Futurecom Systems Group, ULC

Mobile Radio and Control Head Installation Guide for Rackmount DVRS

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Document Revisions

Rev	Date	By	Notes & References
0	October 2019	SN/AJK	Preliminary Release
1	March 2020	D. Shefer	Updated assembly instructions and pictures Added External Alarm programming instructions Changed Rack Mount to Rackmount Included link to latest programming guide
2	August 2020	D. Shefer	Updated DVR-LX Specification Sheet Update for O2 Control Head installation

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Related Publications

Publication Number	Description
8M083X25R18	DVRS Vehicle Mount Installation & Programming Guide (Found on Futurecom's Website)
8A093X01R1	DVR/VRX1000 User Guide (Found on Futurecom's Website)

Foreword

This manual provides installation guidelines for mounting Motorola's Remote Mount APX Mobile Radio and O2 Control Head, inside Futurecom's Rackmount DVRS.

Terminology Used

Abbreviation	Description
Control Head	Motorola Mobile Radio Control Head – O2
DVRS	Digital Vehicular Repeater System
MSU	Motorola Mobile Subscriber Unit
Rackmount DVRS	Complete DVRS and Mobile Radio System, packaged in a 19" rackmount tray

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(iii) Defects or damage due to alterations, modifications or adjustments carried out by the Buyer without Futurecom's explicit approval.

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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 general population, consumer or any other use.

ATTENTION!

Changes or modifications not expressly approved by Futurecom Systems Group, ULC. could void the User's authority to operate the equipment.

Temporary-Fixed Site

Futurecom requires the P25 19" 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" Rackmount DVRS is set up in an vehicle, Users should refer to the separation distances specified in the "RF Safety" Book 8F083X03 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 MPE limits are observed at all times during transmissions.

ATTENTION!

Refer to Product Safety and RF Energy Exposure Booklet 8F083X03 for basic fixed site installation guidance, and for use in a vehicular application.

Introduction

The Digital Vehicular Repeater System (DVRS) is typically mounted inside the trunk of a car and powered from the car's battery. Some applications other than vehicular use require added flexibility, which can be achieved with the use of a Rackmount DVRS which is designed to fit into a standard 19" rack.

Note: - Product Safety and RF Energy Exposure Booklet 8F083X03 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" rack tray as shown on Figure 1 below.

The Rackmount DVRS can be powered up by connecting it directly to +13.8 V DC Power Supply.

10 1/2" x 19" x 15 3/4"

Figure 1 - Rackmount DVRS Form Factor

Rackmount DVRS Installation

Installation Tools Required

Description	Needed for:
#2 Philips	Tightening of screws.
3/16” Flat Screwdriver	Tightening of connector screws.

Installation Guidelines

STEP 1

Unpack the Rackmount DVRS and note the location of the mounting screws for the MSU Control Head and Microphone clip as shown on Figure 2 and Figure 3.
The MSU components mounted in the tray are shown in Figure 4.

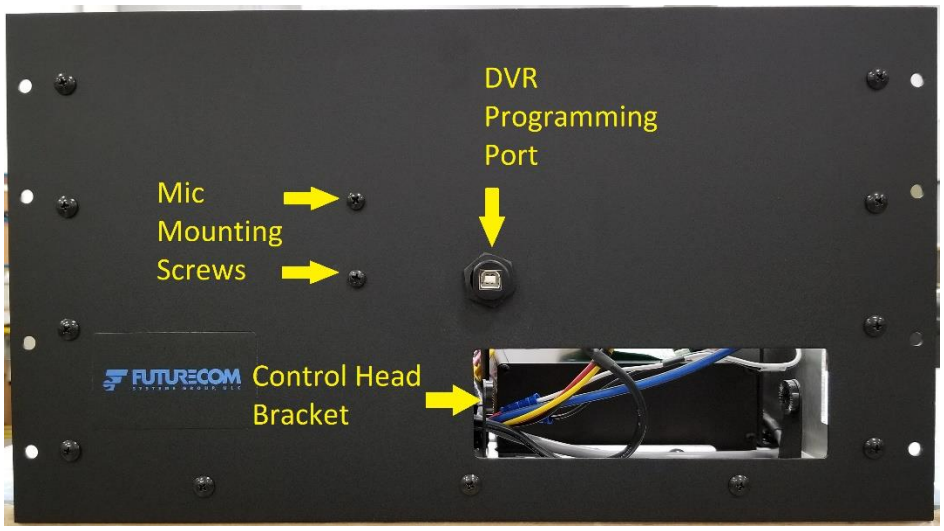

Figure 2 - Rackmount DVRS - As Received (front view)

