

Product Safety and RF Energy Exposure Booklet for Digital Vehicular Repeater Systems (DVRS)

ATTENTION!

Before using this equipment, please read this booklet which contains important operating instructions for safe usage, RF energy control and compliance with exposure limits.

8F083X03 Rev. 4.21.2



RF Exposure

ATTENTION!

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

ATTENTION!

This radio 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.

If this vehicular repeater is used in combination with a separate mobile radio transmitter, it is the responsibility of the Repeater Operator to ensure that Maximum Permissible Exposure (MPE) limits are observed at all times during repeater transmissions. The Repeater operator must ensure at all times that no person comes within the MPE distance from the vehicle body to ensure compliance with the FCC's RF energy exposure limits for the general population.

The minimum lateral distance between all possible personnel and the body of the DVRS equipped vehicle must be as specified in **Table 1** (Stand-alone DVR) and **Table 2** (DVR interfaced to a Mobile Radio i.e. DVRS).

Failure to observe the MPE distance exclusion area around the antenna may expose persons within this area to RF energy above the FCC exposure limit for bystanders (general population).

Stand Alone DVR (20W)	Recommended Lateral Distance from Antenna
VHF	82cm (up to 50% Tx duty cycle)
UHF 380-512MHz	75cm (up to 50% Tx duty cycle)
700MHz	73cm (up to 100% Tx duty cycle)
800MHz	76cm (up to 100% Tx duty cycle)

Table 1 Recommended Lateral Distance - Stand Alone DVR

NOTE:

50% Tx duty cycle is defined as Push To Talk (PTT), 50% Talk - 50% Listen.

100% Tx duty cycle is defined as Push To Talk (PTT), 100% Talk.

Mobile Radio Rated Power (up to 50% Tx duty cycle)	Recommended Lateral Distance from Vehicle Body
DVRS with <7 Watt Mobile Radio	20 cm
DVRS with 7 to 15 Watt Mobile Radio	30 cm
DVRS with 16 to 39 Watt Mobile Radio	60 cm
DVRS with 40 to 100 Watt Mobile Radio	90 cm

Table 2 Recommended Lateral Distance – DVRS (DVR interfaced to a Mobile Radio)

IMPORTANT

The maximum allowed gain of the $\lambda/4$ omni-directional antenna for the Mobexcom P25 DVR Repeater is Unity (0dBd).

RF Exposure Label



The RF Exposure Label should be affixed in the vehicle beside the mobile radio control head. The label should be in the direct view of the Repeater operator. The label is supplied with the Mobexcom P25 DVR Repeater.

FCC Label

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:

- 1) This device may not cause harmful interference, and
- 2) This device must accept any interference received, including interference that may cause undesired operation.

Installation Requirements for Compliance with Radio Frequency (RF) Energy Exposure Safety Standards

ATTENTION!

To ensure compliance with RF Energy Safety Standards:

- Install only Futurecom / Motorola approved antennas and accessories and set conducted power into the DVR and Mobile antennas equal to or lower than the approved power levels – refer to **Table 3** (Stand Alone DVR) or **Table 4** (DVR interfaced to a Mobile Radio i.e. DVRS).
- Ensure the antenna installation is consistent with the DVR Antenna Installation instructions described in this document as well as with the Mobile Radio Antenna Installation Instructions published in the applicable Motorola Installation Manual.
- Ensure the **Product & RF Safety Booklets** enclosed with the Mobile Radio and the DVR are available to the end user upon completion of the installation.

ANTENNA				STAND ALONE DVR MODEL					
#	Kit #	Freq. Range [MHz]	Type	700 MHz (20W) (up to 100% Tx duty cycle)	800 MHz (20W) (up to 100% Tx duty cycle)	403-430 (20W) (up to 50% Tx duty cycle)	450-470 (20W) (up to 50% Tx duty cycle)	470-512 (20W) (up to 50% Tx duty cycle)	VHF (20W) (up to 50% Tx duty cycle)
1	*HAF4016	764-870	¼ wave	20W	20W				
2	HAE6012A	380-433	¼ wave			20W			
3	HAE4003A	450-470	¼ wave				20W		
4	HAE4004	470-512	¼ wave					20W	
5	HAD4006	136-144	¼ wave						20W
6	HAD4007	144-150.8	¼ wave						20W
7	HAD4008	150.8-162	¼ wave						20W
8	HAD4009	162-174	¼ wave						20W

Table 3 Approved Stand-Alone DVR Combinations

NOTE:

Mobile RF conducted antenna power in the tables below denotes up to 50% Tx duty cycle.
 DVR RF conducted antenna power in the tables below denotes up to 100% Tx duty cycle.

