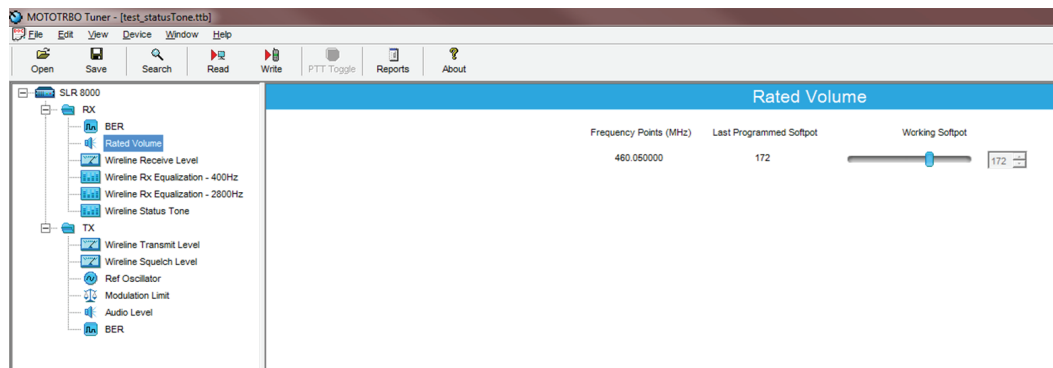
> **NOTE:**
> The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.
>
> Programmed TPL and DPL squelch requirements are automatically disabled for the tuning frequency while in the Tuner application.

4 Launch the Tuner application.

5 To read the softpot values, click **Read**.

6 Under the **RX** menu in the tree view, select **Rx Rated Volume**.

Figure 55: Rx Menu tree (Rx Rated Volume)

7 Adjust the softpot value until the desired receive audio level is achieved at pin #7 (in reference to ground) on the Aux connector. Ground connections provided by the Aux connector are pins: 9, 16, 17, 18, and 19.

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Figure 56: Auxiliary Connector

> ✎ **NOTE:** Optimally, it is recommended to load pin #7 with application loading used during normal operation of the base station/repeater.

8 To save the new tuned softpot value into the base station/repeater's codeplug, click **Write**.

10.6
Tuning the Tx Audio Level Set

Tuning the Tx audio level allows adjustment of the transmitter audio level the SLR 8000 Base Station/ Repeater is expecting at its Aux connector. Adjusting this level set has the effect of increasing or decreasing RF signal deviation for a given transmit audio level. Perform this procedure any time the transmitter audio level needs adjustment.

Procedure:

1 Connect the base station/repeater's transmitter antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Apply a 1 kHz signal at the desired input level to pin #1 or #22 (in reference to ground) on the Aux connector. Ground connections provided by the Aux connector are pins: 9, 16, 17, 18, and 19. See Figure 56: Auxiliary Connector on page 101.

> ✎ **NOTE:** Optimally, it is recommended to load pin #1 or #22 with the application source impedance used during normal operation of the base station/repeater.

4 Launch the Tuner application.

5 To read the softpot values, click **Read**

6 Under the **TX** menu in the tree view, select **Tx Audio Level**

Figure 57: Tx Menu Tree (Tx Audio Level)

7 Enter the tuning frequency into the Communication Analyzer (the value displayed on the Tuner GUI under the heading of "Frequency Points").

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8 To key up the base station/repeater, click **PTT Toggle**

9 Adjust the softpot value until 60% of the rated system deviation (RSD) is achieved.

> **NOTE:** The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.
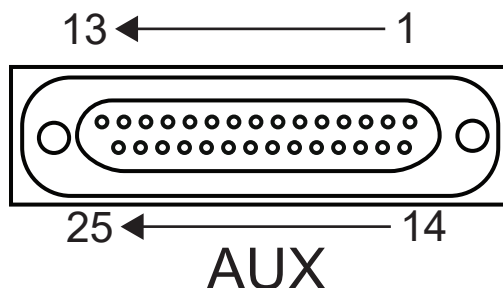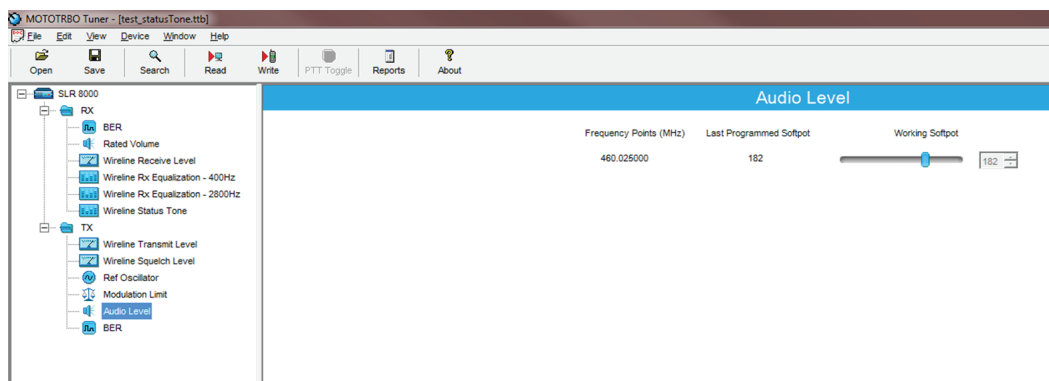
10 To de-key the base station/repeater, click **PTT Toggle**

11 To save the new tuned softpot value into the base station/repeater's codeplug, click **Write**

10.7
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 8000 Base Station/Repeater.

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

10.7.1
Tuning the Modulation Limit (with no Tx Data and no PL)

Prerequisites: If data or PL signaling is applied to Pin 13 of the Aux connector, proceed to Tuning the Modulation Limit (with Tx Data or PL) on page 104. 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 base station/repeater antenna port to the attenuation pad, if necessary, before connecting to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Apply a 1 kHz signal at 1.2 Vrms to Pin 1 of the Aux connector.

   Signal ground is Pin 9 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**.