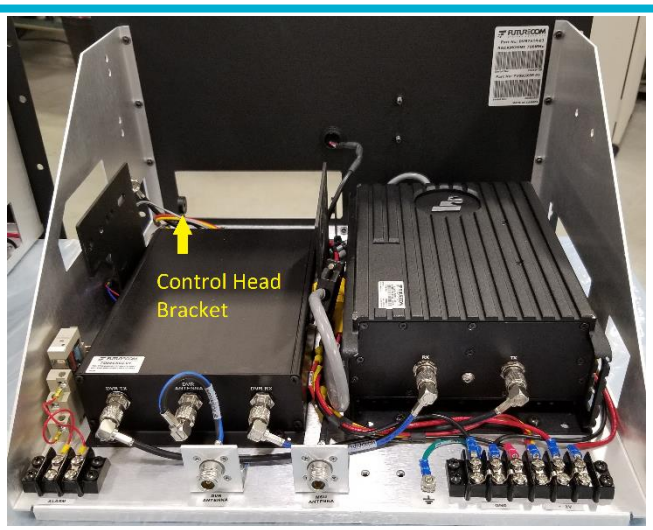

Figure 3 - Rackmount DVRS - As Received (rear view)

Figure 4 - MSU parts to be installed in the tray

(The Microphone is installed on the front panel)

STEP 2:

Connect the DC and the control cable to the Control Head as shown in Figure 5. Install the Control Head in the Control Head Bracket as shown in Figure 6.

Figure 5 - Control head connections

Figure 6 - Control head installation

STEP 3

Locate and remove the Microphone clip mounting screws. Attach the microphone clip as per and .

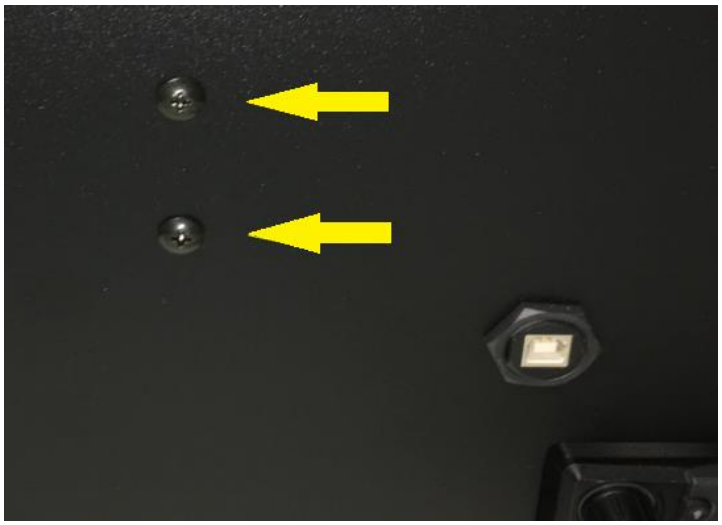

Figure 7 - Location of the microphone clip mounting screws

Figure 8 - Installation of the microphone clip

STEP 4

Connect the MSU DC power cable and the antenna cable as per . Install the MSU in the MSU bracket, see for the detail of the mounting screws location. Connect the Control Head cable and the DVR cable as per .

