



Futurecom Systems Group, ULC

VR Programming Guide

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NOTES

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Manual Revisions

Rev #	Date	Notes & References
0	October 2020	Original Release
1	February 2021	Update for SR2021.1
2	July 2021	Update for SR2021.2
3	August 2021	Update for SR2021.3
4	November 2021	Update for SR2021.4
5	August 2022	Update for SR2022.2
5.01	October 2022	CPS – MSU/PSU Programming for TPS Signaling
6	December 2022	Update for SR2022.3
6.1	March 2023	Update for SR2023.1
6.2	August 2023	Update for SR2023.2

Foreword

Futurecom Vehicular Repeater (VR) is designed to be seamlessly interfaced to:

Remote Mount APX Series Mobile Subscriber Unit (MSU) with or without control head

When the VR is interfaced to a Remote Mount Motorola APX Mobile Radio, the complete equipment package is referred to as Digital Vehicular Repeater System (DVRS).

For compatibility requirements for Mobile and Portable radios refer to [Futurecom website → Support → Documentation and Software → DVR-LX → Firmware → Compatibility Charts](#)

For details on the APX series Mobile or Portable Radios operation, please refer to the applicable Manuals available from Motorola.

For details on how to operate a VR, please refer to the Vehicular Repeater (VR) User's Guide Template available on [Futurecom website → Support → Documentation and Software → DVR-LX → User Guide](#)

Futurecom Repeater Configurator (FRC) contains three main components to service all hardware programming needs:

1. Configurator for APX Repeaters (VRX1000, DVR and DVR-LX®)
2. Configurator for PDR8000®
3. Flash Downloader Utility

This is used to update the firmware of the repeater. In the past the user had to download it separately from the Futurecom website, integrating into FRC makes it more of an all-in-one utility and adds a layer of convenience.

FRC is backwards compatible with all VR firmware versions. It supports reading all previously configured devices. It is continually updated with business rules to ensure integrity of VR configuration.

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The Futurecom Repeater Configurator provided by Futurecom Systems Group ULC includes the following Publicly Available Software.

Publicly Available Software List

Name: MFC Grid Control

Version: 2.24

Modified: Yes

Software Site: <http://www.codeproject.com/KB/miscctrl/gridctrl.aspx>

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

Important Safety Information

The DVRS Repeater is intended for use in occupational / controlled conditions, where users have full knowledge of the operator exposure and can exercise control over the operator exposure to meet FCC/ISED limits. This radio is NOT authorized for general population, consumer, or any other use.

Notice to Users (FCC/ISED)

To satisfy FCC/ISED RF exposure requirements for mobile transmitting devices, refer to the RF Safety Booklet^[1] for TX – RX duty cycle and a separation distance between the antenna of this device and persons during operation. To ensure compliance, operations at closer than this distance is not allowed.

Futurecom requires the P25 DVRS operator to ensure FCC/ISED Requirements for Radio Frequency Exposure are met. The minimum distance between all possible personnel and the body of the DVRS equipped vehicle is specified in the RF Safety Booklet^[2]. Failure to observe the Maximum Permissible Exposure (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).

It is the responsibility of the repeater operator to ensure that MPR limits are always observed during repeater transmissions. The repeater operator must always ensure that no person comes within MPE distance from the antenna.

^[1] Refer to RF Safety Booklet available on the Futurecom website.

^[2] Refer to RF Safety Booklet available on the Futurecom website.

Déclaration de Conformité

Cet équipement a été testé et déclaré conforme aux limites pour appareils numériques de classe A, selon la partie 15 des règlements de la FCC. Ces limites sont destinées à assurer une protection raisonnable contre les interférences nuisibles dans une installation commerciale. L'équipement génère, utilise et peut émettre de l'énergie de fréquence radio et peut causer des interférences nuisibles aux communications radio s'il n'est pas installé ou utilisé conformément au mode d'emploi. Toutefois, rien ne garantit l'absence d'interférences dans une installation particulière.

Les changements et les modifications qui n'ont pas été approuvés expressément par Futurecom Systems Group ULC pourraient faire perdre à l'utilisateur son droit à utiliser cet équipement.

Informations de Sécurité Importantes

Le répéteur DVRS est conçu pour être utilisé dans des conditions professionnelles / contrôlées, dans lesquelles les utilisateurs connaissent à fond leur exposition et peuvent exercer le contrôle nécessaire sur celle-ci pour se conformer aux limites de la FCC / ISED. Cette radio N'EST PAS autorisée pour être utilisée par le grand public, les consommateurs ou autres.

Avis Aux Utilisateurs (FCC / ISED)

Pour satisfaire les exigences de la FCC / ISED en matière d'exposition à l'énergie RF pour les transmetteurs mobiles, prière de consulter la Brochure Sécurité RF¹ pour obtenir le facteur d'utilisation transmission / réception et la distance de séparation entre l'antenne de cet appareil et les personnes pendant l'utilisation. Pour assurer la conformité, le fonctionnement à une distance moins élevée n'est pas autorisé.

Futurecom demande à l'opérateur du répéteur P25 DVRS de satisfaire aux exigences de la FCC / ISED en matière d'exposition à l'énergie RF. La distance minimale entre toutes les personnes possibles et une antenne omnidirectionnelle doit respecter les indications de la Brochure Sécurité RF. Tout manquement à respecter la zone d'exclusion autour de l'antenne définie par la distance correspondant à la limite d'exposition maximale peut exposer les personnes qui se trouvent dans ce rayon à une énergie RF supérieure à la limite d'exposition de la FCC pour les spectateurs (population générale).

C'est à l'opérateur du répéteur qu'il incombe de s'assurer que les limites d'exposition maximales sont respectées en tout temps pendant les transmissions du répéteur. L'opérateur du répéteur doit s'assurer en tout temps que personne ne s'approche de l'antenne à une distance inférieure à celle correspondant à la limite d'exposition minimale.

¹ Prière de consulter la Brochure Sécurité RF (Canada) ou la brochure Sécurité RF (États-Unis) pour les distances de séparation

VR Programming Basics

Key Terminology

A few frequently used terms throughout this programming guide.

VR	Futurecom line of Vehicular Repeaters. It applies to the following products: VRX1000, DVR and DVR-LX®.
DVRS	When a Vehicular Repeater (VR) is interfaced with an MSU, the complete equipment package is referred to as a Digital Vehicular Repeater System (DVRS).
FRC	Futurecom Repeater Configurator (FRC) Configurator application for servicing the hardware programming needs on all supported VR. It is continually updated with business rules to ensure data integrity on our VR configuration.

Installing Futurecom Repeater Configurator (FRC)

SYSTEM REQUIREMENTS	
Operating Systems	Windows 10 or Windows 11
Processor	400 MHz or higher Pentium grade processor
Peripherals	USB Port

Previous Installation

Remove any previous installations of older Tweaker / FRC versions: go to Windows Start → Settings → Apps, find the DVRS Tweaker / FRC and select the Uninstall option.

New Installation

The latest version of FRC is available on the Futurecom website:

[Home](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX](#) → [FRC Programming Software](#)

Step 1: Download and save the Futurecom Repeater Configurator (FRC) installer.

Step 2: Unzip the file (if needed).

Step 3: Double click on the APX Setup application located inside the FRC folder.

Step 4: Follow the Setup Wizard instructions to complete the installation.

Menu Bar

The top Menu Bar is a strip of menu items that, when clicked, display a dropdown menu of other options and commands.

Field	Description	Dropdown Menus (Keyboard Shortcuts in parentheses)
File	Commands for file operations, including applying, loading, saving	Templates (DCD Files) <ul style="list-style-type: none">• Apply DCD Template to Repeater• Save DCD Template• Load DCD Template Legacy Templates (DPD Files) <ul style="list-style-type: none">• Apply DPD Template to Repeater• Save DPD Template• Load DPD Template (Ctrl+F6) Futurecom Support (EPR Files) <ul style="list-style-type: none">• Save EPR Support File• Load EPR Support File (F6) Import <ul style="list-style-type: none">Motorola File Apply Rescue File to Repeater
Repeater	Commands for Repeater, including load, save, reset	Apply License File Preferences Exit
Repeater	Commands for Repeater, including load, save, reset	Load Data from Repeater (F2) Save Changes to Repeater (F4) Reset Repeater (F3) EEPROM Maintenance (Ctrl+E) Info
Application	Log information for Futurecom support purposes.	Log Windows <ul style="list-style-type: none">RS232 Log<ul style="list-style-type: none">Save, ClearApplication Log<ul style="list-style-type: none">Show, Save, Clear Clear All Data
User	For Futurecom support purposes.	Change User
Options		COM Ports (opens Ports window)
Help	Links to support documentation and compatibility charts, provides search functionality.	Help About Find (Ctrl+F) (see below) Compatibility Charts (see below)

Help Menu

'Find' functionality provides a quick way to search through FRC for a particular field. Enter a few letters of a field name, click 'FIND' and results will show all fields matching the string. Click on desired result and click GO to open that screen.

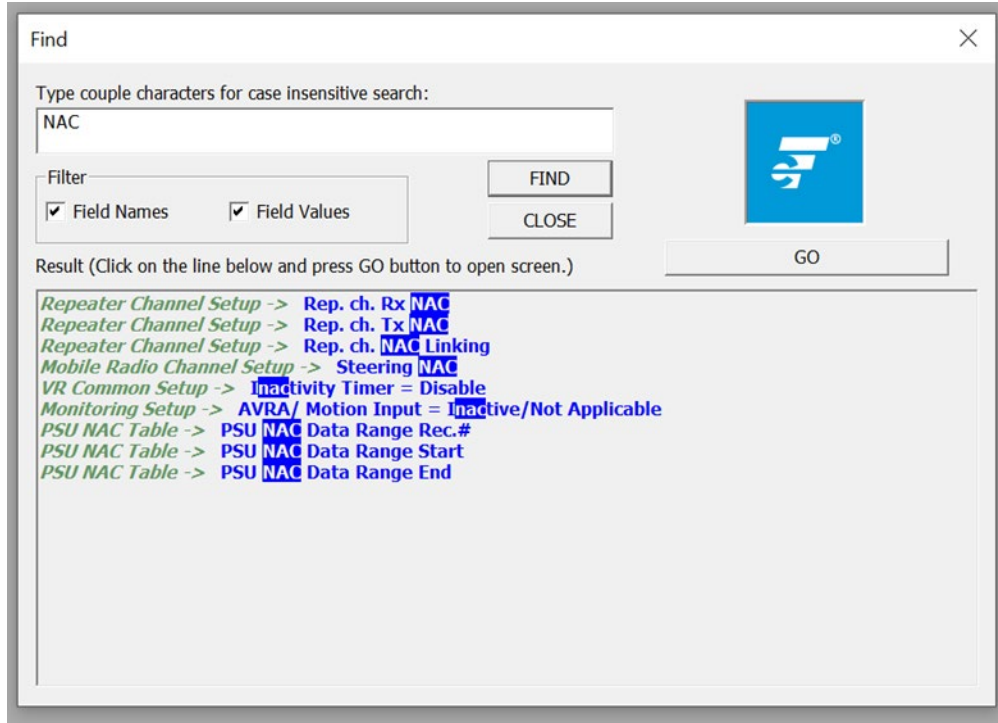


Figure 1: Help Menu - 'Find' Feature

Compatibility Charts can be accessed through the Help drop down menu. This is a static version from the Futurecom website corresponding to the specific FRC release.

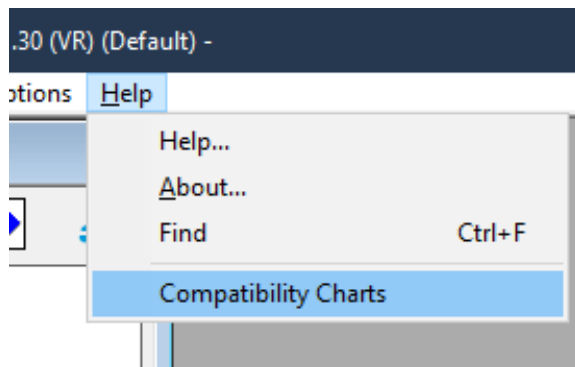


Figure 2: Help Menu - Compatibility Charts

Using FRC on-line

To use FRC on-line, the following is required:

1. FRC installed on the PC.
2. Powered up DVRS.
3. Programming cable (USB cable connected to VR).

Setting Up Communications with the VR

Ensure USB cable is plugged into PC and connected to the USB port on the VR.


Ensure VR is powered up. Note: VR may be connected to DC power but will power up only when the MSU interfaced to it is also powered up.


Reading from the VR (Uploading Data)

To read a VR unit:

1. Establish communication with the VR.
2. Select **Repeater → Load Data from Repeater** OR Press **F2**.
3. Data of the currently connected VR unit will be loaded into FRC for reviewing and/or editing.

Writing to the VR (Downloading Data)

Valid Changes: If any of the parameters within FRC are modified from its original value, the modified fields are shaded in green. In addition, the EEPROM maintenance icon flashes yellow, and when hovering over it, a message indicates EEPROM Changed. 

Invalid Changes: If any invalid changes are made, the modified fields are shaded in red. In addition, the EEPROM maintenance icon flashes red  and the configuration window(s) containing conflicting data is marked with a red exclamation mark on the FRC navigation tree. The changes cannot be written to the VR until the errors are eliminated.


After making the necessary changes to correct any programming errors, the data changes can be saved to the VR by executing any of the following:

Repeater → Save Changes to Repeater (F4)

OR

Repeater → EEPROM Maintenance (Ctrl+E) → Changes → Repeater

OR

Click on the EEPROM Maintenance Icon  → **Changes → Repeater**

Reset the repeater (after the changes are saved) to ensure the changes take effect. Resetting of the VR can be done by executing any of the following methods:

Repeater → Reset Repeater (F3)

OR

Repeater → EEPROM Maintenance (Ctrl+E) → Reset Repeater

OR

Power OFF and ON the MSU

Understanding FRC Programming Files

There are three different types of files that can be used to program a VR: an EEPROM Data file (EPR), a Device Programming Data file (DPD), or a Device Configuration Data file (DCD). These files are referred to as codeplugs and each is used for a different purpose. There are also different categories of data and not all are included in each codeplug type.

Codeplug Applications

- DCD: Used as a template for applying a common set of data to multiple VRs.
Used by Futurecom Support to review programming details and help resolve issues.
Used for sending configuration changes to VR via the Motorola Radio Management tool.
- DPD: Used as a template for applying a common set of data to multiple VRs.
Used by Futurecom Support to review programming details and help resolve issues.
- EPR: Used by Futurecom Support to help resolve issues.

Data Categories

Calibration Data: Includes all data used by Futurecom to calibrate a VR. The data is not visible to the end user.

Electronic Label Data: Includes all hardware and software information for a VR including the serial number. The data can be found in the Hardware/Software Info window under the Repeater Setup folder in the FRC navigation tree.

Personality Data: Includes all configuration windows / fields found under the Personality Data folder in FRC navigation tree.

This VR ID: Found in the VR Common Setup window under the Personality Data folder in the FRC navigation tree.

Codeplug Content

DCD: all personality data for a configuration template

DPD: all personality data for a configuration template

EPR: all the data for a specific VR: calibration, electronic label, personality and VR ID

NOTE: The electronic label data is also stored in the DPD / DCD template files however the information does not overwrite the electronic labels of a VR when applied. The electronic label data stored in a template file is associated with the VR that was used to create the template.

Codeplug Encryption

FRC provides the ability to encrypt all codeplug files. When saving a codeplug, the user is prompted to save in a default or custom encryption mode. The custom encryption mode is currently supported for EPR and DPD files.

