MOTOROLA SOLUTIONS DVR-LX Digital Vehicular Repeater Installation Guide

Contents

MOTOROLA SOLUTIONS

MOTOROLA SOLUTIONS DVR-LX Digital Vehicular Repeater

Product Information

Specifications

- **Brand:** Motorola Solutions
- **Model:** MN010353A01-AA
- **Intended Use:** Remote Mount APX Mobile Radio and O2 Control Head Installation
- **Trademark:** MOTOROLA, MOTO, MOTOROLA SOLUTIONS
- **License:** Nonexclusive, royalty-free license for product use
- **Compliance:** FCC limits for occupational/controlled conditions

Product Usage Instructions

Installation Guidelines

- This manual provides installation guidelines for mounting the Remote Mount APX Mobile Radio and O2 Control Head to the inside of the Rackmount DVRS.

Operation

- The radio equipment is intended for use in occupational/controlled conditions where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits. It is not authorized for general population or consumer use.

Warranty Information

- Refer to Futurecom Terms and Conditions of Sale, Section 7 for standard warranty details.

Legal and Compliance Statements

- This product may contain Open Source software used under license. Refer to the product installation media for full Open Source Legal Notices and Attribution content.
- Changes or modifications not expressly approved by Futurecom Systems Group, ULC. and Motorola Solutions could void the User's authority to operate the equipment.

Contact Us

- To contact support, visit the **motorolasolutions.com** page and select Support.

About This Manual

- This manual provides installation guidelines for mounting Motorola Solutions Remote Mount APX Mobile Radio and O2 Control Head to the inside of the Rackmount DVRS.
- For details on the APX series Mobile Radios operation, refer to the applicable Manuals available from Motorola Solutions Learning eXperience Portal (LXP) website.

Document History

Version	Description	Date
MN010353A01-AA	Initial converted edition.	January 2025

About This Manual

- This manual provides installation guidelines for mounting Motorola Solutions Remote Mount APX Mobile Radio and O2 Control Head to the inside of the Rackmount DVRS.
- For details on the APX series Mobile Radios operation, refer to the applicable Manuals available from Motorola Solutions Learning eXperience Portal (LXP) **website.**

Terms Used in This Manual

Terms/Abbreviations Description

- **Control Head (CH)** Motorola Solutions Mobile Radio Control Head – O2
- **DVRS** Digital Vehicular Repeater System
- **MSU** Mobile Subscriber Unit
- **Rackmount DVRS** Complete DVRS and Mobile Radio System, packaged in a 19-inch rackmount tray.

Notations Used in This Manual

- This guide is designed to give you more visual cues.
- The following graphic icons may be used throughout the manual.
- **DANGER:** The signal word DANGER with the associated safety icon implies information that, if

disregarded, will result in death or serious injury.

- **WARNING:** The signal word WARNING with the associated safety icon implies information that, if disregarded, could result in death serious injury, or serious product damage.
- **CAUTION:** The signal word CAUTION with the associated safety icon implies information that, if disregarded, may result in minor or moderate injury, or serious product damage.
- **CAUTION:** The signal word CAUTION without the associated safety icon implies potential damage to non-MSI equipment, software or data, or injury that is not related to the MSI product.
- **IMPORTANT:** IMPORTANT statements contain information that is crucial to the discussion at hand but is not a CAUTION or WARNING. There is no warning level associated with the IMPORTANT statement.
- **NOTE:** NOTE contains emphasize points of the surrounding text, a reminder, or to indicate minor problems in the outcome of an action.
- They also refer the reader elsewhere for additional information, remind the reader how to complete an action (when it is not part of the current procedure, for instance), or tell the reader where something is on the screen.
- There is no warning level associated with a NOTE.
- **NOTICE:** NOTICE is a regular note that contains additional information more important than the surrounding text, such as exceptions or preconditions. There is no warning level associated with a NOTICE.
- **TIP:** TIP contains information that provides the reader with a different or quicker method of accomplishing the same task. At times, they also give the reader the best way to proceed or handle the task.
- The following special notations highlight certain information.

Table 1: Special Notations

Example	Description
Menu key or PTT button	Bold words indicate the name of a key, button, soft menu item, or programming menu item.
Ordering Guide	Italic words indicate the title of a bibliographic resource.
Powering Off	Typewriter words indicate the Human Machine Interface (HMI) strings or messages displayed on your display.
File → Templates (DCD Files) → Load DCD Tem- pl ate	Bold words with an arrow between indicate the navigation structure in the menu items.