DVR: 7V083X06 (DQPMDDVR8000P) Freq Range: 806-825, 851-870MHz, Trunk Mounted Antenna: HAF4016A, 1/4 wave, 0dBd
 FCC ID: LO6-DVRS800 Maximum conducted power delivered to antenna: DVR (W) / Mobile (W)

Mobile	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3806 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 10W / 57W	HAD4008A, 1/4 wave, 0dBd 10W / 57W	HAD4009A, 1/4 wave, 0dBd 10W / 57W			
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3808 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 10W / 57W	HAD4008A, 1/4 wave, 0dBd 10W / 57W	HAD4009A, 1/4 wave, 0dBd 10W / 57W			
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4870 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd 10W / 120W	HAE6013A, 1/2 wave, 2dBd 10W / 120W	HAE4003A, 1/4 wave, 0dBd 10W / 120W	HAE4011A, 1/2 wave, 3.5dBd 10W / 120W		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4862 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd 10W / 48W	HAE6013A, 1/2 wave, 2dBd 10W / 48W	HAE4003A, 1/4 wave, 0dBd 10W / 48W	HAE4011A, 1/2 wave, 3.5dBd 10W / 48W		
XTL5000 UHF R2(450-512MHz) FCC ID: AZ492FT4867 Max Power: DVR / Mobile	HAE6016A, 1/4 wave, 0dBd 10W / 54W	HAE4003A, 1/4 wave, 0dBd 10W / 54W	HAE4011A, 1/2 wave, 3.5dBd 10W / 54W	HAE4012A, 1/4 wave, 3.5dBd 10W / 54W	HAE4013A, 1/4 wave, 3.5dBd 10W / 54W	HAE4004A, 1/4 wave, 0dBd 10W / 54W
XTL5000 700/800MHz FCC ID: AZ492FT5823 Max Power: DVR / Mobile	HAF4013A, 1/4 wave, 3dBd 10W / 42W	HAF4014A, 1/4 wave, 3dBd 10W / 42W	HAF4016A, 1/4 wave, 0dBd 10W / 42W	HAF4017A, 1/4 wave, 3dBd 10W / 42W		

Table 4A Approved 800 DVRS Configurations

DVR: 7V083X05 (DQPMDDVR7000P) Freq Range: 764-776, 794-806MHz, Trunk Mounted Antenna: HAF4016A, 1/4 wave, 0dBd
 FCC ID: LO6-DVRS700 Maximum conducted power delivered to antenna: DVR (W) / Mobile (W)

Mobile	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3806 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 5W / 57W	HAD4008A, 1/4 wave, 0dBd 5W / 57W	HAD4009A, 1/4 wave, 0dBd 5W / 57W			
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3808 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 5W / 57W	HAD4008A, 1/4 wave, 0dBd 5W / 57W	HAD4009A, 1/4 wave, 0dBd 5W / 57W	RAD4010A, 1/2 wave, 3dBd 20W / 120W *		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4870 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd 5W / 120W	HAE6013A, 1/2 wave, 2dBd 5W / 120W	HAE4003A, 1/4 wave, 0dBd 5W / 120W	HAE4011A, 1/2 wave, 3.5dBd 5W / 120W		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4862 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd 5W / 48W	HAE6013A, 1/2 wave, 2dBd 5W / 48W	HAE4003A, 1/4 wave, 0dBd 5W / 48W	HAE4011A, 1/2 wave, 3.5dBd 5W / 48W		
XTL5000 UHF R2(450-512MHz) FCC ID: AZ492FT4867 Max Power: DVR / Mobile	HAE6016A, 1/4 wave, 0dBd 5W / 54W	HAE4003A, 1/4 wave, 0dBd 5W / 54W	HAE4011A, 1/2 wave, 3.5dBd 5W / 54W	HAE4012A, 1/4 wave, 3.5dBd 5W / 54W	HAE4013A, 1/4 wave, 3.5dBd 5W / 54W	HAE4004A, 1/4 wave, 0dBd 5W / 57W
XTL5000 700/800MHz FCC ID: AZ492FT5823 Max Power: DVR / Mobile	HAF4013A, 1/4 wave, 3dBd 5W / 42W	HAF4014A, 1/4 wave, 3dBd 5W / 42W	HAF4016A, 1/4 wave, 0dBd 5W / 42W	HAF4017A, 1/4 wave, 3dBd 5W / 42W		