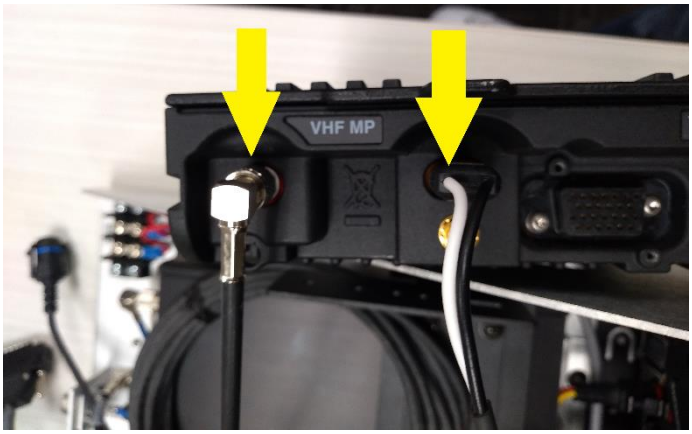

Figure 9 - DC and RF cable connections

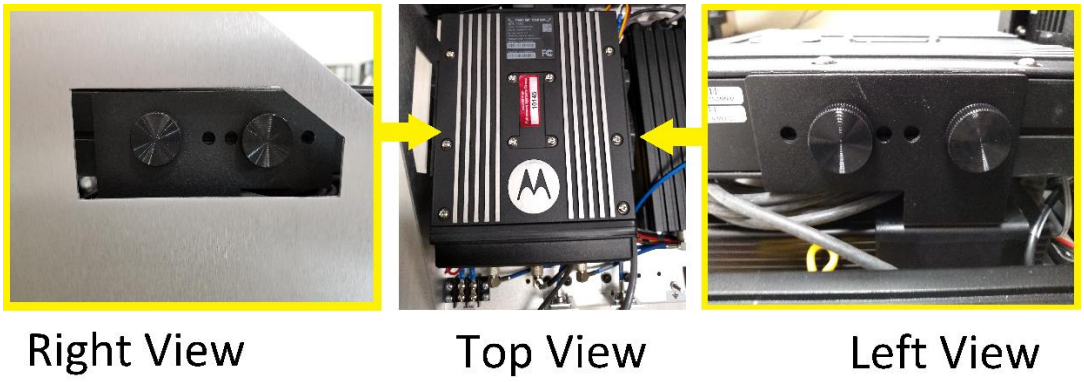

Figure 10 - Installation of the MSU – step 1

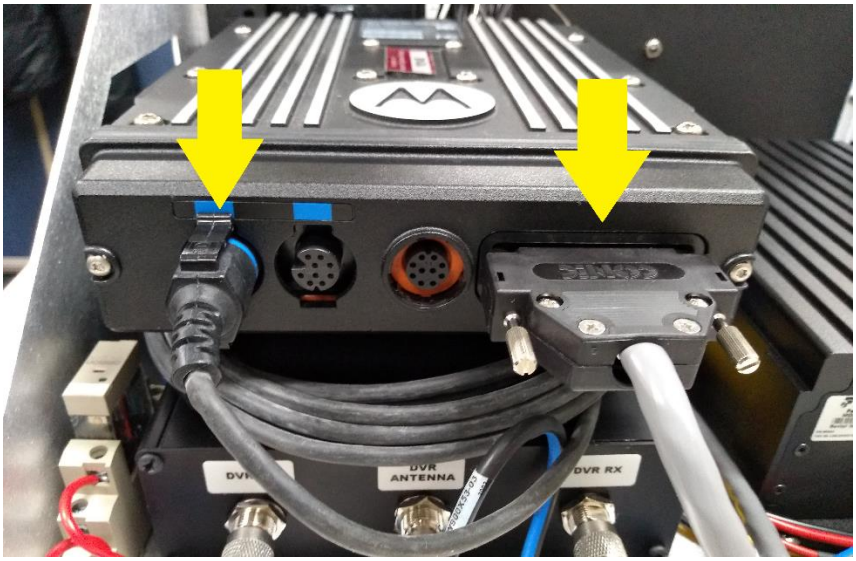

Figure 11 - Installation of the MSU – step 2

STEP 5

Install the tray in the 19” rack. Connect the DC power supply to the Terminal Strip as per Figure 12Connect the MSU Antenna cable, and the DVR Antenna cable, see Figure 13
.