Related Publications

User Guides

Part Number Description

- **MN010246A01** Vehicular Repeater Functional Description Manual
- **MN010256A01** Vehicular Repeater User Guide

Programming Guides

Part Number Description

- **MN010245A01** Vehicular Repeater Programming Guide

Safety Booklets

Part Number Description

- **MN010428A01** Product Safety and RF Energy Exposure Booklet for Digital Vehicular Repeater Systems (Canada)
- **MN010429A01** Product Safety and RF Energy Exposure Booklet for Digital Vehicular Repeater Systems (USA)

Rackmount DVRS Overview

- The Digital Vehicular Repeater System (DVRS) is typically mounted inside the trunk of a car and powered by the car battery.
- Some applications other than vehicular use require added flexibility that can be achieved with the use of a Rackmount DVRS that is designed to fit into a standard 19 in. rack.
- **NOTE:** Product Safety and RF Energy Exposure Booklet for Digital Vehicular Repeater Systems includes approved antennas and associated output powers for DVRS.
- The Rackmount DVRS is a Mobile Radio, Control Head, DVR-LX, and Filters packaged in a compact 19 in. rack tray as shown in Figure 1: Rackmount DVRS Form Factor.
- Dimensions of the Rackmount DVRS are 10½ in. x 19 in. x 15¾ in. (Height x Width x Depth).
- The Rackmount DVRS can be powered up by connecting it directly to a +13.8 VDC Power Supply.

Figure 1: Rackmount DVRS Form Factor

Rackmount DVRS Installation

- This section provides guidelines on installing the Rackmount DVRS.

Required Tools

Tool Requirement

- **#2** Philips Screwdriver Tightening of screws
- **3/16** in. Flat Screwdriver Tightening of connector screws

Installing the Rackmount DVRS

Procedure:

Unpack the Rackmount DVRS.

- **Note** the location of the mounting screws for the MSU Control Head and Microphone clip as shown in Figure 2: Rackmount DVRS Front View (As Received) on page 12 and Figure 3: Rackmount DVRS Rear View (As Received).

Figure 2: Rackmount DVRS Front View (As Received)

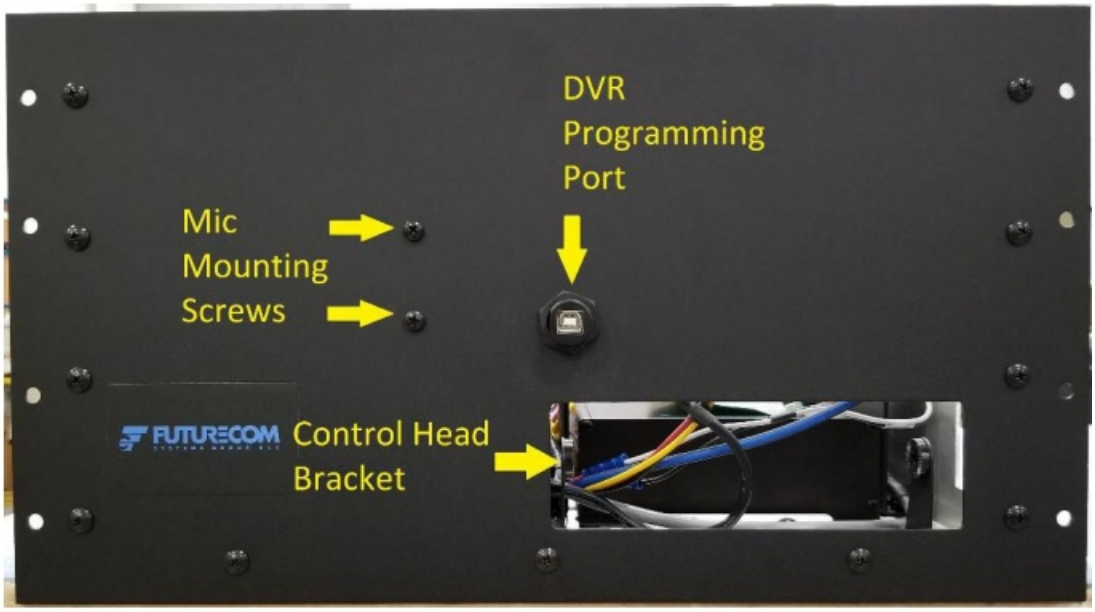
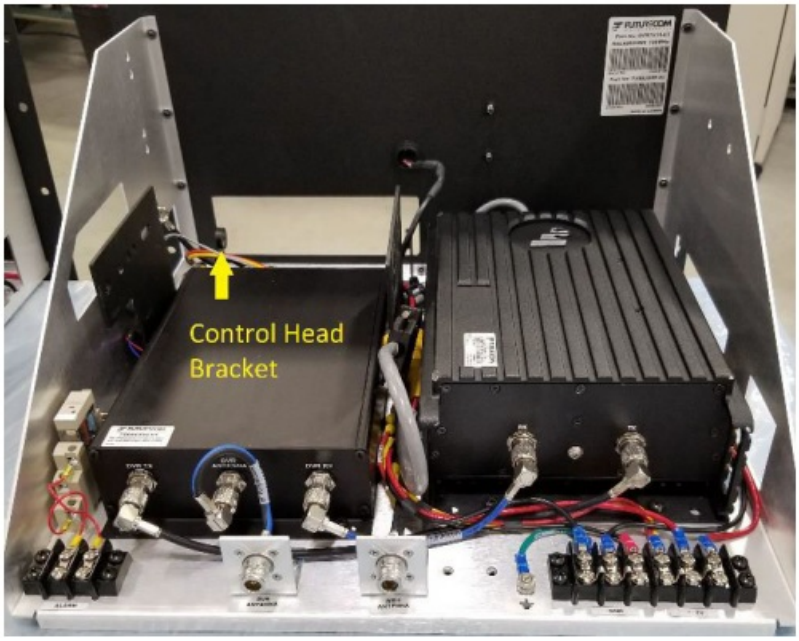