Table 4B Approved 700 DVRS Configurations

DVR: 7V083X04 (DQPMVDVR6000P) Freq Range: 470-512MHz, Trunk Mounted Antenna: HAE4004A, 1/4 wave, 0dBd, HAE6016A, 1/4 wave, 0dBd
 FCC ID: LO6-DVRSUHF Maximum conducted power delivered to antenna: DVR (W) / Mobile (W)

Mobile	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3806	HAD4007A, 1/4 wave, 0dBd	HAD4008A, 1/4 wave, 0dBd	HAD4009A, 1/4 wave, 0dBd			
Max Power: DVR / Mobile	10W / 57W	10W / 57W	10W / 57W			
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3808	HAD4007A, 1/4 wave, 0dBd	HAD4008A, 1/4 wave, 0dBd	HAD4009A, 1/4 wave, 0dBd			
Max Power: DVR / Mobile	10W / 57W	10W / 57W	10W / 57W			
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4870	HAE6012A, 1/4 wave, 0dBd	HAE6013A, 1/2 wave, 2dBd	HAE4003A, 1/4 wave, 0dBd	HAE4011A, 1/2 wave, 3.5dBd		
Max Power: DVR / Mobile	10W / 120W	10W / 120W	10W / 120W	10W / 120W		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4862	HAE6012A, 1/4 wave, 0dBd	HAE6013A, 1/2 wave, 2dBd	HAE4003A, 1/4 wave, 0dBd	HAE4011A, 1/2 wave, 3.5dBd		
Max Power: DVR / Mobile	10W / 48W	10W / 48W	10W / 48W	10W / 48W		
XTL5000 UHF R2(450-512MHz) FCC ID: AZ492FT4867	HAE6016A, 1/4 wave, 0dBd	HAE4003A, 1/4 wave, 0dBd	HAE4011A, 1/2 wave, 3.5dBd	HAE4012A, 1/4 wave, 3.5dBd	HAE4013A, 1/4 wave, 3.5dBd	HAE4004A, 1/4 wave, 0dBd
Max Power: DVR / Mobile	10W / 54W	10W / 54W	10W / 54W	10W / 54W	10W / 54W	10W / 54W
XTL5000 700/800MHz FCC ID: AZ492FT5823	HAF4013A, 1/4 wave, 3dBd	HAF4014A, 1/4 wave, 3dBd	HAF4016A, 1/4 wave, 0dBd	HAF4017A, 1/4 wave, 3dBd		
Max Power: DVR / Mobile	10W / 42W	10W / 42W	10W / 42W	10W / 42W		

Table 4C Approved 470-512MHz DVRS Configurations

DVR: 7V083X03 (DQPMVDVR5000P) Freq Range: 450-470MHz, Trunk Mounted Antenna: HAE4003A, 1/4 wave, 0dBd, HAE6016A, 1/4 wave, 0dBd
 FCC ID: LO6-DVRSUHF Maximum conducted power delivered to antenna: DVR (W) / Mobile (W)