Default Encryption Mode: Futurecom can read codeplugs as needed for customer support.

Custom Encryption Mode: User provided password customizes the encryption. Futurecom does not have the ability to read codeplugs unless password is provided for customer support.

Codeplug Summary

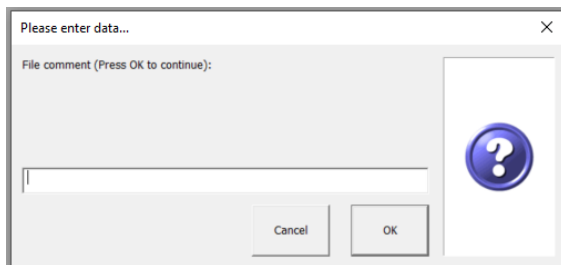
	EPR	DPD	DCD
Applications	Futurecom Support	Template for cloning multiple VRs; Futurecom Support	Template for cloning multiple VRs; Sending configuration changes to VR via Motorola Radio Management tool; Futurecom Support
Content	Calibration data, electronic label data, personality data, and VR ID	Personality data	Personality data
Default Encryption	Yes	Yes	Yes
Custom Encryption	Yes	Yes	No (future)

FRC Icons

Refer to **Appendix 3 – Icon Legend** for a description of icons used in FRC.

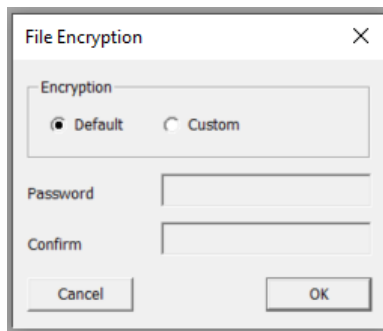
How To Create an EPR File

1. Establish communications with VR
2. Read the VR: select **Repeater** → **Load Data from Repeater (F2)**
3. Save the data as an EPR file: select **File** → **Futurecom Support (EPR Files)** → **Save EPR Support File**
4. Enter a File comment (optional) and click OK

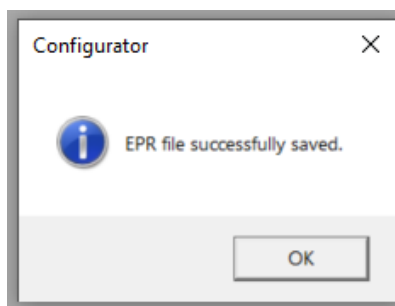


5. Choose File Encryption type and click OK

NOTE: If Custom Encryption type is selected, user must enter Password and Confirm.



6. Click OK for the successful EPR Support File save indication



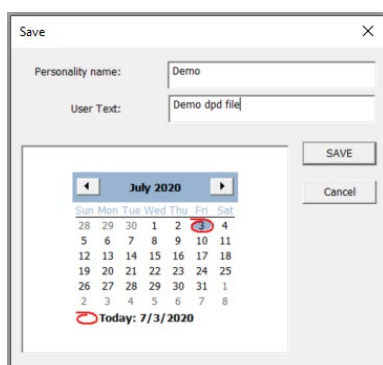
How To Create a DPD File

To create a DPD file, there are two options: create a new file or modify an existing file.

NOTE: Remember to follow programming sequence outlined in VR Programming Guidelines to ensure the MSU and VR are synchronized.

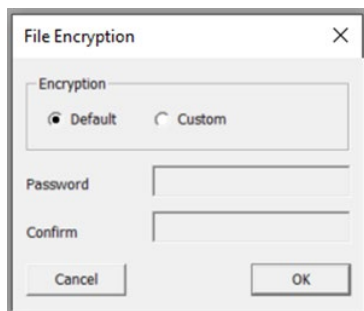
Creation of New File

1. Establish communications with VR
2. Read the VR: select **Repeater** → **Load Data from Repeater (F2)**
3. Make configuration changes (as needed) for this new DPD file
4. Save the data as DPR: select **File** → **Legacy Templates (DPD Files)** → **Save DPD Template**
5. Enter data into Save window and click SAVE



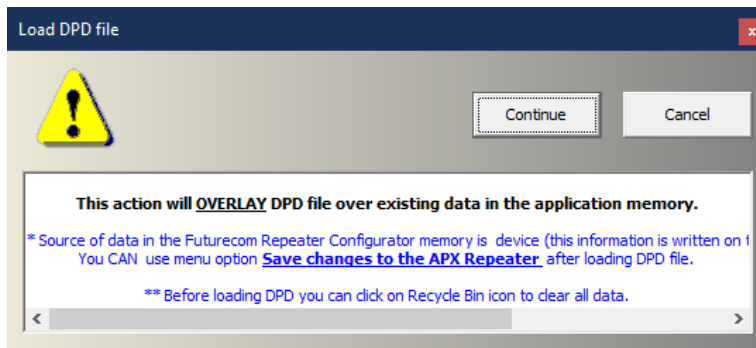
6. Choose File Encryption type and click OK

NOTE: If Custom Encryption type is selected, user must enter Password and Confirm.

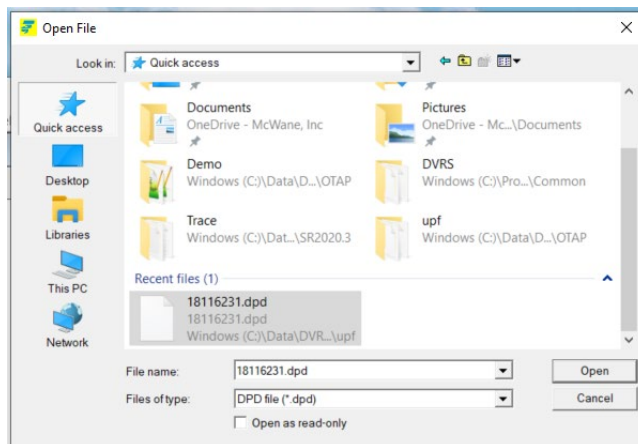


Modify an Existing File

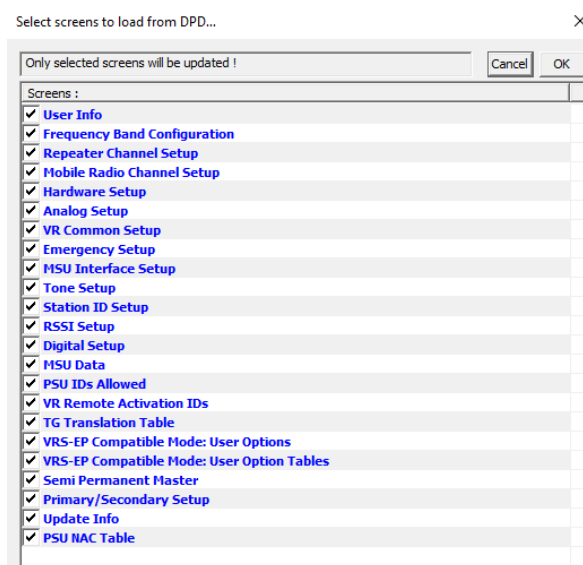
1. Select **File** → **Legacy Templates (DPD Files)** → **Load DPD Template**



2. Click Continue
3. Specify the DPD file location and name then click Open.



4. Unselect any screens with data that is not desired to be loaded and click OK.

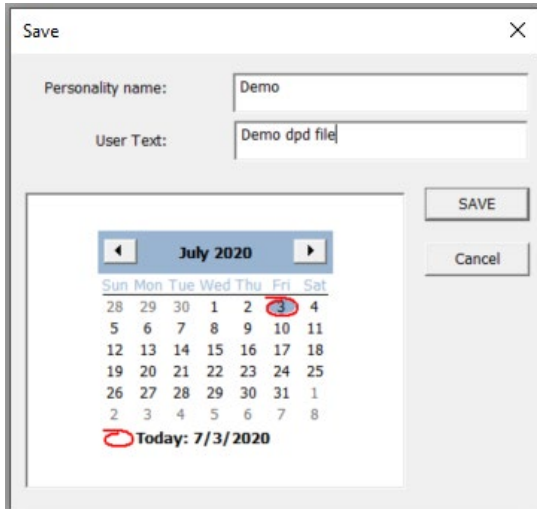


5. Make configuration changes for this new DPD file.

6. Save the data as DPD:

Select **File → Legacy Templates (DPD Files) → Save DPD Template**

7. Enter data into Save window and click SAVE

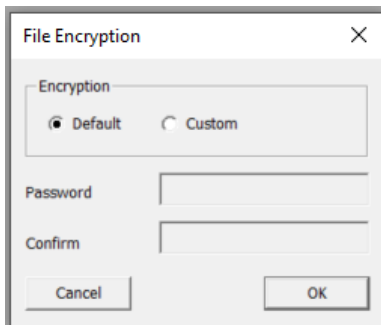


The 'Save' window contains the following elements:

- Personality name:** A text field containing 'Demo'.
- User Text:** A text field containing 'Demo dpd file'.
- Calendar:** A calendar for July 2020. The date 7/3 is circled in red. Below the calendar, it says 'Today: 7/3/2020' with a red circle around the date.
- Buttons:** 'SAVE' and 'Cancel' buttons are located on the right side of the window.

8. Choose File Encryption type and click OK

NOTE: If Custom Encryption type is selected, user must enter Password and Confirm.



The 'File Encryption' window contains the following elements:

- Encryption:** A section with two radio buttons: 'Default' (selected) and 'Custom'.
- Password:** A text field for entering a password.
- Confirm:** A text field for confirming the password.
- Buttons:** 'Cancel' and 'OK' buttons are located at the bottom of the window.

How To Create a DCD File

To create a DCD file, there are two options: create a new file or modify an existing file.

NOTE: Remember to follow programming sequence outlined in VR Programming Guidelines to ensure the MSU and VR are synchronized.

Creation of New File

1. Establish communications with VR
2. Read the VR: select **Repeater → Load Data from Repeater (F2)**
3. Make configuration changes (as needed) for this new DCD file
4. Save the data as DCD: select **File → Templates (DCD Files) → Save DCD Template**
5. Enter data into Save window and click SAVE
6. Enter data into DCD Options window and click OK (Serial numbers are optional)

Configuration Data Name: Filename displayed after importing into Radio Management (max 23 alphanumeric chars)

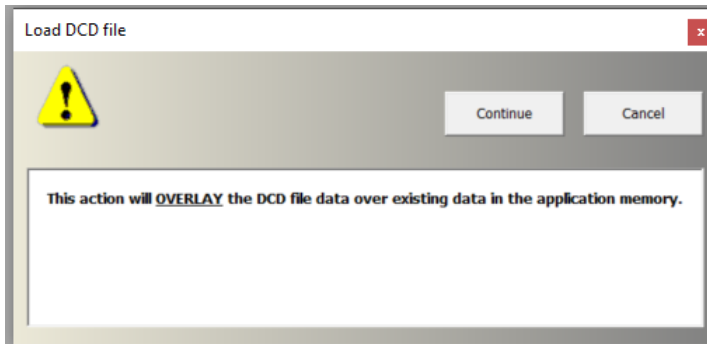
Description: Additional text to clarify content; displayed in Preview File Header section in Open File window. (max 1024 alphanumeric chars)

Load TXT File: Command button that loads an external file that contains a list of the serial numbers. All data imported will be placed into the List of Serial Numbers field

List of Serial Numbers: List of serial numbers of the repeaters that this DCD file should apply to. If left BLANK, this DCD file will be applicable to all repeaters (max 65000 alphanumeric characters). Applicable when delivered to repeater via FRC or RM-OTAP.

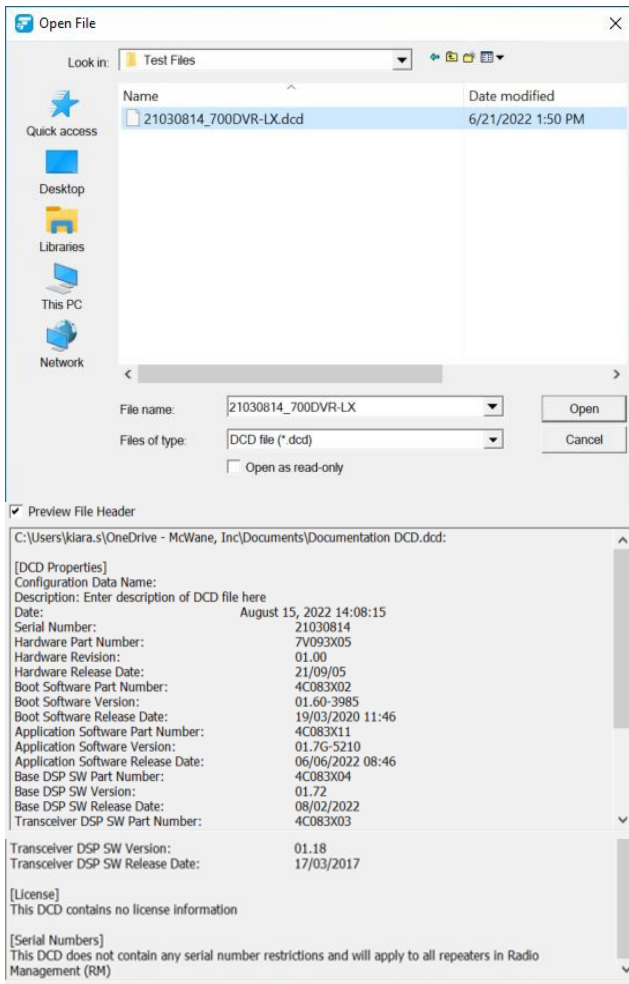
Modify an Existing File

1. Select **File** → **Templates (DCD Files)** → **Load DCD Template**

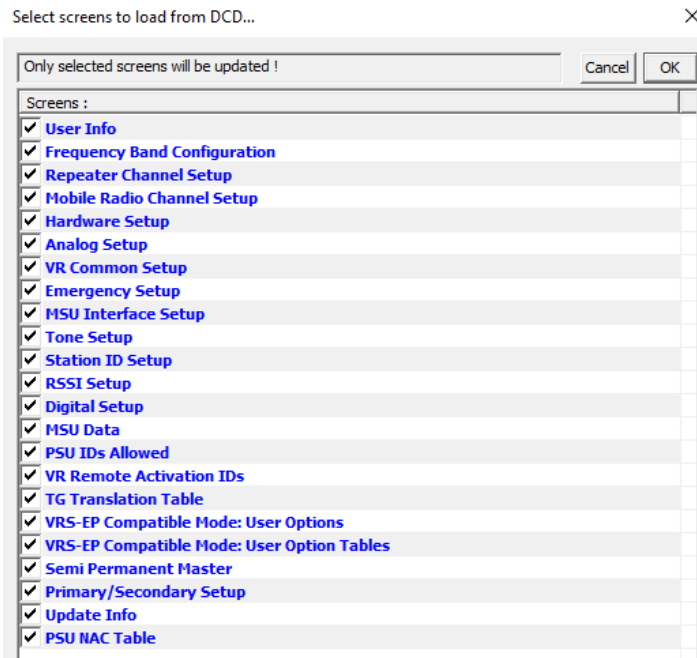


2. Click Continue.
3. Specify the DCD file location and name then click Open.

NOTE: If original DCD file was saved with a description, it will be displayed in the Preview File Header section.



- Unselect any screens with data that is not desired to be loaded and then click OK.