Figure 3: Rackmount DVRS Rear View (As Received)



- The MSU components mounted in the tray are shown in Figure 4: MSU Components for the Tray. The Microphone is to be installed on the front panel.

Figure 4: MSU Components for the Tray

- Connect the DC and the control cable to the Control Head.

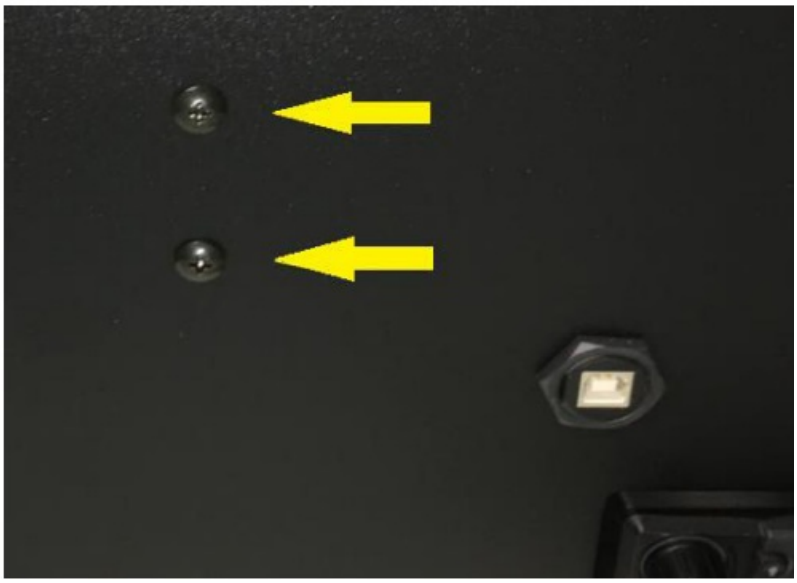
Figure 5: Control Head Connections

Install the Control Head in the Control Head Bracket.

Figure 6: Control Head Installation

Locate and remove the Microphone clip mounting screws.

Figure 7: Location of the Microphone Clip Mounting Screws

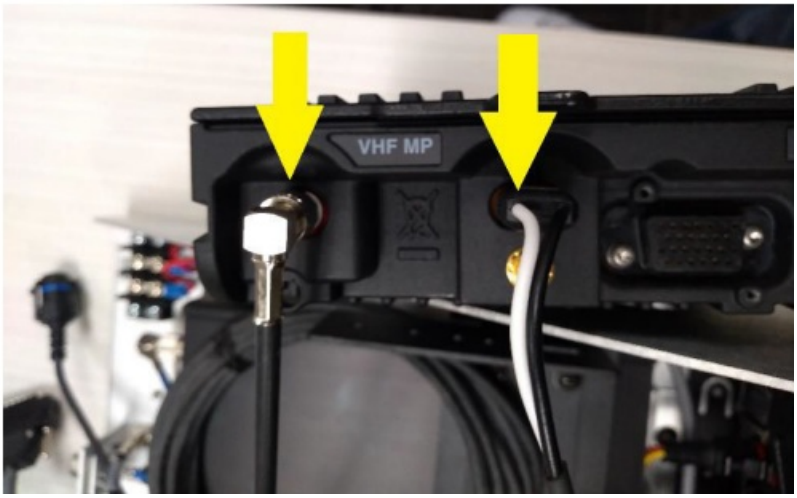


Attach the microphone clip.