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Figure 58: TX Menu Tree (Tuning Procedure with No Tx
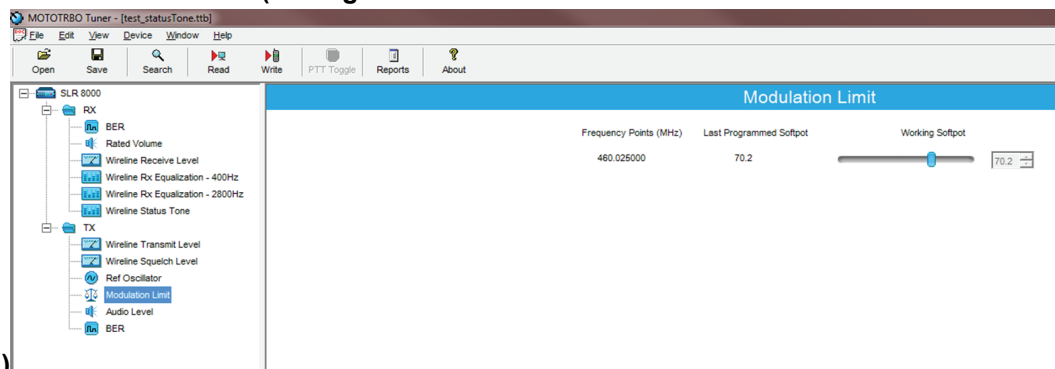
Data)

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**.

10.7.2
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 base station/repeater antenna port to the attenuation pad, if necessary, before connecting to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 In CPS , program the base station/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 9 of the Aux connector.

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5 Key up the base station/repeater by grounding Pin 2 of the Aux connector and measuring the deviation

> ✎ **NOTE:** CPS must have Pin 2 configured as an active low with the PTT function.

6 De-key the base station/repeater.

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

Table 51: Modulation Limits

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
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.

### 10.7.3
Tuning the Modulation Limit (with Tx Data or PL)

Procedure:

1 Connect the base station/repeater's antenna port to the attenuation pad, if necessary, before connecting to the Communication Analyzer.

2 Turn on the base station/repeater using an AC or DC source.

3 Launch the Tuner application.

4 To read the softpot values, click **Read**

5 Under the **TX** menu in the tree view, select **Modulation Limit**.

6 Enter the tuning frequency into the Communication Analyzer (the value displayed by the Tuner application).

7 To key up the base station/repeater, click **PTT Toggle**.

8 Apply a 1 kHz signal at 1.2 Vrms to Pin 22 or Pin 1 of the J7 Aux connector.
- Signal ground is Pin 9 of the J7 Aux connector.

9 Adjust the Modulation Limit softpot to a value that limits the maximum deviation to "X"% RSD, where "X" is equal to "92% RSD" minus "Tx Data's % RSD".

If Tx Data deviation is equal to 17%,

X = 92% - 17% = 75% as the maximum deviation limit.

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Figure 59: Example of Maximum Deviation Limit Calculation
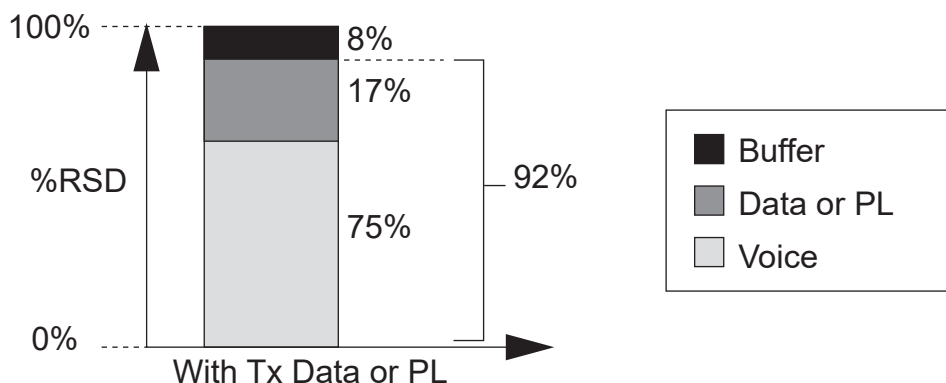
10 To de-key the base station/repeater, click **PTT Toggle**.

11 To save the newly tuned softpot value into the codeplug, click **Write**.

12 Alignment is complete.

> **NOTE:**
> - See Figure 1 for details regarding the audio and data flow.
> - Set the modulation limit to 92% to compensate for any additional deviation incurred by the transmitter VCOs over temperature.
> - The Tuner application always aligns the Modulation Limit parameter in a 12.5 kHz channel spacing regardless of the CPS setting, so calculate the tuning % RSD accordingly. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when outside of the Tuner application.

10.7.4
Verifying the Modulation Limit (with Tx Data or PL)

See Verifying the Modulation Limit (with no Tx Data and no PL) on page 103 with the following exceptions:

- At step 4, additionally apply a TX Data signal which yields the same % RSD as was referenced in step 9 in Tuning the Modulation Limit (with Tx Data or PL) on page 104, to Pin 13 during the validation process.

**10.8**
Tuning the Wireline Receive Level

The procedure outlined in this section is used to set the output level on the Wireline/Aux board's Rx path for a given RF signal deviation on the received signal. Perform this procedure during initial Wireline installation or any time the Rx audio level needs adjustment.

Procedure:

1 Connect the radio's receiver antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Launch the Tuner application.

4 To read the softpot values, click **Read**

5 Under the **RX** menu in the tree view, select **Wireline Receive Level**

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The following image provides graphical representation of the step.