Figure 12 - DC Power connections

Connect the MSU Antenna cable, and the DVR Antenna cable, see Figure 13

Figure 13 - MSU (System) and DVR (Local) Antenna connector location

STEP 6

Program the MSU, DVR-LX and portables for DVRS operation.

- 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.
- Ensure the templates are fully matched by following the guidelines provided in the DVRS Programming Guide 8M083X25R18.
- The **DVR Tx Power shall be set to 32.5 dBm** to provide the correct input signal level to the 50 W Power Amplifier.

NOTE: DVR Tx Power should not be set to more than 33dBm / 2 Watts. Programming higher power levels may result in the Power Amplifier damage.

IMPORTANT! When programming the DVRS frequencies, ensure they match the DVRS filtering frequencies. To check the tuned frequency setting of the DVRS duplexer, please refer to the DVRS labels located on the tray.

STEP 7

Install the MSU Microphone – .

Figure 14 - Front panel fully assembled

This concludes the installation of the Rackmount DVRS.

External Alarm Option Programming Instructions

If the optional external alarm is installed in the Rackmount, it can be programmed with Futurecom Repeater Configurator (FRC) to trigger when specified repeater temperature or power output thresholds are crossed.

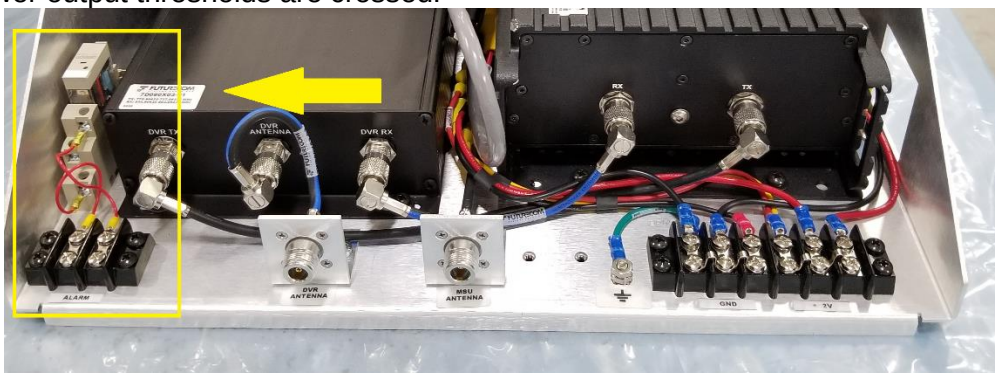

Figure 15 - Optional external alarm hardware location

Note: By default, the alarm's circuit is closed, when the alarm is triggered the circuit opens.

STEP 1

Connect the repeater programming USB cable to the Rackmount and launch Futurecom Repeater Configurator (FRC) Software on a connected PC.

STEP 2

Load data from APX repeater and navigate to the 'Hardware Setup' window - .