- Make configuration changes for this new DCD file.
- Save the data as DCD: select **File → Templates (DCD Files) → Save DCD Template**
- Enter data into Save window and click SAVE
- Enter data into DCD Options window and click OK (Serial numbers are optional)

Configuration Data Name: Filename displayed after importing into Radio Management (max 23 alphanumeric chars)

Description: Additional text to clarify content; displayed in Preview File Header section in Open File window. (max. 1024 alphanumeric chars)

Load TXT File: Command button that loads an external file that contains a list of the serial numbers. All data imported will be placed into the List of Serial Numbers field

List of Serial Numbers: List of serial numbers of the repeaters that this DCD file should apply to. If left BLANK, this DCD file will be applicable to all repeaters (max 65000 alphanumeric characters)

Feature Licenses

Introduction

- There are aspects of the VR that have software options that can be purchased either at the time of sale, or later.
- This section will cover the mechanisms used to apply these features.
- When a feature license is purchased after delivery of the product, it is delivered to the customer as a “UPF” file assigned to specific serial numbers provided by the customer.
- Each product has a different set of licensing options. For a complete list of factory-installed and field upgrade licensed features, see the Ordering Guides on the Futurecom website ([Support](#) → [Documentation and Software](#) → [DVR-LX/DVR/VRX1000](#))

License Delivery

- Customer will be provided a hyperlink to access and download the license file electronically.
- A License file (*.UPF) contains licensing that enables or disables specific feature(s) and the serial numbers of the VRs they have been purchased for (application of licenses is restricted to only the serial numbers provided).
- The license file can be applied to repeater via FRC (direct connection) or Radio Management (via DCD file). Refer to RM-OTAP User Guide on Futurecom website [Home](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX/DVR/VRX1000](#) → [User Guide](#) → [Over the Air Programming via Radio Manager \(RM-OTAP\) User Guide](#)
- The license file can be bundled with a DCD template file (for delivery via Radio Management).
- The license file can be applied to a template file (FRC offline editing).

Applying License to Repeater via FRC

FRC will apply the license file to a connected repeater immediately.

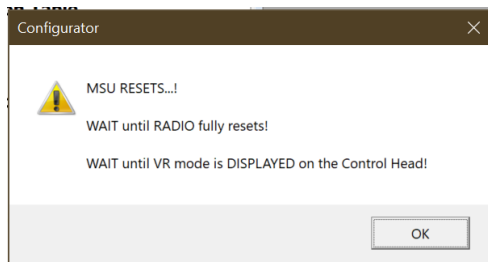
Notes:

- FRC verifies license file is intended for the repeater by validating S/N
- FRC warns user attempting to enable the same license again

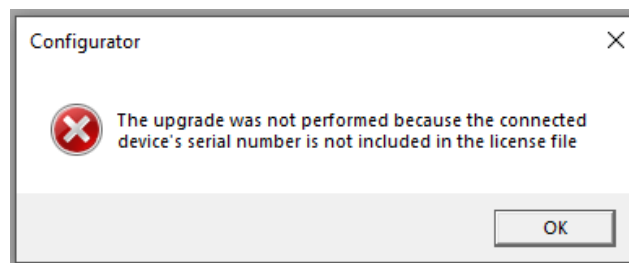
Procedure:

1. Save license file to PC where FRC will be accessed
2. Connect cable from PC to VR
3. Launch FRC
4. Select relevant product (DVR-LX, DVR, VRX1000 or PDR)
5. In FRC, select **Repeater** → **Load data From Repeater**

Message pops up advising you to wait until radio fully resets

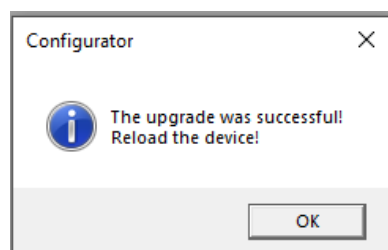


6. To see current licenses applied to repeater,
Select **Repeater Setup** → **Repeater Info** to view Feature licenses
7. Select **File** → **Apply License File** on FRC
8. A window dialog prompts user to choose the license file from local file system (wherever file was saved by user)
9. FRC verifies the associated S/N in license file in one of three ways:
 - a. If embedded S/N in license file does not match S/N of the connected repeater, FRC displays the following error message



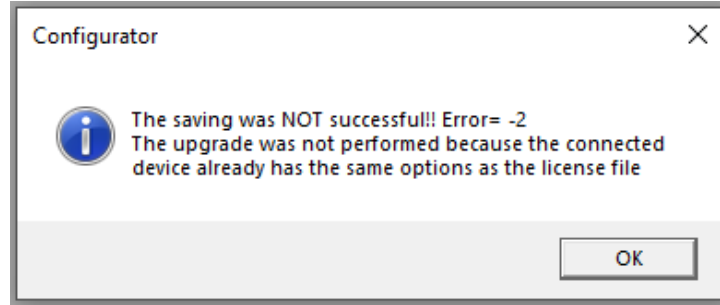
OR

- b. If the S/N matches, the license file is pushed to repeater right away. FRC displays the following confirmation message. User is advised to reload the data from repeater (Repeater → Load Data from Repeater) before making any more changes



OR

- c. If the connected repeater already has the exact same options in the license file, FRC displays following error message



- If Repeater is disconnected after loading data into FRC, FRC will present a series of error messages and then treat the session as an Offline editing session. New license info will be applied locally (within the FRC session), and can be saved into a .DCD or .DPD template for future use.
- If user now reconnects the repeater, the template can be applied to repeater via **Repeater** → **Save Changes to Repeater**, the new license feature and corresponding configuration will be applied to the repeater

Bundling a License File with a DCD File

All feature license files, including the RM-OTAP license file, may be sent using RM-OTAP by bundling with a DCD file.

License file is bundled in as part of creation or modification of file

DCD Options

Configuration Data Name: _____ Description: _____

List the serial numbers of the repeaters you wish to allow this DCD file to be applied to. Leave the list empty to allow this DCD file to be applied to all repeaters.

Separate serial numbers with special characters , ; | or newlines.

Serial numbers should be written either as a single value (eg: 12345678) or as a range (eg: 1234000-1235000). The list below can contain a mixture of individual values and ranges.

Load TXT File

Encryption
☒ Default ☐ Custom
Password: _____
Confirm: _____

☒ Bundle License File | No License File bundled

OK Cancel



HELPFUL HINT

Older versions of Tweaker/FRC have a separate menu option for saving DCD files with license: select **File → DCD Files → Save DCD File with License**

For complete instructions on how to send a DCD file to a VR via RM, refer to the Over the Air Programming Via Radio Manager User Guide, located on the Futurecom website:

[Home](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX](#) → [User Guide](#) → [Over the Air Programming via Radio Manager \(RM-OTAP\) User Guide](#)

Applying License to Template Files

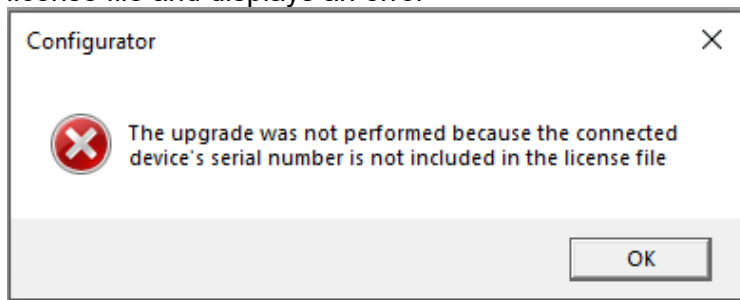
FRC can apply license file to a template file (DPD or DCD) during offline editing. This DOES NOT activate a feature but allows access to new configuration fields that may pertain to a licensed feature.

Notes:

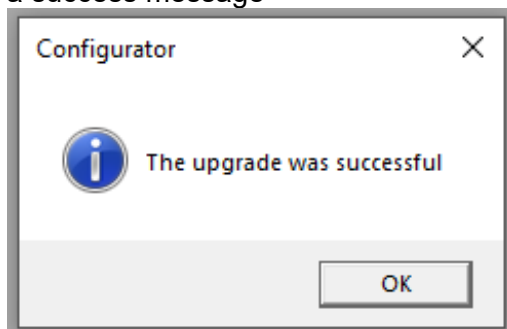
- Template file contains feature license status & the corresponding S/N at the time when template file was created
- FRC verifies if the license file is applicable by checking the S/N against the S/N info in the template file
- A user can apply the license file to the template, so FRC will allow them to configure the features in that template that were not previously accessible

Procedures:

1. Load in a previously saved template file
2. Select File → Apply License File
3. Follow prompt to pick up a license file
4. If S/N in license file does not match the saved S/N in template, FRC blocks importing the license file and displays an error



5. If S/N in license file matches the saved S/N in template, FRC will proceed and displays a success message



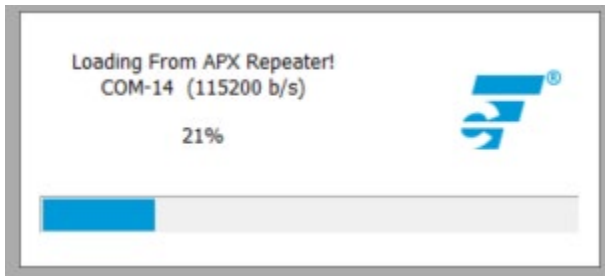
How To Clone a VR

Cloning a VR involves applying a common set of field values to multiple VRs enabling faster configuration of equipment. DPD or DCD templates can be used for this purpose. The basic steps involve:

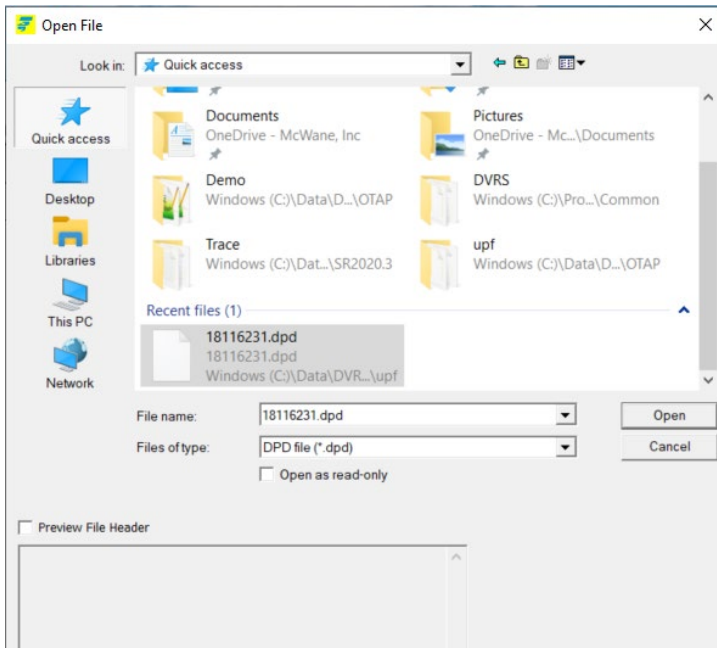
1. Read VR
2. Open DPD / DCD file
3. Select screens to be applied
4. Write to VR

Steps for Cloning

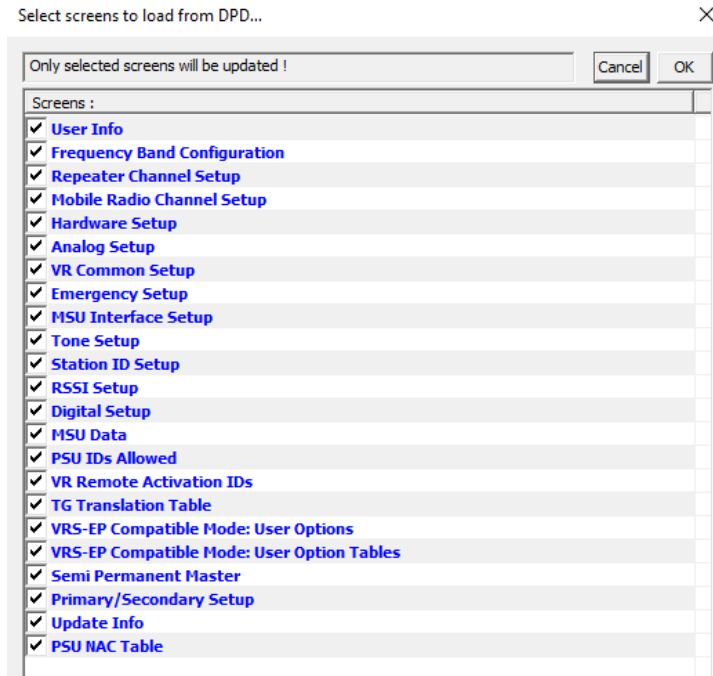
1. Read VR: **Repeater** → **Apply DPD to APX Repeater** (MSU will reset if MSU Programming mode is enabled)



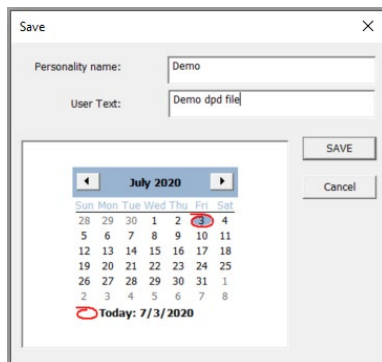
2. Open DPD / DCD file: Follow prompt to select template file to be used and click Open



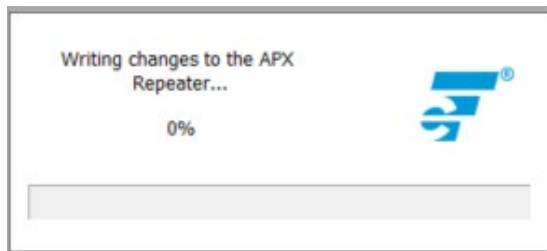
3. Select screens to be applied and click OK



4. Write to VR: Select **Repeater** → **Save Changes to APX Repeater**



5. Click **SAVE** and changes are applied to VR



NOTE: A shortcut is available for this process with the **File → DPD Files (Templates) → Apply DPD to APX Repeater**. It will launch the process described above from beginning to end.

Using FRC Off-Line

Viewing Codeplugs Off-Line

1. Launch FRC.
2. From the FRC File menu, select the type of codeplug to be loaded:
 - **File → Legacy Templates (DPD Files) → Load DPD Template**
 - **File → Templates (DCD Files) → Load DCD Template**
 - **File → Futurecom Support (EPR Files) → Load EPR Support File²**
3. Specify the file location and name when prompted.
4. If saved with custom encryption, enter the corresponding password to load file.

Modifying Codeplugs Off-Line

Once a codeplug is successfully opened (as described in the previous section), the field values are available for reviewing and modification off-line.

Saving Codeplugs Off-Line

1. After editing the fields, the codeplug file can be saved by selecting
 - **File → Legacy Templates (DPD Files) → Save DPD Template**
 - **File → Templates (DCD Files) → Save DCD Template**
 - **File → Futurecom Support (EPR Files) → Save EPR Support File**
2. Follow prompt to specify a new or the same file name and location.
3. For DPD/DCD files only, enter Personality Name, User Text & date for additional description about this personality file.
4. Then user can select one of the 2 encryption modes:
 - Default: codeplug will be encrypted with a default Futurecom encryption
 - Custom: user can enter a password to encrypt the codeplug (EPR/DPD only)

HELPFUL HINT:

If a template file is missing some configurable fields, it may have been created while connected to a VR with an older firmware version prior to the introduction of those fields.