Figure 8: Installation of the Microphone Clip

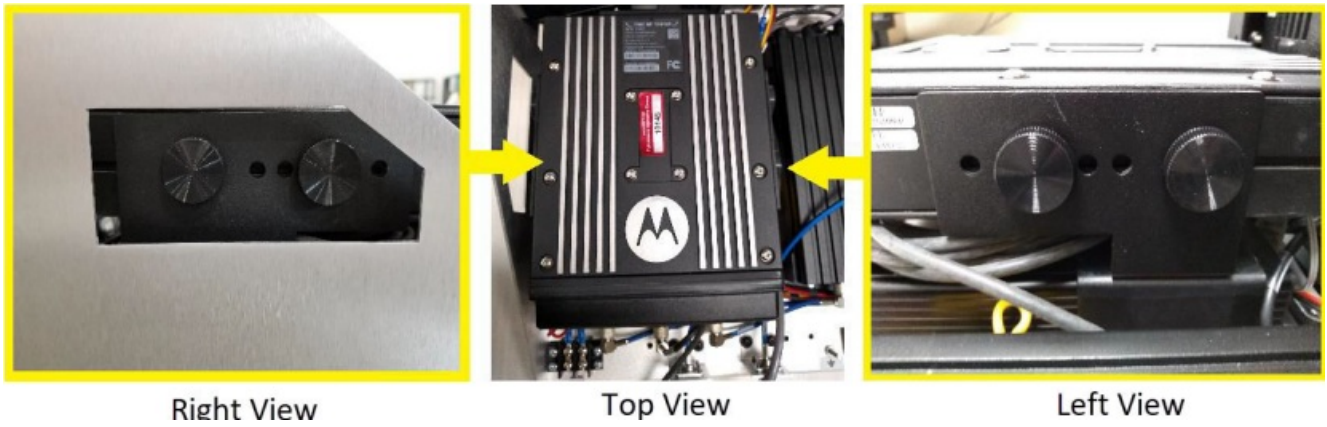
Connect the MSU DC power cable and the antenna cable.

Figure 9: DC and RF Cables Connection



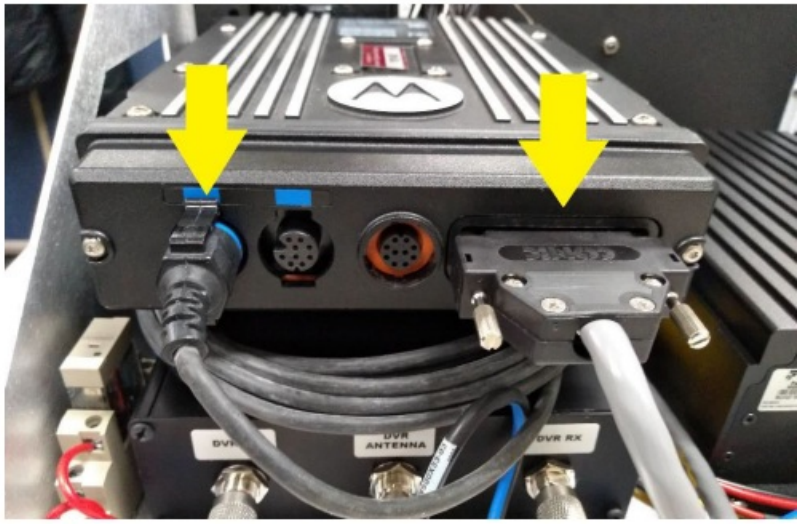
Install the MSU in the MSU bracket. See for the locations of the mounting screws.

Figure 10: MSU Mounting Screws Location



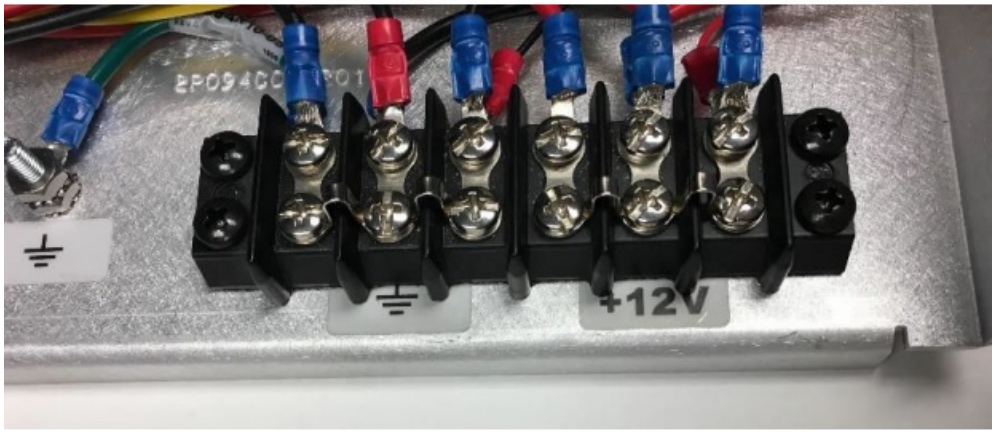
Connect the Control Head cable and the DVR cable.

Figure 11: Control Head and DVR Cables Connection



Install the tray in the 19 in. rack and connect the DC power supply to the Terminal Strip.

Figure 12: MSU Mounting Screws Location



Connect the MSU Antenna and the DVR Antenna cables.