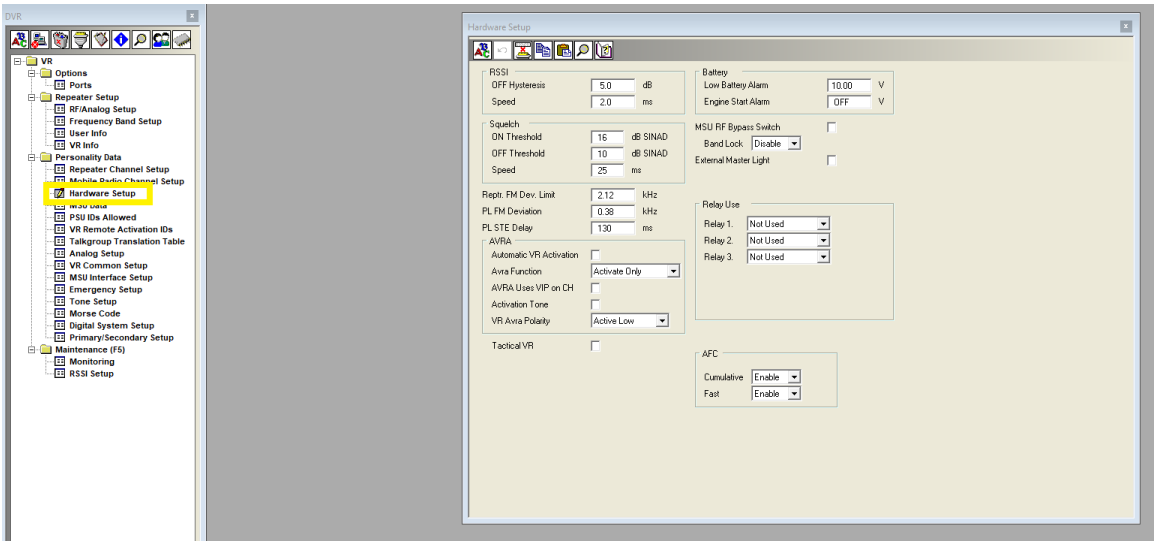

Figure 16 - Hardware Setup window

STEP 3

In the ‘Relay Use’ section, set ‘Relay 3’ to ‘External Alarm’ -

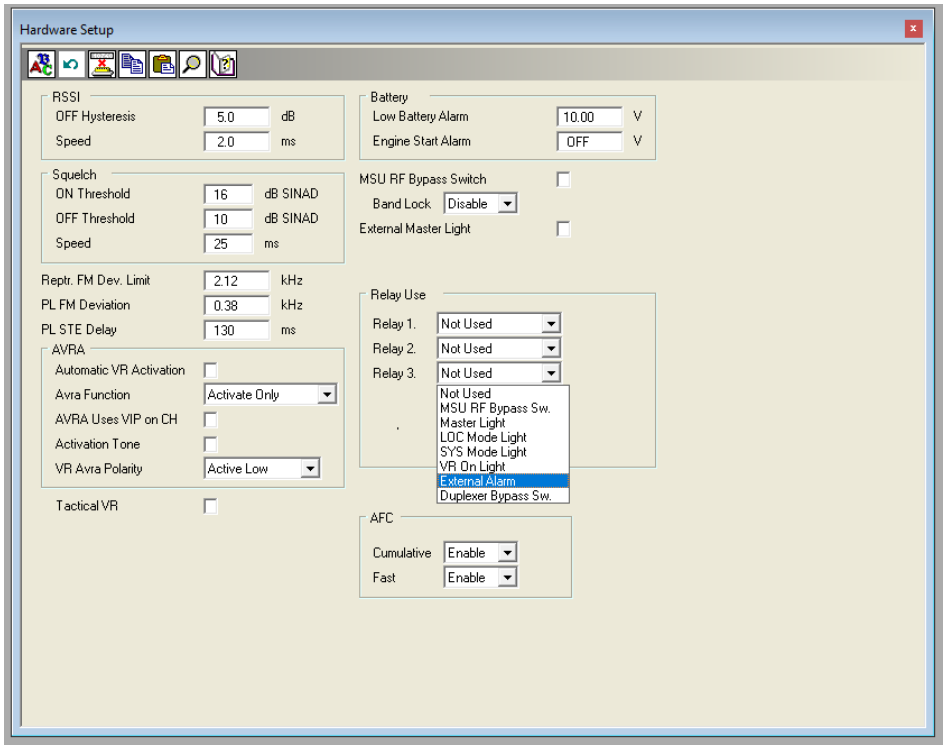

Figure 17 - Relay Use options

STEP 4

Set ‘Temperature Alarm’ and ‘Output Power Alarm’ to desired values - 8.