To update the template file, perform the following steps:

1. Connect FRC to a VR running the most recent version of firmware.
2. Load the template file: **File → Legacy Templates (DPD Files) → Load DPD Template** or **File → Templates (DCD Files) → Load DCD Template**
3. Save a new version of the template file: **File → Legacy Templates (DPD Files) → Save DPD Template** or **File → Templates (DCD Files) → Save DCD Template**

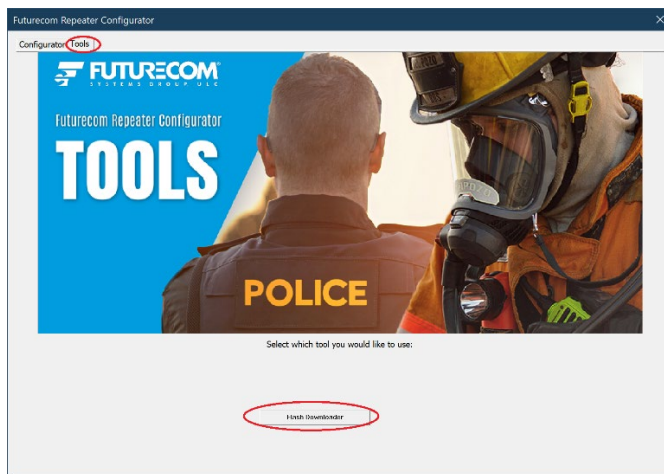
The new template file can now be used off-line and will include previously missing fields.

² Loaded Futurecom Support EPR File cannot be saved to the repeater

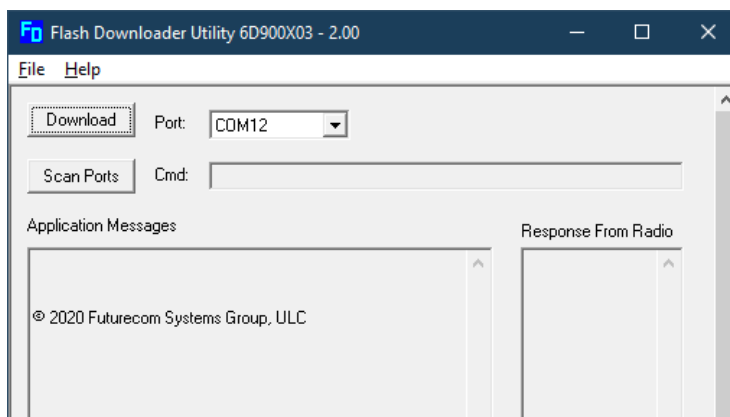
Applying Firmware to VR

The VR firmware can be flash upgraded/downgraded in the field by following the simple instructions below:

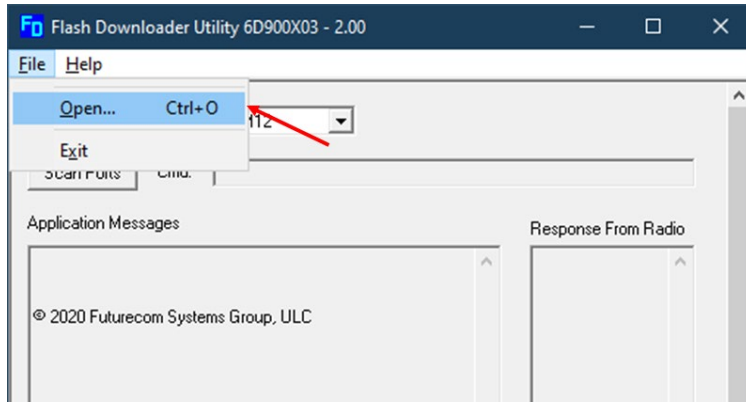
1. Power up the VR.
2. Create a 'Firmware' folder on your computer
3. Download the selected Firmware upgrade file from the Futurecom website.
[Home](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX/DVR/VRX1000](#) → [Firmware Upgrades](#)
4. Unzip the downloaded Firmware file and save the files in this folder.
5. Connect the powered-up DVR / VRX1000 to your computer USB port using the USB programming cable.
6. Launch **Futurecom Repeater Configurator (FRC)**
7. Click on the **Tools** tab on FRC Launcher



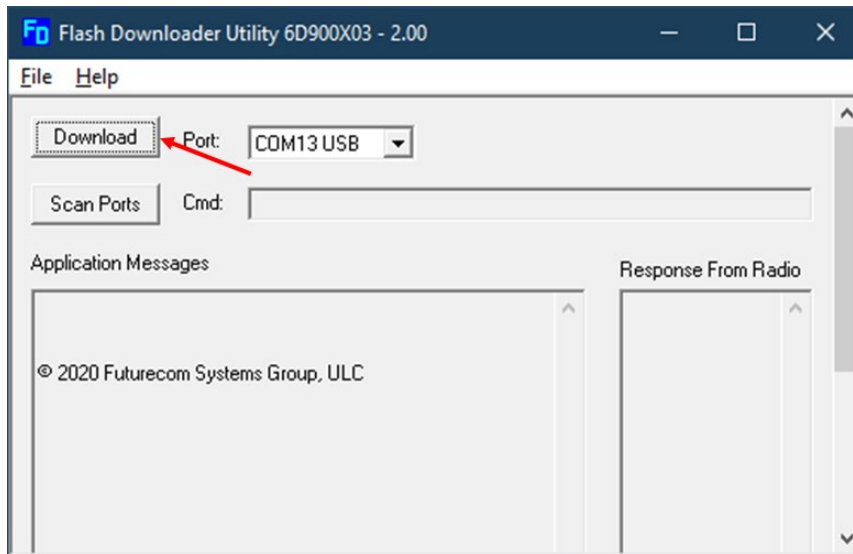
8. Click on the **Flash Downloader** button will launch the Flash Downloader Utility (as shown below)



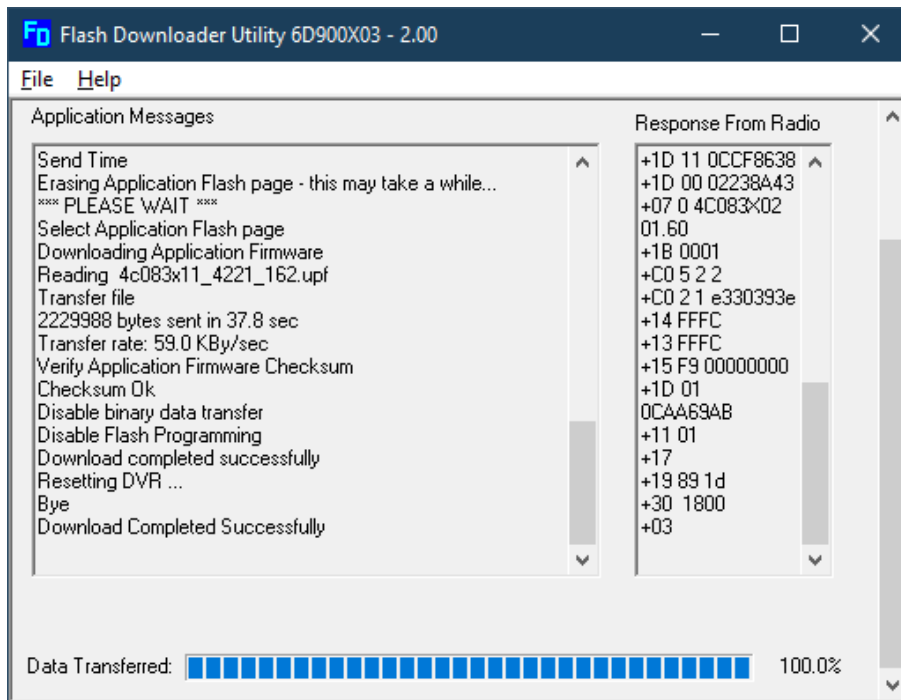
9. Ensure no other program is trying to use the same USB port.
10. Select **File**→**Open** and specify the location of the DVRFirmware.cfg file in the 'Firmware' folder



11. Press the 'Download' button to start the downloading process.



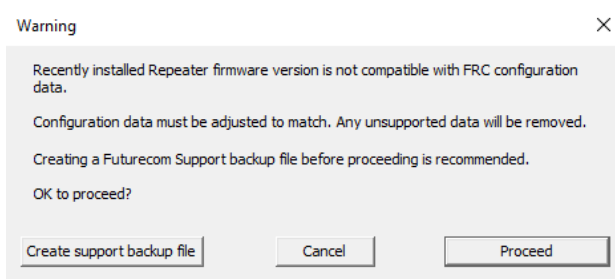
12. Observe the Application messages and progress. Wait until the download is completed 100% successfully.



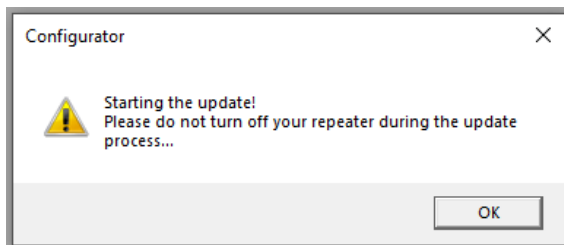
Upgrading Firmware

Migration from lower to higher version

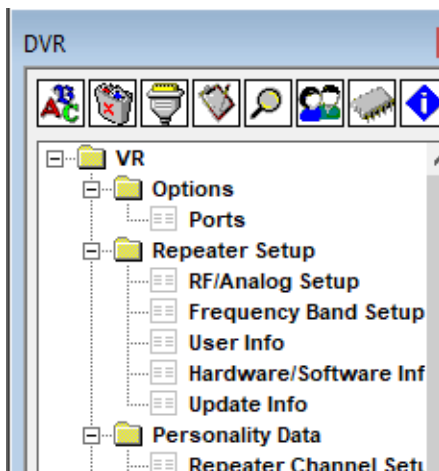
1. Follow the steps above Applying Firmware.
2. Read VR using FRC
3. FRC will detect that new firmware is running and convert the EEPROM map. User sees this prompt



4. Will cover the sequences & screenshots in different comment sections for the case of **"Create support backup file"** and **"Cancel"**
5. Following sequences focus on when user click on **"Proceed"**
6. User will be prompted to ensure DVR is powered on during the conversion process

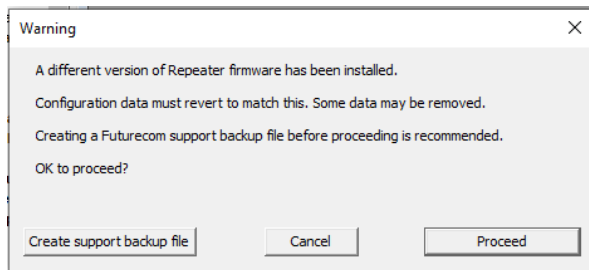


7. Click **"OK"** to proceed
8. FRC will start the conversion process, user will see screens opens & closes as configuration data being converted
9. Upon completion, FRC will show the normal selection panel

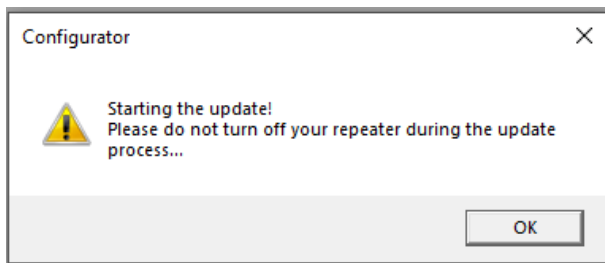


Downgrading Firmware

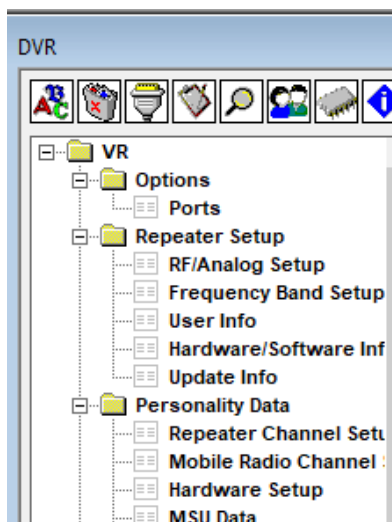
1. Follow the steps above for Applying Firmware downgrade.
2. Read VR using FRC.
3. FRC will detect that new firmware is running and convert the EEPROM map. User sees this prompt:



1. See earlier section on the sequences & screenshots for the case of "**Create support backup file**" and "**Cancel**"
2. Click **Proceed** to continue
3. User will be prompted to ensure VR is powered on during the conversion process



4. Click "**OK**" to proceed
5. FRC will start the conversion process, user will see screens opens & closes as configuration data being converted
6. Upon completion, FRC will shows the normal screen selection panel



VR Programming Guidelines

Programming Steps Overview

The DVRS operation depends on the following:

- VR firmware and programming settings
- MSU firmware and programmed personality
- PSU type, firmware and programmed personality
- System infrastructure

To enable a given VR feature, all the above components must be adequately setup and matched to support it.

IMPORTANT!

Changes to any of the personality templates may require corresponding adjustments to the personality templates of the rest of the system components.

To ensure consistent programming of all components, the following programming sequence is recommended:

Step	Action	Software Program Used
1	Create the MSU template with enabled VR Operation and save it. Ensure the 'DVRS profile' is selected for the desired MSU Talkgroups / modes and there are no frequency plan issues (In-band models only).	APX CPS (Motorola)
2	Export an .xml file by using the "DVRS Export" option in the Motorola CPS (Codeplug Menu). Save the xml file on your PC.	APX CPS (Motorola)
3	Create a .DCD or .DPD file and program the licensed VR channels. Ensure the VR frequencies are within the ordered filtering specification.	FRC (Futurecom)
4	Import the saved .xml file.	FRC (Futurecom)
5	Program the Mobile Channel attributes as required.	FRC (Futurecom)
6	Program the desired analog / digital mode features in the VR.	FRC (Futurecom)
7	Save the .DCD or .DPD template.	FRC (Futurecom)
8	Create the PSU template. Ensure VR Operation is Enabled and the settings match those programmed in the VR.	APX CPS (Motorola)
9	Save the PSU Codeplug.	APX CPS (Motorola)
10	Ensure all personality templates are matched in terms of frequencies, PL / DPL, TX / RX NACs, enabled and disabled features etc. and confirm through testing the DVRS operation before field deployment.	

Table 1 - Recommended Programming Sequence

Additional CPS Programming for VR

There are several VR related fields located throughout CPS. These fields are divided into three groups:

- Basic Programming- fields required to enable VR operation with MSU
- Features- fields that enable/disable features
- Fine Tuning- fields to be considered for adjustment during rollout/testing of DVRS

VR Basic Programming

For each field listed below, refer to the CPS help file for field details.

Purpose/Goal	CPS MSU Programming Details	Comments
Enable VR in APX MSU	DVRS Configuration → DVRS Wide → General → DVRS Hardware Enable	
Select 'DVRS Profile' to be used in desired MSU Conventional and/or Trunking Personalities	Trunking Configuration → Trunking Personality 'X' → General → DVRS Profile Selection → DVRS Profile AND/OR Conventional Configuration → Conventional Personality 'Y' → General → DVRS Profile Selection → DVRS Profile	
Display DVRS button on MSU Control Head	Radio Ergonomics Configuration → Controls → Menu Items → General → Conventional Selected Menu Items → DVRS AND/OR Radio Ergonomics Configuration → Controls → Menu Items → General → Trunking Selected Menu Items → DVRS	To be able to control and change VR mode and channel from MSU control head
Assign DVRS button function to side button on keypad microphone (OPTIONAL)	Radio Ergonomics Configuration → Controls → Keypad Mic and Accessories → General → Conventional Feature → DVRS AND/OR Radio Ergonomics Configuration → Controls → Keypad Mic and Accessories → General → Trunking Feature → DVRS	

VR Feature Programming

For each feature listed below, refer to the **Functional Description** for a feature description or to the CPS help file for field details.