Figure 13: MSU Mounting Screws Location

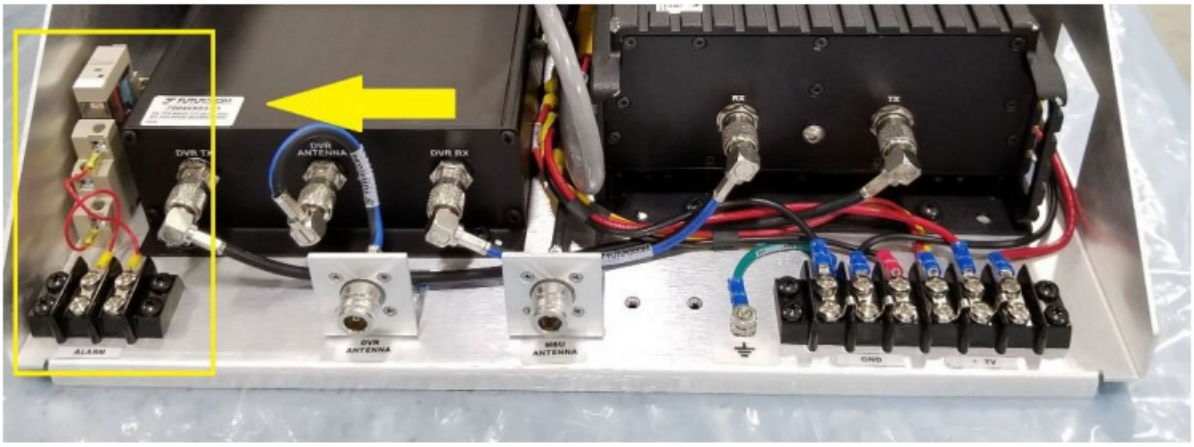
- Program the MSU, DVR-LX®, and portables for DVRS operation.
- **a.** To program the DVR-LX, connect a PC with compatible Futurecom Repeater Configurator (FRC) programming software to the USB port located on the front panel of the Rackmount DVRS.
- **b.** Ensure that the templates are fully matched by following the guidelines provided in the Vehicular Repeater Programming Guide.
- **c.** Set DVR Tx Power to 32.5 dBm to provide the correct input signal level to the 50 W Power Amplifier.
- **CAUTION:** DVR Tx Power should not be set to more than 33 dBm or 2 Watts. Programming higher power levels may result in the Power Amplifier damage.
- **IMPORTANT:** When programming the DVRS frequencies, ensure that they match the DVRS filtering frequencies. To check the tuned frequency setting of the DVRS duplexer, refer to the DVRS labels located on the tray.
- Install the MSU Microphone.
- **Result:** Rackmount DVRS is completely installed.

Figure 14: Front Panel Fully Assembled

Programming the External Alarm Option

If the optional External Alarm is installed in the Rackmount, it can be programmed with Futurecom Repeater Configurator (FRC). The External Alarm is triggered when specified repeater temperature or power output thresholds are crossed.

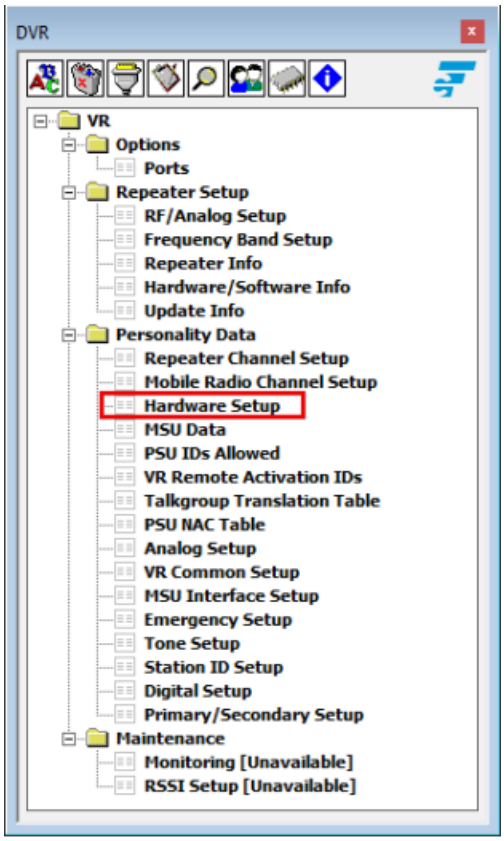
Figure 15: External Alarm Hardware Location



NOTE: By default, the alarm circuit is closed. When the alarm is triggered, the circuit opens.

Procedure:

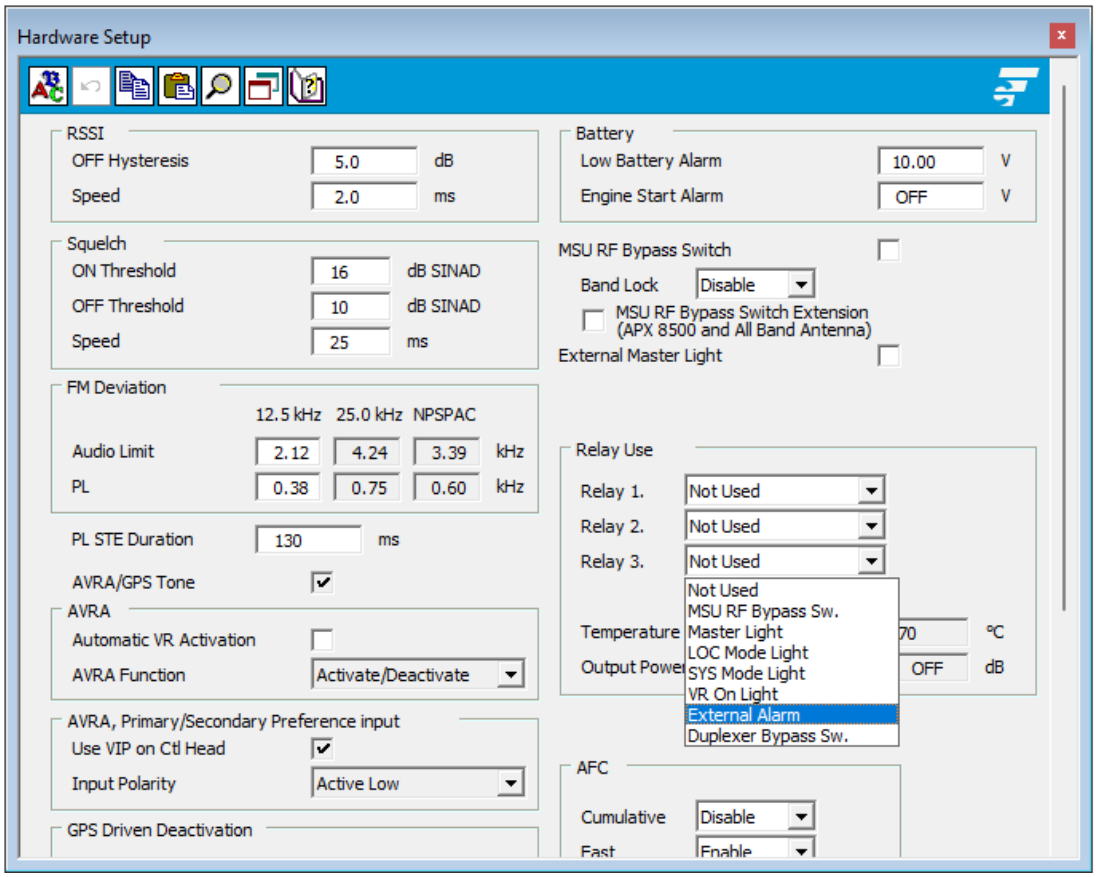
1. Connect the repeater programming USB cable to the Rackmount and launch Futurecom Repeater Configurator (FRC) Software on a connected PC.
2. Load data from the APX repeater to the FRC and select Hardware Setup in the FRC navigation tree.
    - **Figure 16: Hardware Setup in FRC Navigation Tree**



- The Hardware Setup window opens.

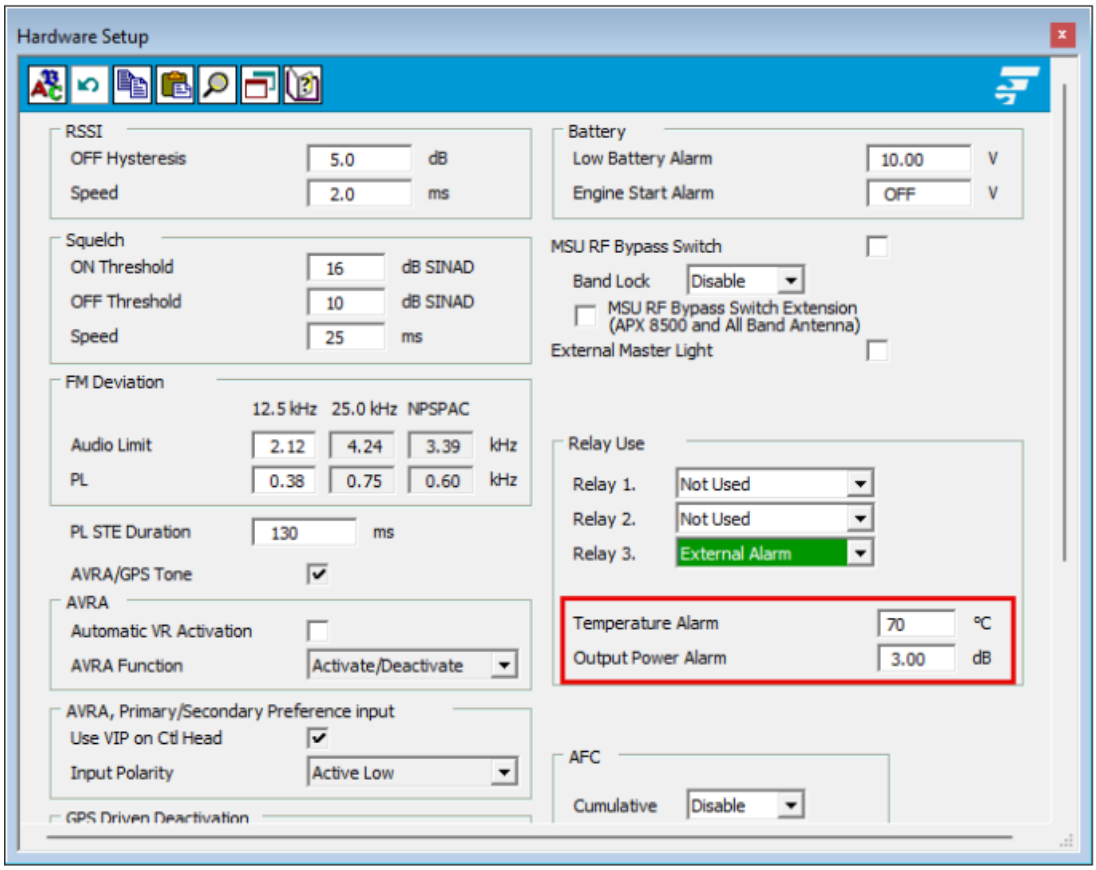
3. In the Relay Use, set Relay 3 to External Alarm.