Figure 60: Rx Menu tree (Wireline Receive Level)
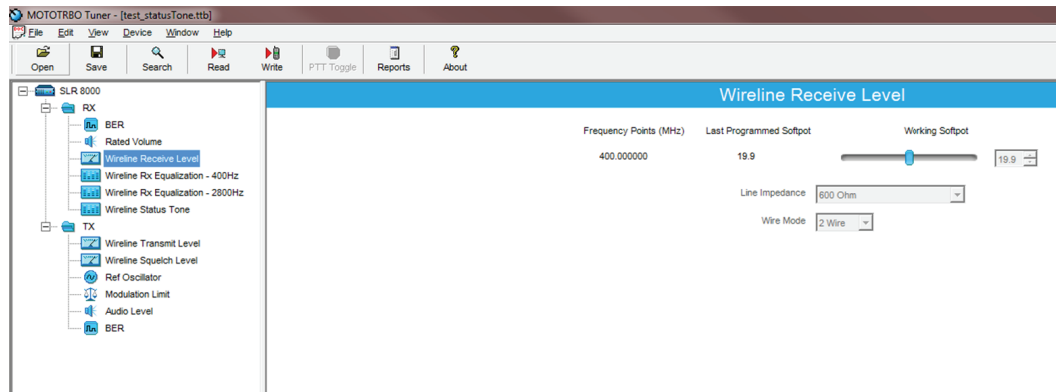
6   Set the Communication Analyzer to output a -47 dBm RF signal modulated with a 1 kHz tone at 60% of full deviation on the tuning frequency. The tuning frequency is the value displayed in the Tuner application under the heading of **Frequency Points**

> **NOTE:**
> Programmed TPL and DPL squelch requirements are automatically disabled for the tuning frequency while in the Tuner application.
>
> The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.

7   Adjust the softpot value until the desired receive audio level is achieved (-30 dBm to +7 dBm) across line two of the WL1 Wireline/Aux backplane connector terminals.

Figure 61: Wireline
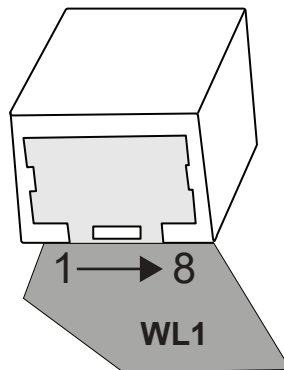
Table 52: Wireline Receive Level

Location	Pin Assignment	Operation
1	Line 2+	2-wire or 4-wire
2	Line 2-	2-wire or 4-wire

> **NOTE:** It is imperative that the load the Wireline/Aux board is driving, matches that of the Wireline/Aux board's source impedance setting noted in the Tuner environment. Optimally, it is recommended to use the actual load which is used during normal operation of the radio.

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8 To save the new tuned softpot value into the radio's codeplug, click **Write**

10.9
Tuning the Wireline Rx Equalization – 2800 Hz

The Rx Equalization feature allows the frequency response adjustment of the Rx Audio relative to a specified rated system deviation, to compensate (equalize) for the response of the wireline backhaul network itself. This section outlines the procedure for high frequency adjustment. Perform this procedure only after Tuning the Wireline Receive Level.

The Rx Equalizer is adjusted relative to the response at 1 kHz. Note the 1 kHz response observed when performing the tuning procedure for Wireline Receive Level. Equalizer adjustments are approximate. Typical adjustments range from 0 dB to approximately +6 dB. See Tuning the Wireline Receive Level on page 105.

Procedure:

1 Connect the radio's receiver antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Launch the Tuner application.

4 To read the softpot values, click **Read**

5 Under the **RX** menu in the tree view, select **Wireline Rx Equalization – 2800 Hz**

   Figure 62: Rx Menu tree (Wireline Rx Equalization – 2800 Hz)
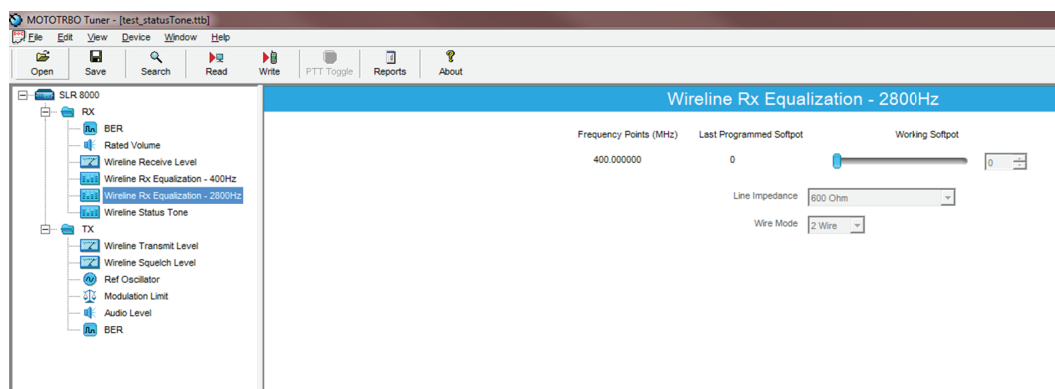
6 Set the Communication Analyzer to output a -47 dBm RF signal modulated with a 2800 Hz tone at 60% of full deviation on the tuning frequency. The tuning frequency is the value displayed in the Tuner application under the heading of **Frequency Points**

> **NOTE:**
> The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.
>
> The emphasis setting of the Communication Analyzer must be turned off for this alignment procedure.
>
> Programmed TPL and DPL squelch requirements are automatically disabled for the tuning frequency while in the Tuner application.

**7** Adjust the softpot value until the best equalization is achieved across line two of the WL1 Wireline/Aux backplane connector terminals. Best equalization is achieved when the far side of the Wireline cable measures a flat response across the upper region of the audio spectrum.

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Compare the response at 2800 Hz with the response measured at 1000 Hz. The values should be approximately equal.