Feature	Purpose	CPS MSU Programming Details	Comments
AVRA	Automatic activation of VR by external logic wired to MSU VIP input	Radio Ergonomics Configuration → Controls → Radio VIPs → General → Input Feature → DVRS Activation Additional FRC Configuration: Hardware Setup → Use VIP on Ctl Head	
	Select polarity of AVRA logic input	DVRS Configuration → DVRS Wide → General → VIP Control of DVRS	
ICM	In Car Monitor (ICM)	DVRS Configuration → DVRS Wide → General → In Car Monitor → HUB controlled OR DVRS Configuration → DVRS Wide → General → In Car Monitor → ICM Button/Menu Controlled	
	ICM button/Menu items	Radio Ergonomics Configuration → Controls → Control Head 'X' → General → Feature → ICM and/or Radio Ergonomics Configuration → Controls → Menu Items → General → Conventional Selected Menu Items → ICM AND/OR Radio Ergonomics Configuration → Controls → Menu Items → General → Trunking Selected Menu Items → ICM	Only if ' ICM Button/Menu Controlled ' Selected for ICM
	ICM operation for each DVRS Profile	DVRS Configuration → DVRS Profiles → Profile 'X' → General → ICM Allowed	Only if ' ICM Button/Menu Controlled ' Selected for ICM
REMOTE ACTIVATION	VR Remote Activation via Call Alert from FNE	DVRS Configuration → DVRS Profiles → Profile 'X' → General → DVRS Remote Activation → Disabled OR DVRS Configuration → DVRS Profiles → Profile 'X' → General → DVRS Remote Activation → Via Call Alert	When this feature is Enabled, the MSU can no longer initiate or receive a regular Call Alert.

MODE CHANGE NOTIFICATION	Send a status message to FNE after every VR mode change	DVRS Configuration → DVRS Profiles → Profile 'X' → General → Generate Status on DVRS Mode Change	
		<i>DVRS Configuration → DVRS Profiles → Profile 'X' → General → Generate Status on DVRS mode Change Holdoff (sec)</i>	<i>CPS Expert View only</i>
		<i>DVRS Configuration → DVRS Profiles → Profile 'X' → General → Generate Status Alternate Mode</i>	<i>CPS Expert View only</i>
LOCAL REPEAT/FALLBACK	Outbound FNE Call Repeat when VR in Local Mode	DVRS Configuration → DVRS Profiles → Profile 'X' → General → Local Mode → Outbound System Repeat in Local Mode	
	MSU Mic PTT transmits to FNE when VR in Local Mode	DVRS Configuration → DVRS Profiles → Profile 'X' → General → Local Mode → MSU System PTT in Local Mode	'Outbound System Repeat in Local Mode' must be enabled This field cannot be enabled at the same time as 'Local Tx Fallback'
	Fallback to Local VR audio repeat when MSU Mic PTT fails to transmit to FNE	DVRS Configuration → DVRS Profiles → Profile 'X' → General → System Mode → Local Tx Fallback	'Outbound System Repeat in Local Mode' must be enabled This field cannot be enabled at the same time as 'MSU System PTT in Local Mode'
MSU SCAN	Suspend Scan on DVRS Active	DVRS Configuration → DVRS Profiles → Profile 'X' → General → Suspend Scan on DVRS Active	

VR Fine Tuning

For each field listed below, refer to the CPS help file for field details.

Purpose/Goal	CPS MSU Programming Details	Comments
Amount of time MSU will transmit a continuous inbound audio call from PSU via VR (proxied call)	DVRS Configuration → DVRS Wide → General → Proxy Time Out Timer (sec)	
Amount of time MSU waits for a busy conventional channel to be available to proxy LPSU call request before denying the request.	DVRS Configuration → DVRS Wide → General → Proxy Limited Patience (sec)	
Amount of time the MSU will stay on the control channel to proxy a system response for a given signaling request from a LPSU.	DVRS Configuration → DVRS Wide → General → Proxy RFSS Response Time (ms)	CPS Expert View only

P25 Trunking OTAR via VR

For the MSU interfaced to the VR to provide packet data services to associated PSUs on a P25 Trunking system, the MSU must be configured for packet data operation and must be context activated on the system.

MSU Scan Programming Requirements

The MSU Scan feature is allowed while the VR is active (System or Local Mode) if the MSU Scan type is configured as one of the following:

- Trunking Scan
- Conventional Scan
- Mixed Conventional Voting Scan
- Legacy Voting Scan
- Multi System Scan
- Priority Monitoring

The MSU does not support any other modes of scan operation, apart from those listed above, while the VR operates in SYSTEM or LOCAL mode. In such unsupported cases, the MSU will automatically suspend scan operation when the VR is set to SYSTEM or LOCAL mode of operation and resume it when the VR is OFF.

NOTE:

The LPSU calls will be repeated on the MSU Selected Channel.

MSU Group Services Programming Requirements

The “Group Text Messaging Service” in the corresponding Trunking system screen has to be set to ‘Full Decode’ in order to enable the Group Text Feature in the MSU.

To enable the Group Alias Update feature, the MSU must have the ‘OTA Radio Alias Type’ set to ‘Decode Only’ in the corresponding Trunking system screen.

The MSU may have Group Text Messaging Services and/or Group Alias Update disabled so it will not store group texts and update its UCL but will still pass along the group texts and alias updates to the VR and its affiliated PSUs.

Exporting MSU data (.xml file)

Once the MSU is programmed for DVRS operation, the data needs to be exported by using the Motorola CPS “DVRS Export” option in the Codeplug menu. The standard CPS Export Data option cannot be used for DVRS programming purposes.

Programming the PSUs for DVRS Operation

The programming of the PSU depends on the PSU type and user requirements. The following paragraph describes the programming options related to DVRS operation for the 3 main types of PSUs – Analog, P25 Digital (Generic), P25 DVRS Enabled.

Certified PSU models have modified firmware that allows them to operate as ‘**DVRS Enabled**’. See [Futurecom website → Support → Customer Documentation → DVR-LX/DVR/VRX1000 → Compatibility Chart](https://futurecom.com/upl/downloads/resources/support-resources/firmware-compatibility-chart.pdf) <https://futurecom.com/upl/downloads/resources/support-resources/firmware-compatibility-chart.pdf> for a list of these certified XTS, APX & APXNext portables and the corresponding subscriber options required.

All other P25 capable PSU models or the above models with older firmware versions can only be programmed as ‘P25 Generic’ since they are not capable of enhanced communications with the VR.

NOTE:

APX MSUs can also be programmed as ‘**DVRS Enabled**’ and used to communicate through a VR provided they are NOT interfaced to a VR.

Programming the P25 ‘DVRS Enabled’ PSU

The P25 ‘**DVRS Enabled**’ PSU needs to be affiliated on the P25 FNE through the VR therefore its ASTRO Unit ID and TG ID must be valid and allowed on the FNE side.

Typically, the conventional ASTRO PSU Unit ID is set to match that of the Trunking system PSU ID in in-band applications. In cross-band application the ASTRO PSU unit ID must be enabled in the P25 system to be able to affiliate and communicate through the VR.

If **Fireground (FG)** signaling is enabled in the PSU, ensure that the programmed “**Tx Voice Type**” (analog or digital) matches the type of corresponding VR “FG Enabled” channel (analog or digital).

XTS Series ‘DVRS Enabled’ PSUs

If the XTS **DVRS Enabled** PSU needs to support say 10 TGs via VR, then the PSU needs to be programmed with 10 different conventional ASTRO personalities using the designated **DVRS Enabled** ASTRO system. Each conventional personality must be strapped to the corresponding TG ID from the specified TG List. Each conventional personality is then assigned to a desired PSU mode in the Zone / Channel assignment listing. The PSU behavior, when switched to a VR channel, is specified by programming the desired features in the corresponding ASTRO system ‘DVRS’ Tab. Alternatively the PSU can be programmed with just one (or a few TG IDs) and **TG translation** can be enabled in the VR so that the PSU TG ID is always translated to the ID of the TG selected on the MSU control head.

NOTE: TG IDs are programmed in the XTS PSU conventional ASTRO Talkgroup List in decimal format.

IMPORTANT!

The PSU and VR PL/DPLs must be programmed to be properly matched. The DVRS Enabled PSU must be programmed for mixed receive to program PL on a DRVS Enabled Channel.

APX Series 'DVRS Enabled' PSUs

If **Group Services** support is required, the "Group Text Messaging Service" in the corresponding conventional system screen must be set to 'Full Decode' to enable the Group Text Feature. To enable the Group Alias Update feature, the PSU must have the 'OTA Radio Alias Type' set to 'Decode Only' in the corresponding conventional personality screen. 'Selective Squelch' needs to be programmed (instead of the default 'Normal Squelch') if the PSU User want to receive only Group Services for its selected Talkgroup.

If the APX **'DVRS Enabled'** PSU needs to support say 10 TGs via the VR, then the PSU may be programmed with a single Conventional Personality, which is using a Conventional System of 'DVRS' type. The Conventional Personality's Frequency Option table will contain 10 entries, which are strapped to desired TG IDs. The actual TG IDs are specified in the designated Astro Talkgroup List, which is then linked to the Conventional Personality ('Astro Talkgroup' tab). The PSU behavior, when switched to a VR channel, is specified by programming the desired features in the corresponding Conventional System 'DVRS' Tab. Each Frequency option of the Conventional Personality (using desired TG ID and a 'DVRS' type Conventional System) is then assigned to a PSU mode in the Zone Channel Assignment listing. Alternatively, the PSU can be programmed with just one (or a few TG IDs) and **TG translation** can be enabled in the VR so that the PSU TG ID is always translated to the ID of the TG selected on the MSU Control Head.

Programming of Generic P25 PSU for Digital VR Mode

The programming of a Generic P25 PSU requires matched VR – PSU programming of:

- VR Tx and Rx Frequencies
- Tx and Rx NACs

In addition, the programmed PSU ASTRO Unit ID and selected TG ID must be valid and allowed on the P25 system.

Programming of the P25 PSU (Generic P25 or 'DVRS Enabled') for operation on Conventional P25 MSU System

Both PSU types must have the Tx and Rx NACs matched with those programmed in the VR. If the P25 conventional system is not using dedicated TG IDs then all system radios transmit with the default TG ID = 1.

When the XTS PSU is programmed as **'DVRS Enabled'**, and 'Talkgroup' is checked in the given conventional personality, the PSU transmits with default TG ID = 2. When the system radios are operating on a conventional P25 system, which is not using Talkgroups, all radios still transmit with default TG ID = 1. Therefore, the **'DVRS Enabled'** PSU programming may need to be changed to TG ID=1 to match the rest of the system radios so that communications can be heard between **'DVRS Enabled'** PSUs and system PSUs. The Generic P25 PSU transmits with default TG ID = 1 so it matches the rest of the system radios and its programming does not need to be changed.

NOTE:

TG ID 1 can be added to the VR Translation tables so that PSU calls coming from Generic P25 PSUs (with TG ID 1) will be translated to the TG ID currently selected on the MSU, while **'DVRs Enabled'** PSUs will be able to make proxied calls on their selected TG IDs.

If the conventional P25 system is using dedicated TG IDs, then the **'DVRs Enabled'** or Generic P25 PSU must be programmed with corresponding conventional personalities using the required TG IDs.

Programming of the P25 XTS PSU (Generic P25 or 'DVRs Enabled') for Inbound Digital Takeover

A Generic P25 XTS PSU must have Smart PTT disabled if "Outbound Takeover by Voice Allowed" is enabled in the VR.

Programming of Analog Conventional PSU for Analog VR Mode

The programming of any PSU for analog mode involves the following:

- PSU Tx frequency and Tx PL/DPL must match the VR Rx frequency and Rx PL / DPL.
- PSU Rx frequency and Rx PL/DPL must match the VR Tx frequency and Tx PL / DPL.
- Adjacent channel spacing programming of the VR channel and PSU must be the same i.e. either 12.5kHz or 25kHz.
- If MDC Emergency is to be used by the PSU, the PSU must have MDC1200 signaling enabled. The MDC1200 System Pretime must be set to 50ms if the PSU Emergency ID is to be seen on other System radios that are on the same TG. If the MSU has the default System Pretime of 700ms, the PSU Emergency ID will only be displayed on the Dispatcher Console.
- **Preamble during pretime must NOT be enabled.**
- If MDC1200 Emergency alarm is used when the MSU is on a trunked channel, the MDC ID (hex) must be allowed on the Trunking system side (see MDC PTT ID offset)
- If DTMF signaling is used, the DTMF sequence programmed in the PSU must end with a '*' i.e., 123*.

Feature Programming

How to Program GPS Driven Deactivation Feature

Step 1: Ensure GPS Feature license has been purchased and applied to VR.

Step 2: Determine how feature will be used (Scenario)³

1. GPS Deactivate Only
 - A. Speed only
 - B. Distance only
 - C. Speed or Distance
 - D. Speed and Distance
2. AVRA Activate with GPS Deactivate
 - A. Speed only
 - B. Distance only
 - C. Speed or Distance
 - D. Speed and Distance
3. AVRA Activate with AVRA or GPS Deactivate
 - A. Speed only
 - B. Distance only
 - C. Speed or Distance
 - D. Speed and Distance
4. AVRA Activate with AVRA followed by GPS Deactivate
 - A. Speed only
 - B. Distance only
 - C. Speed or Distance
 - D. Speed and Distance

Step 3: Open the Hardware Setup window

³ Refer to VR Functional Description: GPS Driven Deactivation for details on this feature.

The screenshot shows the 'Hardware Setup' window with the following configurations:

- RSSI:**
 - OFF Hysteresis: 5.0 dB
 - Speed: 5.0 ms
- Squelch:**
 - ON Threshold: 16 dB SINAD
 - OFF Threshold: 10 dB SINAD
 - Speed: 25 ms
- Battery:**
 - Low Battery Alarm: 10.00 V
 - Engine Start Alarm: OFF V
- MSU RF Bypass Switch:** ☐
- Band Lock:** Disable
- External Master Light:** ☐
- Relay Use:**
 - Relay 1: Not Used
 - Relay 2: Not Used
 - Relay 3: Not Used
- Rep. FM Deviation Limit:** 12.5 kHz: 2.12 kHz, 25.0 kHz: 4.24 kHz, NPSPAC: 3.39 kHz
- PL FM Deviation:** 0.38 kHz
- PL STE Delay:** 150 ms
- AVRA/GPS Tone:** ☒
- AVRA:**
 - Automatic VR Activation: ☒
 - AVRA Function: Activate/Deactivate
- AVRA, Primary/Secondary Preference input:**
 - Use VIP on Ctl Head: ☒
 - Input Polarity: Active Low
- GPS Driven Deactivation:**
 - ☒ GPS Driven Deactivation
 - ☒ Speed: 15 mph
 - OR: ☐
 - ☒ Distance: 2500 feet
 - AVRA Activate/Deactivate Interaction:**
 - Deactivate Upon: AVRA followed by GPS
 - ☒ Fallback to AVRA when no GPS signal: 0.5 min
 - Primary/Secondary Preference: None
- AFC:**
 - Cumulative: Enable
 - Fast: Enable
- Tactical VR:** ☐

Step 4: Configure field values as indicated below for the identified scenario in Table 2, GPS Driven Deactivation Scenarios, below.