- **Figure 17: Relay Use Options**



4. Set the Temperature Alarm and Output Power Alarm to desired values.

- **Figure 18: Alarm Threshold Values**



5. Save changes to the APX Repeater and restart the repeater.

Rackmount DVRS Antenna Requirements

- Any DVRS Model requires the use of two or three antennas, with one or two antennas connected to the Mobile Radio and the remaining antenna connected to the DVR-LX.
- The antennas are not part of the Rackmount package and need to be provided separately.
- **IMPORTANT:** All DVRS models require 30 dB minimum Antenna Isolation between the DVR and Mobile Radio Antennas for interference-free operation. A separation of several feet between the antennas may be needed to achieve this.
- In addition to 30 dB isolation, ensure that the RF exposure separation distance is maintained. See RF Energy Exposure Compliance, Awareness, and Control Information and Operational Instructions.

Appendix A

DVR-LX® P25 Rackmount Repeater Specifications

General Specifications	
Dimensions: Height/Width/Depth	
Low-Profile	10½ in. x 19 in. x 15¾ in.
High-Profile	17½ in. x 19 in. x 15¾ in.
Approximate Weight	
Low-Profile	26 lbs
High-Profile	43 lbs
Channel Spacing	12.5 kHz or 25 kHz programmable
Number of Channels	192
CTCSS/DCS	Programmable per Channel
Power Supply	13.8 VDC ± 20%
DC Current Drain	
Standby/Receive	1.9 A
Transmit (without Power Amplifier)	14.5 A
Transmit (with 50 W Power Amplifier)	25 A
Operating Temperature	–30°C to +60°C
Antenna Impedance	50 Ω
Duty Cycle	Continuous (DVR)
External Connectors	
Antenna (DVR and Mobile)	N Female
Computer Interface	USB

Equipment Type Acceptance	VHF	UHF	800
FCC	136–174 MHz	380–406 MHz	806–824 MHz
	L06-DVRSVHF	406.1–512 MHz	851–869 MHz
		L06-DVRSUHF	L06-DVRS800
Industry Canada	138–174 MHz	406.1–430 MHz	806–824 MHz
	2098B-DVRSVHF	450–470 MHz	851–869 MHz
		2098B-DVRSUHF	2098B-DVRS800

Transmitter Specification	VHF	UHF	800
Frequency Band	136–174 MHz	380–430 MHz	851–869 MHz
		450–470 MHz	
Power Output at Antenna Port			
Without Power Amplifier	1–10 W Programmable		
With Power Amplifier (Optional)	50 W		
CCT Option	• 15 sec to 15 min • Disabled		
Max Spurious Output	–20 dBm		
Frequency Stability (–30°C to +50°C; +25°C Ref.)	± 1.5 ppm		
FM Hum and Noise			
12.5 kHz/25 kHz	–37 dB/–43 dB		
Audio Response	+1, -3 dB of 6 dB per octave preemphasis characteristic over 300 Hz – 3 kHz		
Audio Distortion	<2%		

Receiver Specification	VHF	UHF	800
Frequency Band	136–174 MHz	380–430 MHz	806–824 MHz
		450–470 MHz	
		470–512 MHz	
Receiver Sensitivity (simplex/duplex)	–115 dBm		
Frequency Stability (–30°C to +50°C; +25°C Ref.)	± 1.5 ppm		
Selectivity			
12.5/25 kHz	–60 dB/–75 dB		
Intermodulation	–70 dB		
Deviation			
12.5 kHz/25 kHz	± 2.5 kHz/± 5 kHz		
FM Hum and Noise			
12.5 kHz/25 kHz	–37 dB/–43 dB		
Audio Output (Repeater Detect Audio)	600 mV RMS nominal, flat response		
Audio Response	+1, -3 dB of 6 dB per octave preemphasis characteristic over 300 Hz – 3 kHz		
Audio Distortion	<2%		

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European Union (EU) and United Kingdom (UK) Waste of Electrical and Electronic Equipment (WEEE) Directive

-  The European Union’s WEEE directive and the UK’s WEEE regulation require that products sold in EU countries and the UK must have the crossed-out wheelie bin label on the product (or the package in some cases).
- As defined by the WEEE directive, this crossed-out wheelie bin label means that customers and end users in EU and UK countries should not dispose of electronic and electrical equipment or accessories in household waste.
- Customers or end users in EU and UK countries should contact their local equipment supplier representative or service centre for information about the waste collection system in their country.