> ✏️ **NOTE:** It is imperative that the load the Wireline/Aux board is driving, matches that of the Wireline/Aux board's source impedance setting noted in the Tuner application. Optimally, it is recommended to use the actual load which is used during normal operation of the radio.
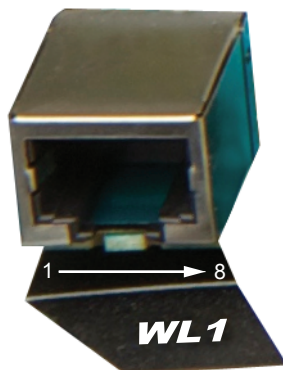
Location	Pin Assignment	Operation
1	Line 2+	2-wire or 4-wire
2	Line 2-	2-wire or 4-wire

8 To save the new tuned softpot value into the radio's codeplug, click **Write**

10.10
# Tuning the Wireline Rx Equalization – 400 Hz

The Rx Equalization feature allows the frequency response adjustment of the Rx Audio relative to a specified rated system deviation, to compensate (equalize) for the response of the Wireline backhaul network itself. This section outlines the procedure for low frequency adjustment. Perform this procedure only after Tuning the Wireline Receive Level.

The Rx Equalizer is adjusted relative to the response at 1 kHz. Note the 1 kHz response observed when performing the tuning procedure for Wireline Receive Level. Equalizer adjustments are approximate. Typical adjustments range from 0 dB to approximately +6 dB. See Tuning the Wireline Receive Level on page 105.

Procedure:

1 Connect the radio's receiver antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Launch the Tuner application.

4 To read the softpot values, click **Read**

5 Under the **RX** menu in the tree view, select **Wireline Rx Equalization – 400 Hz**

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Figure 63: Rx Menu tree (Wireline Rx Equalization – 400 Hz)
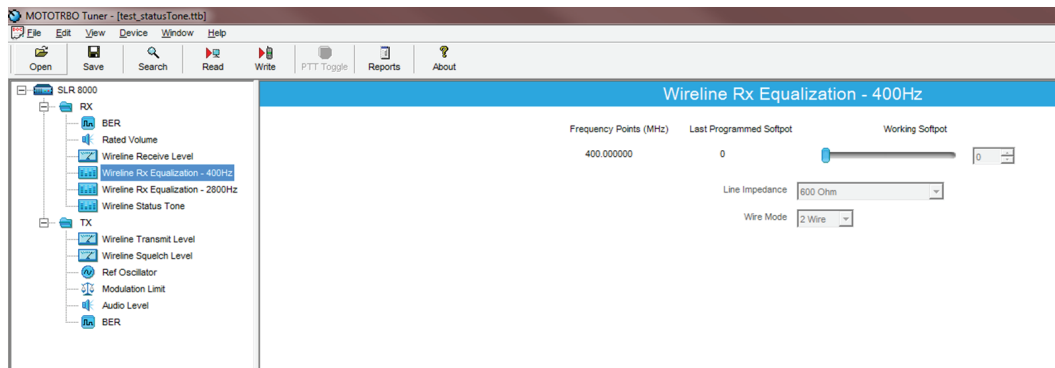
6 Set the Communication Analyzer to output a -47 dBm RF signal modulated with a 400 Hz tone at 60% of full deviation on the tuning frequency. The tuning frequency is the value displayed in the Tuner application under the heading of **Frequency Points**

> **NOTE:**
> The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.
>
> The emphasis setting of the Communication Analyzer must be turned off for this alignment procedure.
>
> Programmed TPL and DPL squelch requirements are automatically disabled for the tuning frequency while in the Tuner application.

7 Adjust the softpot value until the best equalization is achieved across line two of the WL1 Wireline/Aux backplane connector terminals. Best equalization is achieved when the far side of the Wireline cable measures a flat response across the lower region of the audio spectrum. Compare the response at 400Hz with the response measured at 1000 Hz. The values should be approximately equal.

> **NOTE:** It is imperative that the load the Wireline/Aux board is driving, matches that of the Wireline/Aux board's source impedance setting noted in the Tuner application. Optimally, use the actual load which is used during normal operation of the radio.
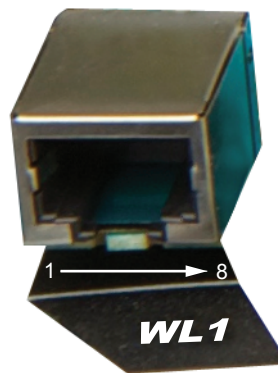
Location	Pin Assignment	Operationa
1	Line 2+	2-wire or 4-wire
2	Line 2-	2-wire or 4-wire

8 To save the new tuned softpot value into the radio's codeplug, click **Write**

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10.11

Tuning the Wireline Transmit Level

The procedure outlined in this section is used to adjust the level the Wireline is expecting on the Tx pair of the WL1 Wireline/Aux connector. Adjusting the expected level has the effect of increasing or decreasing RF signal deviation for a given Wireline Tx audio level. Perform this procedure during initial Wireline installation or any time the Tx audio level needs adjustment.

Procedure:

1 Connect the radio's transmitter antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Apply a 1 kHz signal at the desired input level (-36 dBm to +4 dBm) to the WL1 Wireline/Aux backplane connector terminals.

This signal is known as "Test Tone" and corresponds with the level of average voice. Optimally, it is recommended to use the actual source which is used during normal operation of the radio to provide the signal.
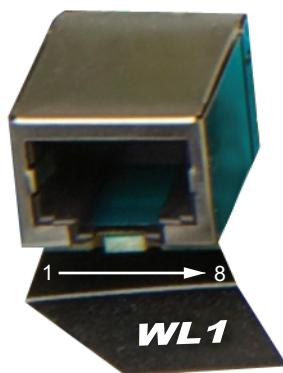
Figure 64: Wireline

Table 53: Wireline Transmit Level

Location	Pin Assignment	Operation
1	Line 2+	2-wire
2	Line 2-	2-wire
4	Line 1-	4-wire
5	Line 1+	4-wire

NOTE:
Most Motorola Solutions dispatch consoles can generate a 1 kHz tone at the correct level by using the "Alert Tone" feature. Consult the appropriate console manual for more information.

If the Wire Mode is set for 2-Wire operation, then inject the signal into the line two terminals of connector WL1. Otherwise, inject the signal into the line one terminals of WL1.