Table 2 - GPS Driven Deactivation Scenarios

FRC FIELD	SCENARIO (from Step 2 above)															
	1A	1B	1C	1D	2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C	4D
AVRA/GPS Tone	Optional															
Automatic VR Activation					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AVRA Function					Activate only	Activate only	Activate only	Activate only	Activate / Deactivate	Activate / Deactivate	Activate / Deactivate	Activate / Deactivate	Activate / Deactivate	Activate / Deactivate	Activate / Deactivate	Activate / Deactivate
GPS Driven Deactivation	Must be selected for all scenarios															
Speed	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓
<i>Speed Threshold</i>	User Value		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value
<i>Speed Units- mph or km/h</i>	User Value		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value
Distance		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓
<i>Distance Threshold</i>		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value	User Value
<i>Distance Units- feet or meters</i>		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value	User Value		User Value	User Value	User Value
<i>Threshold Logic</i>			OR	AND			OR	AND			OR	AND			OR	AND
Deactivate Upon									AVRA or GPS	AVRA or GPS	AVRA or GPS	AVRA or GPS	AVRA Follow by GPS	AVRA Follow by GPS	AVRA Follow by GPS	AVRA Follow by GPS
Primary / Secondary Preference	None or Stationary based on desired behaviour ⁴															

NOTE: *Field names in italics* are descriptions of the fields that have no titles on the FRC Hardware Setup window.

Step 5: For Scenarios 4A-4D which involve “Deactivate Upon: AVRA Followed by GPS”⁵, there is an additional configuration option which will allow an AVRA trigger only to deactivate the VR upon loss of GPS signal:

- Check box “Fallback to AVRA when no GPS signal”
- enter desired timer value

Step 6: Be sure to test VR operation before implementing VR wide.

⁴ Refer to Primary / Secondary Feature Document for details on this feature.

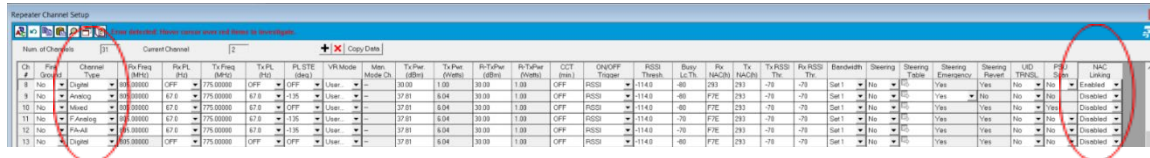
⁵ Refer to VR Functional Description: GPS Driven Deactivation for details on this feature.

How to Program NAC Linking Feature

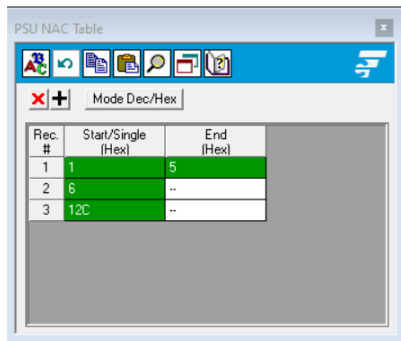
Step 1: In the Repeater Channel Setup window, select the desired option for the VR channel under the **NAC Linking** field. (scroll to far right).

Step 2: Use FRC copy data feature to quickly apply the same configuration any additional channels.

NOTE: Only Digital or Forced Analog Channel Type support this feature. For all other channel types, this feature must be disabled.



Step 3: Add any restricted NACs to the PSU NAC Table. May include a range of NACs or individual NACs.



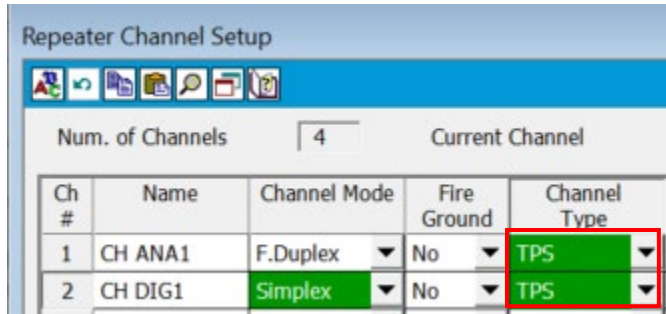
Step 4: Enable the PSU "DVR Sync NAC Matching" field. This field can be found in the CPS tool: Conventional Configuration → Conventional System → DVRS set of fields.

How to Program TPS Signaling

FRC – VR Programming

Step 1: Open Repeater Channel Setup window

Step 2: Set **Channel Type** to TPS



Step 3: Set **PL** and **NAC** values to match with PSU programming: Rx PL(Hz), Tx PL(Hz), PL STE(deg.), Rx NAC(h), Tx NAC(h)

1																			
+ X Copy Data																			
Rx Freq (MHz)	Rx PL (Hz)	Tx Freq (MHz)	Tx PL (Hz)	PL STE (deg.)	VR Mode	Man. Mode Ch.	Tx Pwr. (dBm)	Tx Pwr. (Watts)	R-TxPwr (dBm)	R-TxPwr (Watts)	CCT (min.)	ON/OFF Trigger	RSSI Thresh.	Busy Lc.Th.	Rx NAC(h)	Tx NAC(h)			
173.82000	156.7	173.82000	156.7	-135	User...	--	37.81	6.04	30.00	1.00	OFF	Sq&RSSI	-115.0	-70	293	293			

CPS – MSU and PSU Programming for TPS Signaling

Prerequisite for MSU only – ensure DVRS profile is set in the conventional personality, then proceed with the steps below.

Step 1: Conventional System → Set System Type to ASTRO

Step 2: Conventional Configuration → Conventional Personality:

- RX Options → RX Voice/Signal Type → Mixed Mode
- TX Options → TX Voice/Signal Type → ASTRO
- Signaling → ASTRO → ASTRO System → set to selected profile
- Signaling → Non-ASTRO → Signaling Type → None
- ASTRO Talkgroup → Talkgroup → Unchecked
- Features → Incident Signaling Type → Tactical Public Safety
- Features → Tactical Public Safety UI Enable → Checked**

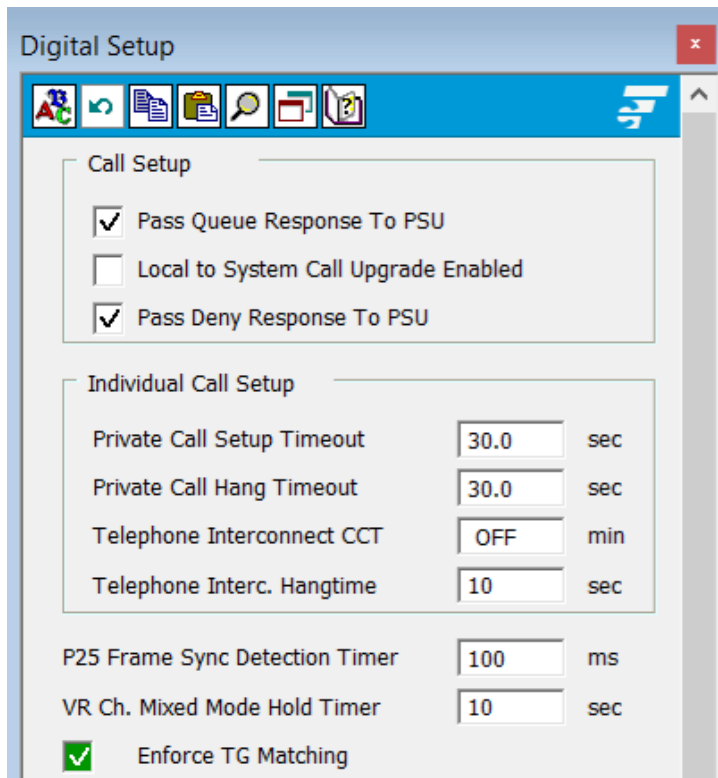
Step 3: Under Radio Wide → Tactical Public Safety there are additional parameters that may be configured as per user preference. Refer to Motorola documentation for further information.

How to Program Talkgroup Matching

FRC - VR Programming

Step 1: Open the Digital Setup window.

Step 2: Check the **Enforce TG Matching** field.



The screenshot shows the 'Digital Setup' window with a toolbar at the top. The 'Call Setup' section contains three checkboxes: 'Pass Queue Response To PSU' (checked), 'Local to System Call Upgrade Enabled' (unchecked), and 'Pass Deny Response To PSU' (checked). The 'Individual Call Setup' section contains four fields: 'Private Call Setup Timeout' (30.0 sec), 'Private Call Hang Timeout' (30.0 sec), 'Telephone Interconnect CCT' (OFF min), and 'Telephone Interc. Hangtime' (10 sec). Below these are 'P25 Frame Sync Detection Timer' (100 ms) and 'VR Ch. Mixed Mode Hold Timer' (10 sec). At the bottom, the 'Enforce TG Matching' checkbox is checked.

Field	Value	Unit
Private Call Setup Timeout	30.0	sec
Private Call Hang Timeout	30.0	sec
Telephone Interconnect CCT	OFF	min
Telephone Interc. Hangtime	10	sec
P25 Frame Sync Detection Timer	100	ms
VR Ch. Mixed Mode Hold Timer	10	sec

Additional Notes

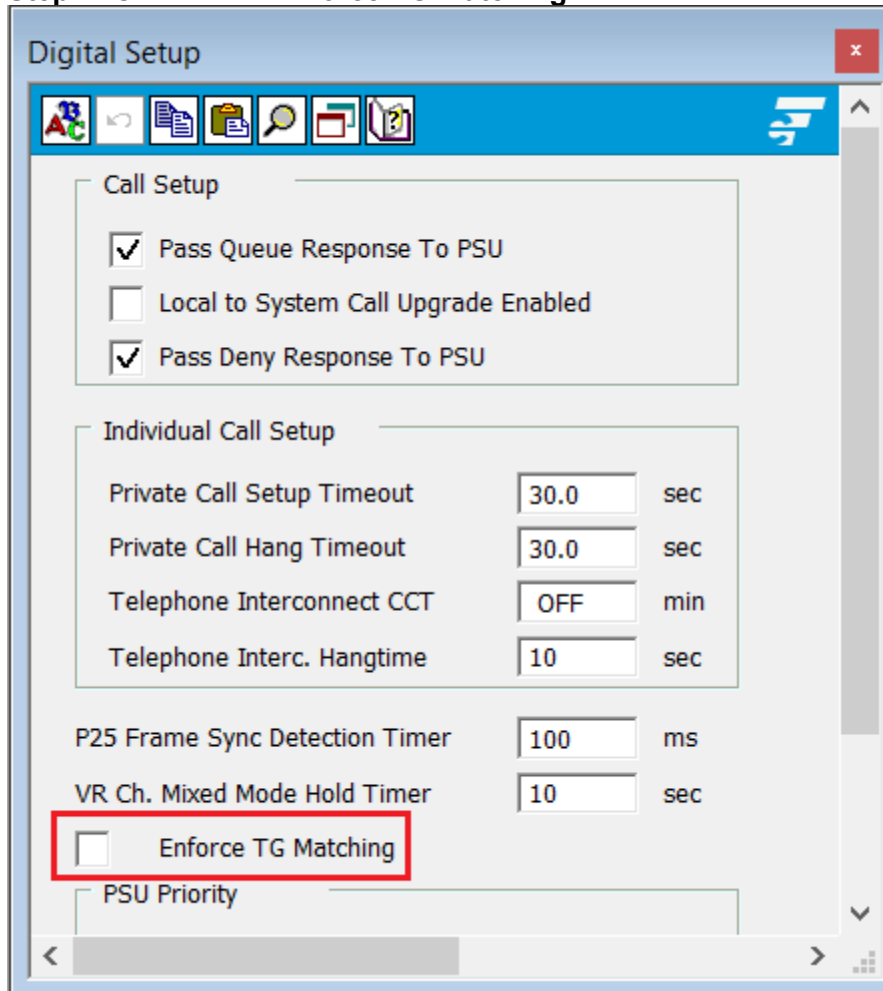
The PSU displays “TG mismatch” when this feature is enabled and the PSU talkgroup does not match the MSU talkgroup.

How to Program Talkgroup Proxying

FRC - VR Programming

Step 1: Open the Digital Setup window.

Step 2: Confirm the **Enforce TG Matching** field is unchecked.



The screenshot shows the 'Digital Setup' window with a blue title bar and a toolbar. The window is divided into sections. The 'Call Setup' section contains three checkboxes: 'Pass Queue Response To PSU' (checked), 'Local to System Call Upgrade Enabled' (unchecked), and 'Pass Deny Response To PSU' (checked). The 'Individual Call Setup' section contains four rows of settings: 'Private Call Setup Timeout' (30.0 sec), 'Private Call Hang Timeout' (30.0 sec), 'Telephone Interconnect CCT' (OFF min), and 'Telephone Interc. Hangtime' (10 sec). Below this, 'P25 Frame Sync Detection Timer' is set to 100 ms and 'VR Ch. Mixed Mode Hold Timer' is set to 10 sec. The 'Enforce TG Matching' checkbox is unchecked and highlighted with a red rectangle. The 'PSU Priority' section is partially visible at the bottom.

Section	Field	Value	Unit
Call Setup	Pass Queue Response To PSU	<input checked="" type="checkbox"/>	
	Local to System Call Upgrade Enabled	<input type="checkbox"/>	
	Pass Deny Response To PSU	<input checked="" type="checkbox"/>	
Individual Call Setup	Private Call Setup Timeout	30.0	sec
	Private Call Hang Timeout	30.0	sec
	Telephone Interconnect CCT	OFF	min
	Telephone Interc. Hangtime	10	sec
	P25 Frame Sync Detection Timer	100	ms
	VR Ch. Mixed Mode Hold Timer	10	sec
	Enforce TG Matching	<input type="checkbox"/>	
PSU Priority			

CPS - PSU Programming for Talkgroup Proxying

Step 1: Create a new ASTRO Talkgroup List

- Conventional Configuration → ASTRO Talkgroup List → *New List*
- *New List* → Talkgroup List → add a record for each PSU talkgroup

Step 2: Update the Conventional Personality, *Conventional Personality*

- Signaling → ASTRO → ASTRO Rx Unmute Rule → Selective Squelch
- ASTRO Talkgroup → Talkgroup → checked
- ASTRO Talkgroup → Talkgroup List → *New List*
- ASTRO Talkgroup → Selection Type → Strapped (preferred over Selectable)
- Frequency Options → create a record for every PSU talkgroup
 - Each record will have same Rx/Tx frequency info
 - ASTRO Talkgroup ID → select the appropriate PSU talkgroup for each record

Step 3: Update the Zone Channel Assignment

- Add a new VR channel record for each PSU talkgroup
- Channels → Personality → *Conventional Personality* for each record
- Channels → Conventional Frequency Option → select the appropriate PSU talkgroup for each record

Additional Notes

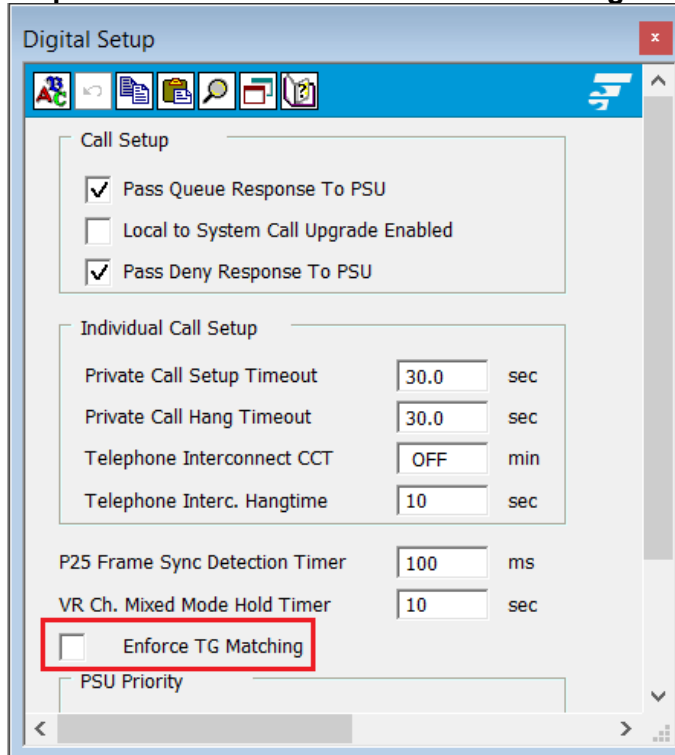
1. Deployment: It is recommended to set the MSU to a talkgroup that is never used to ensure the talkgroup is always available when needed. If it is set to a commonly used talkgroup, when a user is in range and presses PSU PTT, they would get a deny tone if the talkgroup is busy.
2. Programming: For Step 2, Strapped is the preferred configuration. However, if desired, Selectable may be set instead and then Step 3 is not required. Please note that the Selectable option requires the end user to follow a two-step process to change talkgroups: change selector button for PSU channel, and then enter menu to select talkgroup.