Disclaimer

- Please note that certain features, facilities, and capabilities described in this document may not be applicable to or licensed for use on a specific system, or may be dependent upon the characteristics of a specific mobile subscriber unit or configuration of certain parameters. Please refer to your Motorola Solutions contact for further information.
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RF Energy Exposure Compliance, Awareness, and Control Information and Operational Instructions

- This radio equipment is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits.
- This radio device is NOT authorized for the general population, consumer, or any other use.
- ⚠**CAUTION:** Changes or modifications not expressly approved by Futurecom Systems Group, ULC. and Motorola Solutions could void the User's authority to operate the equipment.

Temporary-Fixed Site

Futurecom and Motorola Solutions require the P25 19 in. Rackmount DVRS operator to ensure FCC/IC Requirements for Radio Frequency Exposure are met. It is the responsibility of the Licensee to ensure that the appropriate separation distances between the antennas and bystanders are established and followed to meet the FCC and IC Maximum Permissible Exposure (MPE) Requirements in any particular temporary fixed location. In situations where a site assessment is not practical, it is recommended that the antennas be located at least 9 feet from bystanders. This should ensure MPE compliance in any Temporary-Fixed application and is likely to be a much greater separation distance than is necessary in most cases. Failure to observe the MPE distance exclusion area around the antenna may expose persons within this area to RF energy above the FCC/IC exposure limits for bystanders (general population).

Vehicular Use

If the 19 in. Rackmount DVRS is set up in a vehicle, Users should refer to the separation distances specified in the manual Product Safety and RF Energy Exposure Booklet for Digital Vehicular Repeater Systems1 to determine the separation distances to be used and the antennas approved for such vehicular use. Failure to observe the MPE distance exclusion area around the antenna may expose persons within this area to RF energy above the FCC/IC exposure limits for bystanders (general population). It is the responsibility of the repeater operator to ensure that MPE limits are observed at all times during transmissions.

Commercial Warranty

- Please reference Futurecom Terms and Conditions of Sale, Section 7 regarding standard warranty.
- Reference manual for basic fixed site installation guidance, and use in a vehicular application.

Contact Us

- The Centralized Managed Support Operations (CMSO) is the primary contact for technical support included in your organization's service agreement with Motorola Solutions.

- To enable faster response time to customer issues, Motorola Solutions provides support from multiple countries around the world.
- Service agreement customers should be sure to call the CMSO in all situations listed under Customer Responsibilities in their agreement, such as.

To confirm troubleshooting results and analysis before taking action

- Your organization received support phone numbers and other contact information appropriate for your geographic region and service agreement.
- Use that contact information for the most efficient response. However, if needed, you can also find general support contact information on the Motorola Solutions website, by following these steps.
    1. Enter **motorolasolutions.com** in your browser.
    2. Ensure that your organization's country or region is displayed on the page. Clicking or tapping the name of the region provides a way to change it.
    3. Select "Support" on the **motorolasolutions.com** page.

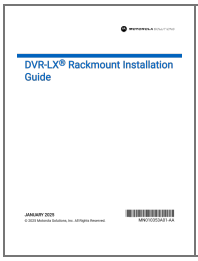
Comments

- Send questions and comments regarding user documentation to **documentation@motorolasolutions.com.**
- Provide the following information when reporting a documentation error.
- The document title and part number
- The page number or title of the section with the error
- A description of the error
- Motorola Solutions offers various courses designed to assist in learning about the system. For information, go to **https://learning.motorolasolutions.com** to view the current course offerings and technology paths.

FAQ

- **Q: What is the intended use of the product?**
    - **A:** The product is intended for mounting the Remote Mount APX Mobile Radio and O2 Control Head inside the Rackmount DVRS.
- **Q: Where can I find warranty information?**
    - **A:** Warranty information can be found in the Futurecom Terms and Conditions of Sale, Section 7.
- **Q: Can the radio equipment be used for general population or consumer purposes?**
    - **A:** No, the radio equipment is intended for use in occupational/controlled conditions only, not for general population or consumer use.

Documents / Resources

	**MOTOROLA SOLUTIONS DVR-LX Digital Vehicular Repeater** [pdf] Installation Guide MN010353A01, MN010353A01-AA, DVR-LX Digital Vehicular Repeater, DVR-LX, Digital Vehicular Repeater, Vehicular Repeater

References

- Solving for safer - Motorola Solutions Australia & NZ
- User Manual