4 Launch the Tuner application and click the "Read" button to read the softpot values.

5 Under the **TX** menu in the tree view, select **Wireline Transmit Level**

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Figure 65: Tx Menu tree (Wireline Transmit Level)
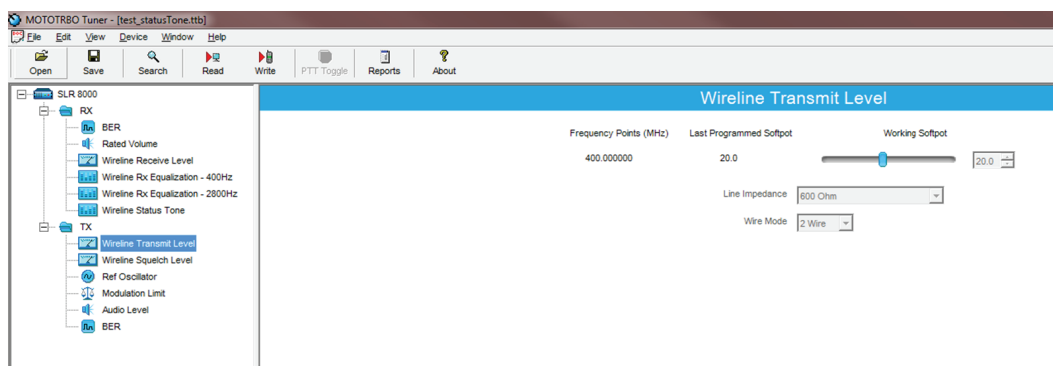
6   Enter the tuning frequency into the Communication Analyzer (the value displayed on the Tuner application under the heading of **Frequency Points**).

7   To key up the radio, click **PTT Toggle**

> 📝 **NOTE:** If enabled, the Wireline's Automatic Level Control (ALC) and Wireline Squelch Hysteresis features are automatically turned off when the radio is keyed up from within the Tuner application. The features are automatically re-enabled when the radio is de-keyed or when leaving the Tuner application.

8   Adjust the softpot value until 60% of the rated system deviation (RSD) is achieved.

> 📝 **NOTE:** The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 60% is 1.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.

9   To de-key the radio, click **PTT Toggle**

10 To save the new tuned softpot value into the radio's codeplug, click **Write**

10.12
Tuning the Wireline Squelch Level

The Wireline Squelch feature is used to mute Wireline Tx audio when the audio level falls below a designated threshold. The procedure in this section is used to set the nominal squelch threshold. An additional hysteresis value can be added to the nominal squelch threshold by adjusting the **Squelch Hysteresis** setting in the Wireline configuration options of the CPS tool.

> 📝 **NOTE:** This calibration procedure should be performed after adjusting the Wireline Transmit Level. See Tuning the Wireline Transmit Level on page 110.

The Wireline Squelch level is adjusted relative to the expected audio level for High Level Guard Tone. This is true regardless of the Remote Control method selected. The expected level of High Level Guard Tone is 6 dB above the "Test Tone" level used in Tuning the Wireline Transmit Level on page 110.

> 📝 **NOTE:** It is possible to set the Wireline Squelch threshold higher than the level of average voice. Setting the Squelch threshold too high can result in unintended audio drop-outs or no audio at all.

Procedure:

1   Connect the radio's transmitter antenna port to the Communication Analyzer.

2   Power the base station/repeater from either an AC or DC source.

3 Apply a 1 kHz signal, at the desired squelch threshold, to the WL1 Wireline/Aux backplane connector terminals. Optimally, it is recommended to use the actual source which is used during normal operation of the radio to provide the signal.

Figure 66: Wireline

Table 54: Wireline Squelch Level

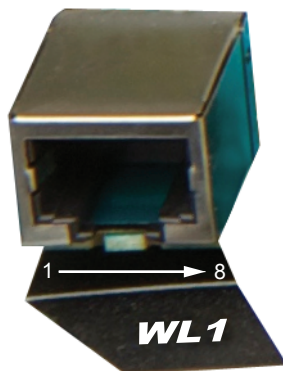| Location	Pin Assignment	Operation
1	Line 2+	2-wire
2	Line 2-	2-wire
4	Line 1-	4-wire
5	Line 1+	4-wire

NOTE: If the Wire Mode is set for 2-Wire operation, then inject the signal into the line two terminals of connector WL1. Otherwise, inject the signal into the line one terminals of WL1. In addition, the Wire Mode used must be the same configuration as that was used in the Wireline Transmit Level alignment in Tuning the Wireline Transmit Level on page 110.

4 Launch the Tuner application.

5 To read the softpot values, click **Read**

6 Under the **TX** menu in the tree view, select **Wireline Squelch Level**

Figure 67: Tx Menu tree (Wireline Squelch Level)
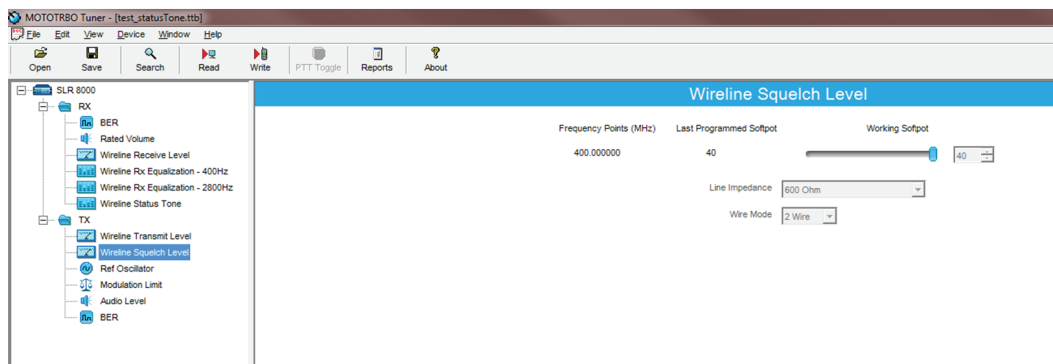
7 Enter the tuning frequency into the Communication Analyzer (the value displayed on the Tuner application under the heading of **Frequency Points**).