How to Program Talkgroup Translation

FRC - VR Programming

Step 1: Open the Digital Setup window.

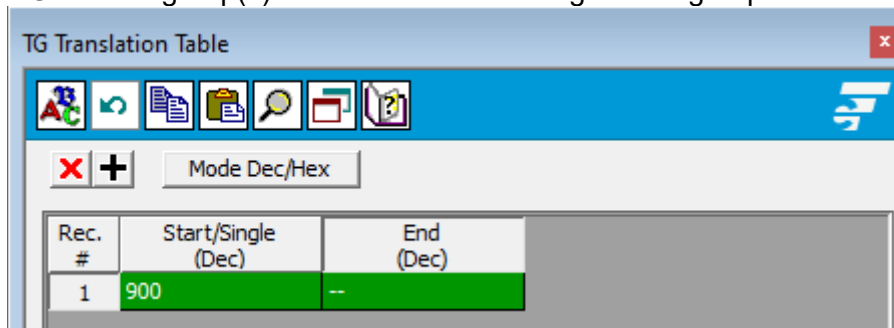
Step 2: Confirm that the **Enforce TG Matching** field is unchecked.



Step 3: Open the TG Translation Table window.

Step 4: Add the PSU talkgroup ID to be used for translation.

NOTE: Talkgroup(s) must be outside of range of talkgroups used on the Trunking System.



CPS - PSU Programming for Talkgroup Translation

Step 1: Create a new ASTRO Talkgroup List

- Conventional Configuration → ASTRO Talkgroup List → *New List*
- Add a new record for the PSU talkgroup ID that will not be used → *Translation talkgroup*
 - *MUST MATCH TG ID ENTERED INTO THE TG TRANSLATION TABLE*
 - *MUST MATCH TG ID MODE - DEC/HEX*

Step 2: Update the Conventional Personality, *Conventional Personality*

- Signaling → ASTRO → ASTRO Rx Unmute Rule → Normal Squelch
- ASTRO Talkgroup → Talkgroup → checked
- ASTRO Talkgroup → Talkgroup List → *New List*
- ASTRO Talkgroup → Selection Type → Strapped (preferred over Selectable)
- Frequency Options → create a record for the translated PSU talkgroup
 - ASTRO Talkgroup ID → *Translation talkgroup*

Step 3: Update the Zone Channel Assignment

- Add a new VR channel record for the translated PSU talkgroup
- Channels → Personality → *Conventional Personality*
- Channels → Conventional Frequency Option → *Translation talkgroup*

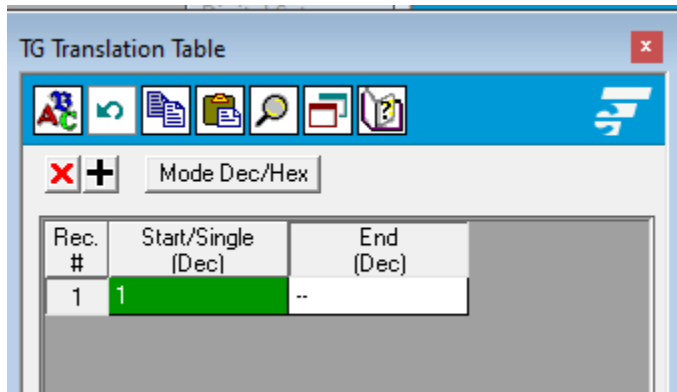
Additional Notes

1. Programming: PSU talkgroup(s) to be used for the Talkgroup Translation feature must be outside the range of talkgroups used on the Trunking system.
2. Programming: PSUs need to be programmed with Normal Squelch to hear outbound calls (system originated calls) or MSU microphone PTT calls as they will be repeated on the MSU talkgroup- no translation in this direction. Normal Squelch ignores conventional talkgroups.
3. Programming: PSUs can be programmed with just one talkgroup ID which significantly reduces the amount of required programming when the PSU needs access to many talkgroups. It also means only one zone/channel for the portable user which simplifies operation.
4. Generic (Non-DVRS Enabled) PSUs: When not configured for conventional talkgroup operation, P25 PSUs use talkgroup ID 1 by default when transmitting. If TG ID 1 is added to the VR Translation table, then PSUs transmitting TG ID 1 will be translated to the talkgroup selected on the MSU.
5. Programming: For Step 2, Strapped is the preferred configuration. However, if desired, Selectable may be set instead and then Step 3 is not required. Please note that the Selectable option requires the end user to follow a two-step process to change talkgroups: change selector button for PSU channel, and then enter menu to select talkgroup.

Talkgroup Translation Table

When the local PSU transmits on a TG that is in the VR Translation table, the call will be transmitted on the TG currently selected on the MSU control head. The local PSUs must be programmed with Normal squelch or NAC=F7E to be able to receive outbound (system) or MSU Mic PTT calls when TG Translation is enabled. The **TG Translation** Table allows the user to program the Local PSU TG IDs that are enabled for TG Translation. The default list is empty, i.e., TG translation is disabled.

To enter a single entry into TG Translation Table, user can enter '--' in the end column.



IMPORTANT!

The VR Translation table (and corresponding PSU programming) must not contain TG IDs that are used by the trunked FNE side.

How to Program Unit ID Translation

FRC- VR Programming

Step 1: Open the Digital Setup window.

Step 2: Confirm that the **Enforce TG Matching** field is unchecked.

Digital Setup

Call Setup

- ☒ Pass Queue Response To PSU
- ☐ Local to System Call Upgrade Enabled
- ☒ Pass Deny Response To PSU

Individual Call Setup

Private Call Setup Timeout: 30.0 sec

Private Call Hang Timeout: 30.0 sec

Telephone Interconnect CCT: OFF min

Telephone Interc. Hangtime: 10 sec

P25 Frame Sync Detection Timer: 100 ms

VR Ch. Mixed Mode Hold Timer: 10 sec

☐ Enforce TG Matching

PSU Priority

Step 3: Open the Repeater Channel Setup window.

Step 4: Scroll to the far right and set the UID TRNSL. field to Yes for each required channel.

Repeater Channel Setup

Num. of Channels: 1 Current Channel: 1

+ X Copy Data

Ch #	Tx NAC(h)	Tx RSSI Thr.	Rx RSSI Thr.	Bandwidth	Steering	Steering Table	Steering Emergency	Steering Revert	UID TRNSL.	PSU Scan	NAC Linking
1	293	-70	-80	Set 1	No		Yes	No	Yes	No	Disabled

Additional Notes

1. Programming- only applicable to digital channels.
2. Programming- overrides Talkgroup Proxying and Translation features.
3. Programming- incompatible with PSU Authentication feature.
4. Programming- incompatible with Data Services and PSU Authentication.

How to Program Emergency Revert

For a Trunking System

- Step 1:** Mobile CPS → Emergency Configuration → Trunking Emergency Profiles → General → Emergency Talkback set to **Revert**
- Step 2:** Mobile CPS → Trunking Configuration → Trunking Personality → General → Trunking Emergency Profile Selection set to Profile configured in Step 1
- Step 3:** Mobile CPS → Trunking Configuration → Trunking Personality → General → Emergency Revert Type set to **Talkgroup Revert** or **System Revert**, depending on desired configuration.

(continue with either **Talkgroup** or **System** Revert Configuration as outlined below)

For Talkgroup Revert Configuration

- Step 4:** Mobile CPS → Trunking Configuration → Trunking Personality → General → Emergency Talkback Revert → Talkgroup ID set to desired ID
- Step 5:** Using FRC, import the Motorola file with the above configuration.
- Step 6:** FRC → Mobile Radio Channel Setup → Emergency Rev. Item# → set to Item # that corresponds to the desired zone/channel to be used for Emergency alarms/calls

Mobile Radio Channel Setup

Num. of Items: 80 MSU Data Copy Data

Item #	Zone #	Ch. #	Name	Pers. Type	TG# (hex)	Emergency Revert	Emergency Rev.Item#
39	4	10	REV TG	Trk.P25	130	Tg 12E	45
40	4	11	FFFE	Trk.P25	FFFE	Tactical	--
41	4	12	FFFC	Trk.P25	FFFC	Tactical	--

- Step 7:** FRC → Emergency Setup → Emergency Cancel → Timeout set to desired value

Emergency Setup

Analog Emergency
Analog Signaling Type: Modem MDC-1200

☒ Display PSU Emergency ID
☐ Send Emergency Ack Tones

Emergency Cancel
Analog Signaling Type: DTMF Tones
ANI Code: 456
Timeout: 10 s

NOTE: If Timeout is set to OFF, MSU behaviour is different for an Emergency Alarm vs Call. Refer to **Emergency Setup → Emergency Cancel → Timeout** for details.

For System Revert Configuration

- Step 4:** Mobile CPS → Trunking Configuration → Trunking Personality → General → Emergency System Revert → Revert Zone set to desired zone
- Step 5:** Mobile CPS → Trunking Configuration → Trunking Personality → General → Emergency System Revert → Revert Channel set to desired channel
- Step 6:** Using FRC, import the Motorola file with the above configuration.
- Step 7:** FRC → Mobile Radio Channel Setup → Emergency Rev. Item# → displays the Item # associated with the zone/channel programmed in Step 4/5

Mobile Radio Channel Setup

Num. of Items: 80 MSU Data Copy Data

Item #	Zone #	Ch. #	Name	Pers. Type	TG# (hex)	Emergency Revert	Emergency Rev.Item#
36	4	7	132	Trk.P25	132	Tactical	--
37	4	8	133	Trk.P25	133	Tactical	--
38	4	9	REV SYS	Trk.P25	131	-----N/A-----	54

- Step 8:** FRC → Emergency Setup → Emergency Cancel → Timeout set to value

Emergency Setup

Analog Emergency
Analog Signaling Type: Modem MDC-1200

☒ Display PSU Emergency ID
☐ Send Emergency Ack Tones

Emergency Cancel
Analog Signaling Type: DTMF Tones
ANI Code: 456
Timeout: 10 s

NOTE: If Timeout is set to OFF, MSU behaviour is different for an Emergency Alarm vs Call. Refer to **Emergency Setup → Emergency Cancel → Timeout**

For a Conventional System

- Step 1:** Mobile CPS → Conventional Configuration → Conventional System → General → Emergency Profile set to an existing Emergency Profile.
- Step 2:** Mobile CPS → Conventional Configuration → Conventional Personality → Signaling → Emergency Revert → Revert Type set to **Revert Channel**.
- Step 3:** Mobile CPS → Conventional Configuration → Conventional Personality → Signaling → Emergency Revert → Revert Zone set to desired zone
- Step 4:** Mobile CPS → Conventional Configuration → Conventional Personality → Signaling → Emergency Revert → Revert Channel set to desired channel.
- Step 5:** Using FRC, import the Motorola file with the above configuration.
- Step 6:** FRC → Mobile Radio Channel Setup → Emergency Revert → displays zone/channel programmed in Step 3/4.

Mobile Radio Channel Setup

Num. of Items: 139 MSU Data Copy Data

Item #	Zone #	Ch. #	Name	Pers. Type	TG# (hex)	Emergency Revert	Emergency Rev.Item#
28	3	3	173.975M	Cnv.Mix.NonASTR	--	Selected	--
29	3	4	764.0125M	Cnv.P25	--	Zn(3)Ch(3)	--
30	3	5	764.6125M	Cnv.P25	--	Zn(3)Ch(3)	--

Step 7: FRC → Emergency Setup → Emergency Cancel → Timeout set to desired value

Emergency Setup

Analog Emergency
Analog Signaling Type: Modem MDC-1200

☒ Display PSU Emergency ID
☐ Send Emergency Ack Tones


Emergency Cancel
Analog Signaling Type: DTMF Tones
ANI Code: 456
Timeout: 10 s

NOTE: If Timeout is set to OFF, MSU behaviour is different for an Emergency Alarm vs Call.
Refer to **Emergency Setup → Emergency Cancel → Timeout** for details.

FRC Window and Field Definitions

Documentation Conventions

The following table provides information on conventions used throughout the document.

Convention	Description	Examples
Window Name→Field Name	Used through field descriptions to refer to a specific FRC field on a specific FRC window	Repeater Info → Personality Name refers to the Personality Name field located on the Repeater Info Window
Vertical Field Name	Field grouping / Box title for a set of fields logically grouped together on an FRC window	Repeater Info → Date of Programming is the group name for the following fields: DAY, MONTH, YEAR
Range	Valid values allowed for a field with units of measurement (where appropriate) and default value identified where default value exists	Repeater Info → Personality Name: Maximum 14 alphanumeric characters Repeater Channel Setup → Tx Pwr: 20-40 dBm
Bold Text in Range Column	Factory default value	Repeater Channel Setup → Tx Pwr: 20-40 (30) dBm
<i>Italic Field Names</i>	Fields displayed without a title / label	Hardware Setup → <i>Speed Threshold</i>  15 is the <i>Speed Threshold</i> value for the Speed Field
Description	Explains what the field represents and provides details on each field value where appropriate	Mobile Radio Channel Setup → TG Mode: Enables or Disables Slaving of the VR Mode to the selected TG. 'None' → this selection assumes no specific VR Mode is linked to the TG. The VR stays in the last mode or the Mode associated with the VR Channel. 'Local' / 'System' → This selection forces the VR Mode to change to either Local or System respectively upon selection of the TG. 'User' → The Last VR Mode that was selected by the User is in effect and the User can change it as required. 'Disabled' → VR is Disabled when this TG is selected. 'OFF' → VR is in OFF mode when this TG is selected.
Notes	Restrictions / limitations related to the programming of the field; identifies dependencies on other fields, or if a feature license is required	Repeater Channel Setup → PSU Scan Must be enabled on all Repeater Channels that will be used by PSUs with Conventional Scan option enabled. Feature License - PSU Conventional Scan required for this field to be editable. Refer to VR Ordering Guides for order code Mobile Radio Channel Setup → Emergency Revert This field will be marked red (invalid) if it:

		<ul style="list-style-type: none"> • Points to MSU channel, which TG Mode is "Disabled" • Points to a 'VR Disabled' zone and channel • Points to an MSU channel, which does not have the current VR channel in the list of allowed VR channels
<i>Blue, Italic, Bold text</i> in Notes column	Feature license required for this field to be editable.	Repeater Channel Setup → PSU Scan <i>Feature License - PSU Conventional Scan</i> required for this field to be editable. Refer to VR Ordering Guides for order code
Field Name*	VR model specific fields	Mobile Radio Channel → Mob. Det* Identified as *VRX1000 ONLY field in the Notes column
Field Name α	<p>Fields that are only applicable to the connected VR</p> <p>These fields will NOT be propagated in the template file (DPD or DCD) or Radio Manager</p> <p>These fields are greyed out during offline editing except for Hardware/Software Info screen</p>	VR Common Setup → This VR IDα ID of the connected VR
Field Name ●	<p>Fields that are only applicable to the installed FRC and stored locally on its PC</p> <p>These fields will NOT be propagated in the template file (DPD or DCD)</p>	Ports → COM Port ● COM Port setting specific to the version of FRC installed on the PC
Greyed Out (Disabled) Fields	<p>Greyed out fields cannot be edited.</p> <p>Two scenarios exist:</p> <ol style="list-style-type: none"> 1) Parameters displayed are ignored by VR either due to licensing, or configuration of other fields. 2) Parameters displayed are fixed based on VR unit hardware/software. 	<p>Examples:</p> <ol style="list-style-type: none"> 1) Observed with GPS Driven Deactivation 2) Observed with Hardware/Software info

Options

Ports

Ports

COM Port • COM-6 Futurecom USB Modem #2

DVRs Port • 4060

Programming mode for MSU • YES

Field Name	Range	Description	Notes
COM Port •	N/A	Automatically selected and used when connecting directly to the VR USB Port.	The save icon sets the selected COM port as the default USB Port so it is the first port accessed for any read/write operation.
DVRs Port •	Read Only	Automatically assigned field.	
Programming Mode for MSU •	Yes No	When set to ' Yes ' the MSU is placed into programming mode whenever the VR is being programmed. When set to 'No' the MSU is still fully functional while the VR is being programmed.	The save icon saves the selected setting (yes or no) as a default on this FRC.