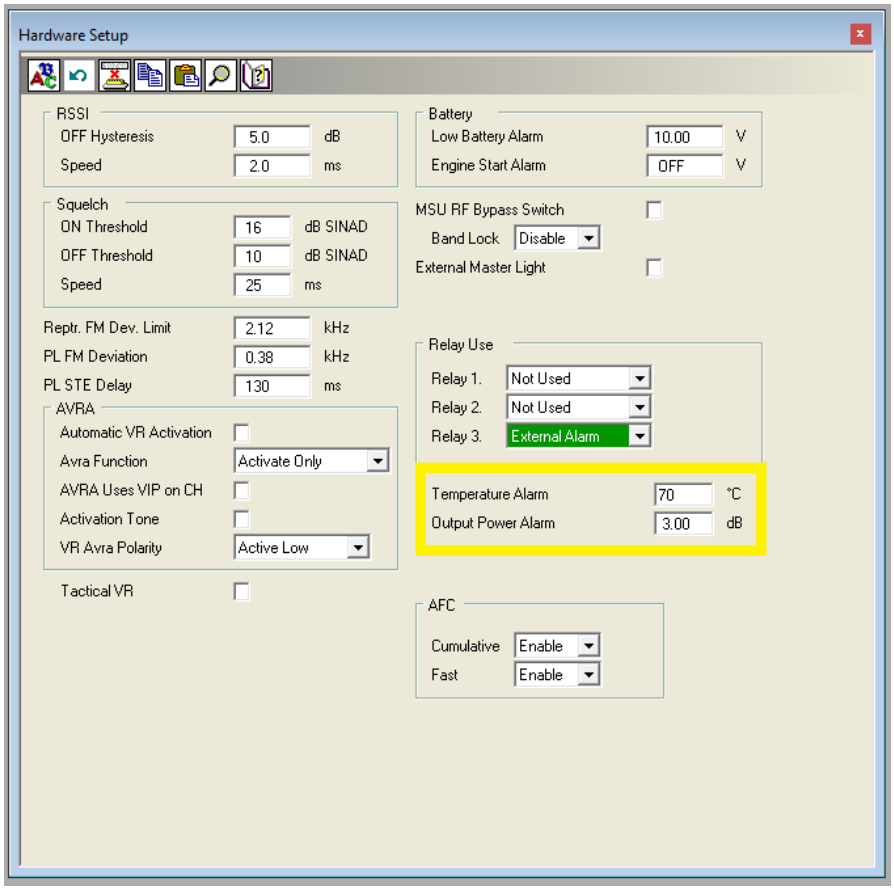

Figure 18 - Alarm threshold values

STEP 5

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

Rackmount DVRS Antenna Requirements

Any DVRS Model requires the use of two or three antennas – one or two connected to the Mobile Radio and one 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 30dB 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 30dB isolation, ensure RF exposure separation distance is maintained. Refer to the RF Energy Exposure Compliance, Awareness and Control Information and Operational Instructions section of this document.

Appendix 1 – DVR-LX P25 Rackmount Repeater Specifications

General Specifications			
Dimensions: Height / Width / Depth			
Low-Profile	10 1/2” x 19” x 15 3/4”		
High-Profile	17 1/2” x 19” x 15 3/4”		
Approximate Weight			
Low-Profile	26 lbs		
High-Profile	43 lbs		
Channel Spacing	12.5 or 25 kHz programmable		
Number of Channels	192		
CTCSS/DCS	Programmable per Channel		
Power Supply	13.8V DC +/- 20%		
DC Current Drain			
Standby/Receive	1.9A		
Transmit (without Power Amplifier)	14.5 A		
Transmit (with 50W Power Amplifier)	25 A		
Operating Temperature	-30ºC to +60ºC		
Antenna Impedance	50 Ohms		
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 L06-DVRSVHF	380-406 MHz 406.1-512 MHz L06-DVRSUHF	806-824 MHz 851-869 MHz L06-DVRS800
Industry Canada	138-174 MHz 2098B-DVRSVHF	406.1-430 MHz 450-470 MHz 2098B-DVRSUHF	806-824 MHz 851-869 MHz 2098B-DVRS800

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

Receiver Specification	VHF	UHF	800
Frequency Band [MHz]	136-174	380-430 450-470 470-512	806-824
Receiver Sensitivity (simplex/duplex)	-115 dBm		
Frequency Stability (-30 °C to +60 °C; +25 °C Ref.)	± 1.5ppm		
Selectivity 12.5 / 25 kHz	-60 dB / -75 dB		

Intermodulation	**-70 dB**
Deviation 12.5 / 25 kHz	**± 2.5 kHz / ± 5 kHz**
FM Hum and Noise 12.5 / 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 / octave de-emphasis characteristic over 300 Hz – 3 kHz**
Audio Distortion	**<2%**

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