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8 To key up the radio, click the backplane **PTT Toggle**

> 📝 **NOTE:**
>
> - If enabled, the Wireline's Automatic Level Control (ALC) and Wireline Squelch Hysteresis features are automatically turned off when the radio is keyed up from within the Tuner application. The features are automatically re-enabled when the radio is de-keyed or when leaving the Tuner application.
>
> - The Wireline's Automatic Level Control (ALC) alignment procedure can result in a difference between the Wireline Squelch Threshold set during this procedure and the actual value observed in normal operation. This difference can be eliminated or minimized, by carefully following the Wireline Transmit Level tuning procedure found in Tuning the Wireline Transmit Level on page 110 to obtain an accurate alignment.

9 Adjust the softpot value until the Communication Analyzer indicates that the deviation has dropped out (< 100 Hz of deviation).

10 To de-key the radio, click **PTT Toggle**

11 To save the new tuned softpot value into the radio's codeplug, click **Write**

10.13
Tuning the Wireline Status Tone Level (Analog Voting)

The procedure outlined in this section is used to set the status tone output level on the Wireline/Aux board's Rx path. Perform this procedure during initial Wireline/Aux board installation or anytime the Wireline receive audio level needs adjustment.

> 📝 **NOTE:** This calibration procedure should be performed after adjusting the Wireline Receive Level. See Tuning the Wireline Receive Level on page 105.

Procedure:

1 Connect the radio's receiver antenna port to the Communication Analyzer.

2 Power the base station/repeater from either an AC or DC source.

3 Launch the Tuner application.

4 To read the softpot values, click **Read**.

5 Under the **RX** menu in the tree view, select **Wireline Status Tone Level**.

Figure 68: Rx Menu Tree (Wireline Status Tone Level)
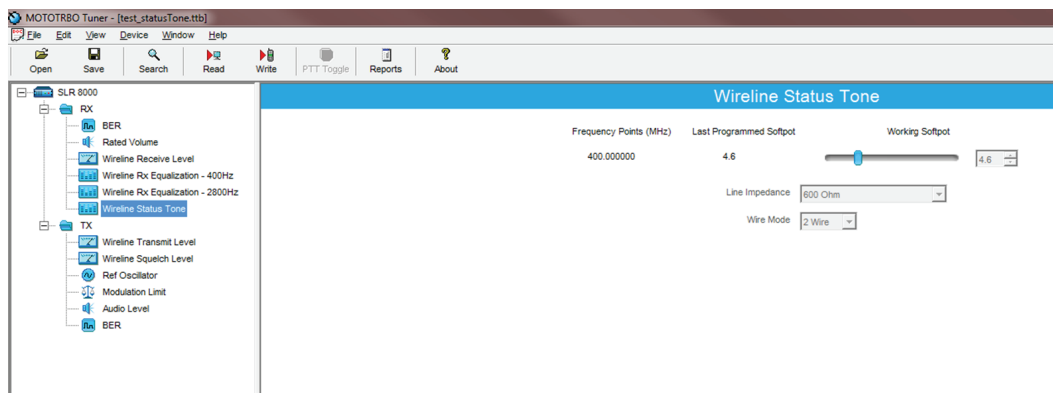
6 Set the Communication Analyzer to output a -47 dBm RF signal modulated with a 1 kHz tone at 100% of full deviation on the tuning frequency. The tuning frequency is the value displayed on the Tuner application under the heading of **Frequency Points**

> **NOTE:**
> The Tuner aligns this parameter in a 12.5 kHz channel spacing, so 100% is 2.5 kHz of deviation. If the CPS is set for 25 kHz operation, the base station/repeater automatically scales the deviation by a factor of two when it is outside the Tuner application.
>
> Programmed TPL and DPL squelch requirements are automatically disabled for the tuning frequency while in the Tuner application.

7 Note the audio level that is yielded from step 6 and then remove the RF signal that was delivered to the base station/repeater in step 6. The status tone level is generated with the absence of the RF carrier.
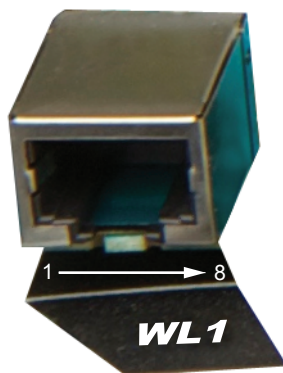
8 Relative to the audio level noted in step 7, adjust the softpot value until the desired status tone level is achieved (0 to 20 dB below 100 % RSD) across line two of the WL1 Wireline/Aux backplane connector terminals.

Location	Pin Assignment	Operation
1	Line 2+	2-wire or 4-wire
2	Line 2-	2-wire or 4-wire

> **NOTE:** It is imperative that the load the Wireline/Aux board is driving, matches that of the Wireline/Aux board's source impedance setting noted in the Tuner application. Optimally, it is recommended to use the actual load which is used during normal operation of the radio. Additionally, ensure that the status tone level does not exceed +7dBm.

9 To save the new tuned softpot value into the radio's codeplug, click **Write**

10.14
Changing to Battery Charger Only Mode

This feature allows you to change operation mode from "Normal Mode" to "Battery Charger Only" mode.

Prerequisites: Power the repeater from an AC source and connect the system to a laptop with USB cable. Run the MOTOTRBO Tuner application.

Procedure:

1 Connect the battery to the repeater's DC connector.

2 To read the softpot values, click **Read**.

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3 Under the **Device Information** main menu, click **Battery Charger Only Mode**.

The mode change procedure begins. When the mode change procedure is completed, the display shows `All functions other than the battery charger will be disabled. Do you wish to continue?`

4 Do one of the following:

- Click **Yes**. The display shows `The Unit is in battery charger only mode. Please remove power for 15 seconds to exit.`

- Click **No** to return to the main menu.

Power off for 15 seconds to restore full system functionality. The system only detects and charges another battery after restoring full system functionality.

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 8000 Repeater Series Base Station Repeater QUICK START GUIDE" (part number MN002302A01-AC, July 2018) 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.