Mobile	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3806	HAD4007A, 1/4 wave, 0dBd	HAD4008A, 1/4 wave, 0dBd	HAD4009A, 1/4 wave, 0dBd			
Max Power: DVR / Mobile	10W / 57W	10W / 57W	10W / 57W			
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3808	HAD4007A, 1/4 wave, 0dBd	HAD4008A, 1/4 wave, 0dBd	HAD4009A, 1/4 wave, 0dBd			
Max Power: DVR / Mobile	10W / 57W	10W / 57W	10W / 57W			
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4870	HAE6012A, 1/4 wave, 0dBd	HAE6013A, 1/2 wave, 2dBd	HAE4003A, 1/4 wave, 0dBd	HAE4011A, 1/2 wave, 3.5dBd		
Max Power: DVR / Mobile	10W / 120W	10W / 120W	10W / 120W	10W / 120W		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4862	HAE6012A, 1/4 wave, 0dBd	HAE6013A, 1/2 wave, 2dBd	HAE4003A, 1/4 wave, 0dBd	HAE4011A, 1/2 wave, 3.5dBd		
Max Power: DVR / Mobile	10W / 48W	10W / 48W	10W / 48W	10W / 48W		
XTL5000 UHF R2(450-512MHz) FCC ID: AZ492FT4867	HAE6016A, 1/4 wave, 0dBd	HAE4003A, 1/4 wave, 0dBd	HAE4011A, 1/2 wave, 3.5dBd	HAE4012A, 1/4 wave, 3.5dBd	HAE4013A, 1/4 wave, 3.5dBd	HAE4004A, 1/4 wave, 0dBd
Max Power: DVR / Mobile	10W / 54W	10W / 54W	10W / 54W	10W / 54W	10W / 54W	10W / 54W
XTL5000 700/800MHz FCC ID: AZ492FT5823	HAF4013A, 1/4 wave, 3dBd	HAF4014A, 1/4 wave, 3dBd	HAF4016A, 1/4 wave, 0dBd	HAF4017A, 1/4 wave, 3dBd		
Max Power: DVR / Mobile	10W / 42W	10W / 42W	10W / 42W	10W / 42W		

Table 4D Approved 450-470MHz DVRS Configurations

DVR: 7V083X07 (DQPM DVR4000P) Freq Range: 380-430MHz, Trunk Mounted Antenna: HAE6012A, 1/4 wave, 0dBd
 FCC ID: LO6-DVRSUHF Maximum conducted power delivered to antenna: DVR (W) / Mobile (W)

Mobile	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3806 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 10W / 57W	HAD4008A, 1/4 wave, 0dBd 10W / 57W	HAD4009A, 1/4 wave, 0dBd 10W / 57W			
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3808 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 10W / 57W	HAD4008A, 1/4 wave, 0dBd 10W / 57W	HAD4009A, 1/4 wave, 0dBd 10W / 57W			
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4870 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd 10W / 120W	HAE6013A, 1/2 wave, 2dBd 10W / 120W	HAE4003A, 1/4 wave, 0dBd 10W / 120W	HAE4011A, 1/2 wave, 3.5dBd 10W / 120W		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4862 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd 10W / 48W	HAE6013A, 1/2 wave, 2dBd 10W / 48W	HAE4003A, 1/4 wave, 0dBd 10W / 48W	HAE4011A, 1/2 wave, 3.5dBd 10W / 48W		
XTL5000 UHF R2(450-512MHz) FCC ID: AZ492FT4867 Max Power: DVR / Mobile	HAE6016A, 1/4 wave, 0dBd 10W / 54W	HAE4003A, 1/4 wave, 0dBd 10W / 54W	HAE4011A, 1/2 wave, 3.5dBd 10W / 54W	HAE4012A, 1/4 wave, 3.5dBd 10W / 54W	HAE4013A, 1/4 wave, 3.5dBd 10W / 54W	HAE4004A, 1/4 wave, 0dBd 10W / 54W
XTL5000 700/800MHz FCC ID: AZ492FT5823 Max Power: DVR / Mobile	HAF4013A, 1/4 wave, 3dBd 10W / 42W	HAF4014A, 1/4 wave, 3dBd 10W / 42W	HAF4016A, 1/4 wave, 0dBd 10W / 42W	HAF4017A, 1/4 wave, 3dBd 10W / 42W		