MOTOTRBO™
SLR 8000 Series
Base Station Repeater

QUICK START GUIDE

en-US	fr-CA	es-LA

pt-BR	zh-CN	ko-KR	id-ID	uk-UA

M **MOTOROLA** *SOLUTIONS*

MOTOTRBO™ SLR 8000 Series Base Station 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**	CAUTION indicates a potentially hazardous situation which, if not avoided, **might** result in equipment damage.
⚠️ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, **could** result in death or injury.
⚠️	This symbol indicates areas of the product that pose potential burn hazards.

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■ 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 Solutions product service and installation manuals and the Motorola Solutions R56 Standards and Guidelines for Communications Sites manual (which can be obtained by ordering CD-ROM 9880384V83). To obtain copies of these materials, please contact Motorola Solutions 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 Base Station 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 Solutions 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 Solutions 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 Solutions R56 and specified installation instructions for safe operation.
- Slots and openings in the cabinet are provided for ventilation. Do not block or cover openings 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 racks. 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."

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- ⚠️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 in the cabinet 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 Solutions R56 manual.
- Shock hazard. DC input voltage shall be no higher than 60 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 Solutions 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 Solutions R56.

This product complies with the requirements set forth by the European R&TTE regulations and applicable CENELEC standards concerning human exposure to Electromagnetic Energy (EME) at Transmitter Antenna sites. "Appendix F" of the SLR 8000 Series Base Station 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 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 F" in the SLR 8000 Series Base Station 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 Solutions Aftermarket & Accessory Department.

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Part 68 Information

Part 68 FCC Guideline

This section applies when the SLR 8000 Base Station Repeater is equipped with the optional Wireline Interface Board. This equipment complies with Part 68 of the FCC rules and the requirements adopted the ACTA. On the rear of this equipment is a label that contains, among other information, the registration number:

US:ABZNINANPML6730

If requested, this number must be provided to the telephone company. The connector used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. A compliant connector is provided with this product. See installation instructions for details.

REN: N/A
Connector: RJ1DC
Authorized Network Port: 04NO2
Service Order Code: 7.0Y

If the equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If you experience trouble with this equipment, please refer to "Appendix B", "Appendix C" or "Appendix D" of MN002296A01_ for repair and warranty information. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

None of the circuit boards in this equipment are field repairable. For assistance in sending the boards back for repair, please contact the Service Center listed in "Appendix B", "Appendix C" or "Appendix D" of MN002296A01_.

This equipment cannot be used on public coin phone service provided by the telephone company. Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

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◼ **MOTOTRBO SLR 8000 Series Base Station Repeater Supplemental Safety and Installation Requirements**
ATTENTION!

The MOTOTRBO SLR 8000 Series Base Station Repeater must be installed in a suitable, in-building enclosure. A restricted access location is required when installing this equipment into the end system.

The Base Station Repeater contains a Class 1 built-in power supply component. It is equipped with an appliance inlet for connecting to an AC input, as well as DC input terminals which meet SELV DC circuit requirements.

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. The maximum guaranteed operating altitude is 5000 meters above sea level. Operating above this maximum altitude may result in degradation to product specifications and compliances.

The nominal 15.75 VDC output from the power supply to the PA is at an energy hazard level (exceeds 240 VA).

When installing into the end system, care must be taken so as not to touch the output wires. When the MOTOTRBO SLR 8000 Series Base Station Repeater is used in a DC reverting system, the DC power supply must be located in the same building as the

MOTOTRBO SLR 8000 Series Base Station Repeater, and it must meet the requirements of a SELV circuit.

◼ **General Installation**

Proper installation ensures the best possible performance and reliability of the Base Station 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 12 of the SLR 8000 Series Basic Service and Installation Manual before beginning the actual installation.

◼ **Pre-Installation Overview**

The following information is an overview for installing the SLR 8000 Series Repeater:

📄 **List of Supplied Items**

- SLR 8000 Series Base Station Repeater
- Cabinet and Rack mounting hardware
- AC line cord
- Quick Start Guide

NOTE: Save the SLR 8000 Series Base Station Repeater shipping container and its components to facilitate possible future SLR 8000 Series Base Station Repeater shipping needs.

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📄 Environmental Conditions at Intended Installation Site

The repeater may be installed in any location suitable for electronic communications equipment, provided that the environmental conditions do not exceed the equipment specifications for temperature, humidity, and air quality.

📄 Operating Temperature Range

-30°C (-22°F) to +60°C (+140°F) – consider cabinet temperature rise.

📄 Humidity

Humidity range: At or below RH of 95%, non-condensing at 50°C (122°F).

📄 Air Quality

• Air quality: airborne particulates level must not exceed 90 µg/m3

The Motorola Solutions 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 in a rack or cabinet.
• Open frame racks accept multiple repeaters and ancillary equipment; EIA 48.3 cm (19 inch) rack configuration. Recommended clearance front and rear is 91.44 cm (36 in) minimum for servicing access.
• Cabinets must be equipped with ventilation slots or openings in the front (for air entry) and back or side panels (for air to exit). If several repeaters are installed in a single cabinet, be sure ventilation openings surround each repeater to allow for adequate

cooling. All cabinets must have at least 15 cm (6 in) of open space between the air vents and any wall or other cabinets to allow for adequate air flow.

📄 Mounting the SLR 8000 Series Base Station Repeater in a Rack or Cabinet

When mounting the SLR 8000 Series Base Station Repeater into a rack or cabinet, use the included mounting hardware. This allows proper installation of the repeater within the center of gravity of a rack or to use in forward mounting the repeater in cabinet installations.

NOTE: See Chapter 12 of the SLR 8000 Series Base Station Repeater for modular racks and cabinets that are available for purchase.

See Figure 1a and Figure 1b for an illustration of the mounting hardware configured for a rack installation.

Figure 1a: Rack installation

Figure 1b: Rack installation

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Applicant: Motorola Solutions

Equipment Type: ABZ99FT3095B / 109AB-99FT3095B

See Figure 2a and Figure 2b for an illustration of the mounting hardware configured for a cabinet installation.

Figure 2a: Mounting hardware   Figure 2b: Mounting hardware

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 (47–63Hz) at 10A maximum.

> ⚠️ **Caution**
> Do not apply AC power to the repeater at this time. Make sure that the circuit breaker associated with the AC outlet is turned off.
> The AC socket-outlet must be installed near the equipment and must be easily accessible.

- When applicable, DC input power cabling: 11–15.5 VDC at 23A maximum, or 20.6 - 32 VDC at 23A maximum.

> ⚠️ **WARNING**
> Ensure that the appropriate voltage is connected with a nominal 13.6VDC (11–15.5 VDC), or nominal 27.2 VDC (20.6 - 32 VDC)

> ⚠️ **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.

Grounding

Connect a bonding wire from the repeaters 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 Solutions 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.

Cable Connections

- Connect RF coaxial cables to transmit (N-Type Female) and receive (BNC Female) antenna connectors.
- System cable connections are made through the Aux and/or Ethernet connectors.

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Connectors

Rear Panel

Figure 3 illustrates the position of the external connectors located on the back panel of the repeater. Table 1 identifies the connector types as well as the primary function of a connector.
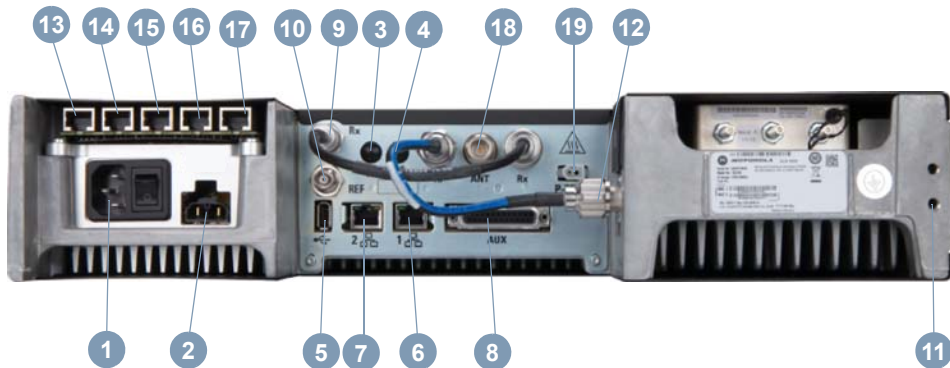

Figure 3: SLR 8000 Series Base Station Repeater rear panel locations

Table 1: Connector Type and Primary Function

NO	Connector	Function(s)
1	C14 (IEC 60320)	AC Power Inlet and Base Station Repeater Power Switch
2	Molex 42818-0212	DC Power Inlet and DC Charger Outlet
3	Option Dependent	Future Option 1
4	Option Dependent	Future Option 2
5	Type A Socket	USB - (Optional) - Future
6	RJ-45 - Jack	Ethernet 1
7	RJ-45 - Jack	Ethernet 2 - (Optional) - Future
8	DB25 - Female	Rx Audio, Tx Audio, PTT, COR, Accessory Power, 1 PPS, and GPIO
9	BNC - Female	Receiver RF
10	BNC - Female	Frequency Reference Input
11	T30 TORX Screw	Bonding ground connection
12	N-Type - Female	Transmitter RF

Table 1: Connector Type and Primary Function

NO	Connector	Function(s)
13	RJ-45 - Jack	Wireline #1 - Balanced Rx and Tx Audio with E&M - (Optional)
14	RJ-45 - Jack	Wireline #2 - Balanced Rx and Tx Audio with E&M - (Optional) - Future
15	RJ-45 - Jack	GPIO1 - (Optional) - Future
16	RJ-45 - Jack	GPIO2 - (Optional) - Future
17	RJ-45 - Jack	GPIO3 - (Optional) - Future
18	N-Type - Female	RF Antenna Relay - Transmitter RF and Receiver RF - (Optional)
19	Molex 03-06-2024	External Circulator Temperature Sense - (Optional)

Post-Installation Checklist

Applying Power

After the SLR 8000 Series Base Station Repeater has been mechanically installed and all electrical connections have been made, power may now be applied and the repeater checked for proper operation.

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Front Panel LEDs

After turning on the repeater power, the seven LEDs on the repeater front panel:

1. Light for approximately one second to indicate that they are functional, then

2. Go off for one second.

3. Indicate the operational status of the repeater.

Front Panel Speaker/Microphone

- **Microphone Connector (RJ45) Jack:** accepts interface with the GMMN4063_ microphone accessory.
- **Volume Increase Button:** Raises the volume level of the integrated front panel speaker.
- **Volume Decrease/Mute Button:** Lowers/Mutes the volume level of the integrated front panel speaker.

Verifying Proper Operation

Operation of the repeater can be verified by:

- Observing the state of the seven 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 sufficiently cool before touching the repeater.

Archiving

Copying the Base Station Repeater Codeplug Data to a Computer

Proceed to the Customer Programming Software (CPS) configuration procedures to customize the repeater parameters (e.g., operating frequency, PL, codes, etc.). Backup the codeplug data of the SLR 8000 Series Base Station Repeater using the CPS application.

The SLR 8000 Series Base Station Repeater connector to facilitate the CPS configuration is a USB Type-B host connection located on the front of the repeater. See Figure 4.
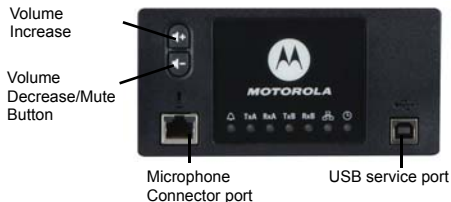

Volume Increase

Volume Decrease/Mute Button

Microphone Connector port

USB service port

Figure 4: Front panel

Motorola Solutions Service Center

To find out more about Motorola Solutions Service Centers, please visit http://www.motorolasolutions.com

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www.motorolasolutions.com/mototrbo

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