Table 4E Approved 380-430MHz DVRS Configurations

DVR: 7V083X01 (DQPM DVR3000P) Freq Range: 136-174MHz, Trunk Mounted Antenna: HAD4006A, 1/4 wave, 0dBd, HAD4007A, 1/4 wave, 0dBd, HAD4008A, 1/4 wave, 0dBd, HAD4009A, 1/4 wave, 0dBd
 FCC ID: LO6-DVRSVHF Maximum conducted power delivered to antenna: DVR (W) / Mobile (W)

Mobile	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna	Roof Mounted Antenna
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3806 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 6W / 57W	HAD4008A, 1/4 wave, 0dBd 6W / 57W	HAD4009A, 1/4 wave, 0dBd 6W / 57W			
XTL5000 VHF (147-174MHz) FCC ID: AZ492FT3808 Max Power: DVR / Mobile	HAD4007A, 1/4 wave, 0dBd 6W / 57W	HAD4008A, 1/4 wave, 0dBd 6W / 57W	HAD4009A, 1/4 wave, 0dBd 6W / 57W			
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4870 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd Future approval	HAE6013A, 1/2 wave, 2dBd Future approval	HAE4003A, 1/4 wave, 0dBd Future approval	HAE4011A, 1/2 wave, 3.5dBd Future approval		
XTL5000 UHF R1(380-470MHz) FCC ID: AZ492FT4862 Max Power: DVR / Mobile	HAE6012A, 1/4 wave, 0dBd Future approval	HAE6013A, 1/2 wave, 2dBd Future approval	HAE4003A, 1/4 wave, 0dBd Future approval	HAE4011A, 1/2 wave, 3.5dBd Future approval		
XTL5000 UHF R2(450-512MHz) FCC ID: AZ492FT4867 Max Power: DVR / Mobile	HAE6016A, 1/4 wave, 0dBd Future approval	HAE4003A, 1/4 wave, 0dBd Future approval	HAE4011A, 1/2 wave, 3.5dBd Future approval	HAE4012A, 1/4 wave, 3.5dBd Future approval	HAE4013A, 1/4 wave, 3.5dBd Future approval	HAE4004A, 1/4 wave, 0dBd Future approval
XTL5000 700/800MHz FCC ID: AZ492FT5823 Max Power: DVR / Mobile	HAF4013A, 1/4 wave, 3dBd Future approval	HAF4014A, 1/4 wave, 3dBd Future approval	HAF4016A, 1/4 wave, 0dBd Future approval	HAF4017A, 1/4 wave, 3dBd Future approval		

Table 4F Approved 136-174MHz DVRS Configurations

Antenna Installation Instructions

IMPORTANT

To assure optimum performance and compliance with RF Energy Safety standards, these antenna installation guidelines and instructions are limited to metal-body vehicles with appropriate ground planes and take into account the potential exposure of back seat passengers and bystanders outside the vehicle.

Selecting an Antenna Site/Location on a Metal Body Vehicle

External installation

Check the requirements of the antenna supplier and install the vehicle antenna external to a metal body vehicle in accordance with those requirements.

Roof top

For optimum performance and compliance with RF Energy Safety standards, mount the mobile radio antenna in the center area of the roof.

Trunk lid

For optimum performance and compliance with RF Energy Safety standards, mount the DVRS antenna in the center area of the trunk.

Before installing an antenna on the trunk lid:

- Ensure that the distance from the antenna location on the trunk lid will be at least 85 cm (33 inches) from the front surface of the rear seat-back to assure compliance with RF Energy Safety standards.
- Ensure that the trunk lid is grounded by connecting grounding straps between the trunk lid and the vehicle chassis.
- Ensure that the antenna cable can be easily routed to the radio. Route the antenna cable as far away as possible from any vehicle electronic control units and associated wiring.
- Check the antenna location for any electrical interference.
- Ensure that any other mobile radio antenna on this vehicle is at least 1ft (30.48cm) away from the DVR and its associated mobile radio antennas.

NOTE:

Any two metal pieces rubbing against each other (such as seat springs, shift levers, trunk and hood lids, exhaust pipes etc.) in close proximity to the antenna can cause severe receiver interference.

Mobile Radio / DVR Antenna separation

To ensure interference-free performance when both the Mobile Radio and the DVR are active, the two antennas must be mounted in such way as to provide 30dB minimum antenna isolation.