Repeater Setup

IMPORTANT!

Do not change VR settings unless knowledgeable with specific options. The Futurecom Repeater Configurator (FRC) program reports any obvious errors and does not allow invalid data to be saved to the VR, however, not all inconsistencies can be reported by the FRC. Successful DVRS programming requires thorough understanding of the VR, MSU and PSU programming, as well as specific User/System requirements. DVRS will operate properly only when all templates (VR, MSU and PSU) are matched. E.g.: changing APX MSU template may require an update of VR template, which in turn may require update of PSU template.

RF / Analog Setup

The values in this window are set to the correct settings upon shipping from the Futurecom factory. No changes to those values are required unless instructed otherwise by Futurecom.

Frequency Band Setup






This screen is used for selecting the adjacent channel separation. Three selections are possible – Set 1, Set 2 & Set 3, which can be either Narrowband (12.5kHz / 1.5kHz) or Wideband (25kHz / 3kHz) or NPSPAC (25KHz / 4kHz). Ensure the correct spacing (Set 1 or Set 2 or Set 3) is selected to match the portable radio programming on each VR channel – see “Repeater Channel Setup” screen, ‘Bandwidth’ field.

Rx/Tx Synthesizer Frequency Step field indicates the allowable step size of frequencies within the frequency band.

- VHF- 2.5, 5, 6.25 kHz
- UHF- 6.25 kHz
- 700MHz- 6.25 kHz
- 800MHz- 6.25 kHz

Repeater Info

This screen is provided for template maintenance purposes. The VR personality templates can be dated and referenced from this Menu screen by entering an applicable template / project description and revision.

Field Name		Options / Units	Description	Notes
Date of Programming	Day	2 digits	Indicates the day for the date of programming for this personality template.	
	Month	2 digits	Indicates the month for the date of programming for this personality template.	
	Year	2 digits	Indicates the year for the date of programming for this personality template.	
Personality Name		Maximum 14 alphanumeric, characters	Name used to reference this personality template.	
VR User Text		Maximum 32 alphanumeric, characters	Informational text to differentiate this configuration from other Repeater installations such as County name, Chief's vehicle, Fire Engine 49 etc.	
Set Repeater Password			Set Password for the Repeater	
Reset Repeater Password			Reset the Repeater Password.	
Tier Level*		<i>Tier 1</i> <i>Tier 2</i> <i>Tier 3</i>	VRX1000 Operation Mode	*VRX1000 ONLY field See table below
Feature Licenses	Authentication 	Enabled / Disabled	Showing the status of the Feature License required to enable Authentication functionality	Feature License - Authentication required to enable this feature. Refer to VR Ordering Guides
	RM-OTAP 	Enabled / Disabled	Showing the status of the Feature License required to enable Over the Air Programming functionality	Feature License - RM-OTAP required to enable this feature. Refer to VR Ordering Guides
	PSU Conventional Scan 	Enabled / Disabled	Showing the status of the Feature license required to enable PSU Scan functionality.	Feature License - PSU Conventional Scan required to enable this feature. Refer to VR Ordering Guides
	SmartConnect Extension 	Enabled / Disabled	Showing the status of the Feature license required to enable SmartConnect In-Vehicle Range Extension	Feature License - SmartConnect In-Vehicle Range Extension required to enable this feature. Refer to VR Ordering Guides
	GPS Driven Deactivation 	Enabled / Disabled	Showing the status of the Feature license required to enable GPS Driven Deactivation	Feature License - GPS Driven Deactivation required to enable this feature. Refer to VR Ordering Guides

The screenshot shows a 'User Info' window with the following fields and options:

- Date of Programming:** DAY (20), MONTH (10), YEAR (21)
- Personality Name:** Local
- VR User Text:** J
- Buttons:** Set Repeater Password..., Reset Repeater Password...
- Feature Licenses:**
 - Authentication x: Enabled
 - RM-OTAP x: Enabled
 - PSU Conventional Scan x: Enabled
 - SmartConnect Extension x: Enabled
 - GPS Driven Deactivation x: Enabled
 - PA Booster x: Disabled

'Tier' level of the VRX1000 indicates the features sets supported by the VRX1000*

Tier	Order Option	VRX1000 Feature sets supported
Tier 1	N.A. (Included with VRX1000)	Enabled by default on any VRX1000 model and supports the following operation: <ul style="list-style-type: none"> Analog Only Operation OR VRS750 Compatibility Mode
Tier 2	P25 Operation	Add-on Option to Tier 1 providing the following additional capabilities: <ul style="list-style-type: none"> P25 Digital for use on P25 Conventional FNE P25 Digital for use on P25 Trunked (FDMA) FNE without support of Enhanced Trunking features (used with Generic P25 PSUs)
Tier 3	P25 Enhanced Trunking Features P25 Encryption	Add-on Options to Tier 2 . Include the following additional capabilities: <ul style="list-style-type: none"> Forced Analog Operation for use on P25 Trunked TDMA FNE Or non-P25 FNE (such as Type II Trunking). Requires 'DVRS Enabled' PSUs. P25 Digital for use on P25 Conventional FNE. P25 Digital for use on P25 Trunked (FDMA) FNA including Enhanced Trunking features. Supports 'DVRS Enabled' PSUs and associated enhanced Trunking features. enables P25 Encryption pass through VRX1000

Hardware / Software Info

This screen is for information only and it displays the firmware revisions, model and serial number of the VR.

Update Info

This screen is for information only

Field Name	Options / Units	Description	Notes
Local Configuration ▾			
Name			for future use
Timestamp			for future use
Access Time	alphanumeric characters	Indicates the time on when the repeater's configuration was programmed locally	
CRC			for future use
Local Firmware ▾			
Name			for future use
Timestamp			for future use
Access Time	alphanumeric characters	Indicates the time on when the repeater's firmware was updated locally	
CRC			for future use
OTAP Configuration ▾			
Name	alphanumeric characters	Indicates template name of the last configuration set (DCD file) that was pushed via Motorola Radio Management.	Can give a dcd file a Template name which appears in DVRS Fileview in RM → Config Data Name
Timestamp	alphanumeric characters	Indicates the timestamp on when the configuration set was created Format: YYYYMMDD-HHMMSS	
Access Time			for future use
CRC	alphanumeric characters	Indicates the checksum of the configuration set pushed via Motorola Radio Management	
OTAP Firmware ▾			
Name	alphanumeric characters	Indicates name of the firmware bundle that was pushed via Motorola Radio Management	
Timestamp	alphanumeric characters	Indicates the timestamp on when the firmware bundle was created Format: YYYYMMDD-HHMMSS	
Access Time			for future use
CRC	alphanumeric characters	Indicates the checksum of the firmware bundle pushed via Motorola Radio Management	

Field Name	Options / Units	Description	Notes
Last Configuration [⌘]	MSU Local	Indicate the source of the configuration set: MSU – configuration is programmed via Motorola Radio Management Local – configuration is programmed locally via Futurecom Repeater Configurator	
Last Firmware [⌘]	MSU Local	Indicate the source of the firmware: MSU – firmware is programmed via Motorola Radio Management Local – firmware is programmed locally via Futurecom Repeater Configurator	
Reload OTAP Configuration from MSU		Command button to apply the last DCD file sent via RM-OTAP	<i>Feature License - RM-OTAP required to enable this feature. Refer to VR Ordering Guides for order code</i>
Reload OTAP Firmware from MSU		Command button to apply the last Firmware version sent via RM-OTAP	<i>Feature License - RM-OTAP required to enable this feature. Refer to VR Ordering Guides for order code</i>

Personality Data

This section covers the VR channels setup along with the features set required for the various operation scenarios.

Repeater Channel Setup Window

Field Name	Options / Units	Description	Notes
Ch #	1 to 192	VR Channel Number – referenced in the Mobile Radio Channel Setup when associating VR channels to Mobile Radio Modes.	Read Only Field.
Name	Seven (7) character string	VR Channel name (alias) displayed on the Control Head when the VR is enabled.	
Channel Mode	F. Duplex Simplex	Determines the VR mode of operation for the specific channel – Full Duplex or Simplex.	F. Duplex not available for VRX1000 Simplex Operation is not compatible with Rackmount Booster PA.
Fire Ground	Yes / No	Enables or Disables Fireground Signalling Capabilities on the selected VR channel.	Fireground (FG) signaling can be enabled on analog or digital VR channels only.
Channel Type	Digital Analog Mixed F. Analog TPS FA-All	Defines the VR Channel Type. Mixed Mode is selected when the same VR channel will be used by Analog and P25 PSUs.	<ul style="list-style-type: none"> Only Analog and TPS supported with Tier 1 VRX1000 Only Digital, Analog, Mixed and TPS supported with Tier 2 VRX1000 All channel types supported with Tier 3 VRX1000
Rx Freq*	[MHz] Dependent on DVR band	DVR Rx Frequency (Must match the PSU Tx Frequency).	*DVR ONLY field Rx Frequency is the same as the programmed Tx frequency when programmed in Simplex mode
Rx PL	[Hz] / DPL	VR Rx PL / DPL (Must match the Analog PSU Tx PL / DPL).	Applies to Analog, Mixed and F. Analog Mode Only.
Tx Freq*	[MHz] Dependent on DVR band	DVR Tx Frequency (Must match the PSU Rx Frequency).	*DVR ONLY field
Splx Freq*	[MHz]	VRX1000 Simplex Rx / Tx Frequency (Must match the PSU Rx / Tx Frequency).	*VRX1000 ONLY field
Tx PL	[Hz] / DPL	VR Tx PL / DPL (Must match the Analog PSU Rx PL / DPL).	Applies to Analog, Mixed and F. Analog Mode Only.
PL STE	[deg] / DPL	Analog PSU PL / DPL Squelch Tail Elimination – must be programmed to match the PSU.	Applies to Analog, Mixed and F. Analog Mode Only.

Field Name	Options / Units	Description	Notes
VR Mode	System Local User	Determines the Default VR mode when this VR channel is selected. TG Mode (Mobile Radio Channel Setup) overrides this setting.	If Local is selected, then VR Common Setup→Local Mode Allowed field must be checked.
Man. Mode Ch.	Enabled Disabled	Manual Mode Change Enables / Disables the VR mode change from the VRS button on the Control Head. If this field is set to Disabled, the VRS button still toggles between the default VR mode and OFF mode.	This field is automatically set to Enabled when the VR Mode is set to User.
Tx Pwr⁶	+20 to +40 (+34.75) dBm for DVR/DVR-LX® +20 to +34.75 (+34.75) dBm for VRX1000	Specifies the selected Tx Output Power at the VR Antenna Port on the VR Tx frequency.	FRC will allow the setting of minimum power of .1W (+20dBm) but recommend using no lower than: 1W (+30dBm) for DVR/DVR-LX 0.5W (+27dBm) for VRX1000. Actual output power is less accurate below these recommended minimum values. Goal is to balance the link between VR and PSU With Booster PA this value is ignored and is fixed at +32.5dBm / 1.80W
R-Tx Pwr⁶	+20 to +40 (+37.8) dBm for DVR/DVR-LX® +20 to +34.75 (+34.75) dBm for VRX1000	Specifies the selected Tx Output Power at the VR Antenna Port when the VR transmits on its Rx frequency to other VRs. Goal is to balance the link between VR and PSU.	FRC will allow the setting of minimum power of .1W (+20dBm) but recommend using no lower than: 1W (+30dBm) for DVR/DVR-LX 0.5W (+27dBm) for VRX1000. Actual output power is less accurate below these recommended minimum values. With Booster PA this value is ignored and is fixed at +32.5dBm / 1.80W

⁶ Default values are set for largest range and will need to be adjusted/customized for smaller ranges. See VR Introduction to Primary/Secondary Feature

Field Name	Options / Units	Description	Notes
CCT	0 to 60 min	Continuous Carrier Timer – specifies the maximum time a VR can be transmitting before its Tx function is disabled. If the CCT is set to 0 (OFF), the VR operates in continuous duty mode.	Does not affect Telephone Interconnect Calls. Phone calls have a separate CTT programmed in the Digital Setup window.
ON / OFF Trigger	RSSI Squelch Sq&RSSI	Specifies if the RSSI (signal strength) and or Squelch (signal quality) should be used to determine the channel ON / OFF status.	When the "Channel Type" is "Digital", the only valid option for this field is "RSSI". For the RSSI threshold and hysteresis configuration, see the "RSSI Thresh" column of the "Repeater Channel Setup" window and the "RSSI" group of the "Hardware Setup" window respectively. For the Squelch configuration, see the "Squelch" group in the "Hardware Setup" window.
RSSI Thresh	-127 to -50 (-115) dBm	Determines the sensitivity of the VR. The VR ignores any signals below this threshold.	The Duplexer Rx Insertion Losses as entered in the Interface to Mobile Setup screen are considered to calculate the RSSI at the Antenna Port.
Busy Lc Th⁶	-105 to -65 dBm DVR / DVR-LX 800 MHz only: -95 to -65 dBm	Threshold used during the dynamic Busy Lockout Phase if Primary / Secondary Enable BL for Voice Comm is enabled (see Digital Mode Settings).	Not applicable with Booster PA.
Rx NAC (h)	0 to FFF (293) Hex	Must match the P25 PSU Tx NAC. Serves as CAS validation in Digital Mode (equivalent to Rx PL / DPL in Analog Mode). F7E Enables the VR to receive on any NAC.	Applies to Digital, Mixed and F.Analog Mode.
Tx NAC (h)	0 to FFF (293) Hex	Must match the P25 PSU Rx NAC. Serves as CAS validation in Digital Mode (equivalent to Tx PL / DPL in Analog Mode).	Applies to Digital, Mixed and F.Analog Mode.

Field Name	Options / Units	Description	Notes
Tx RSSI Thr. ⁶	-110 to -60 (-110) dBm	When a Secondary VR detects a request for VR repeat and it does not detect any Heart Beats coming from the current Primary VR, the Secondary VR checks for activity on its Tx frequency (exceeding the Tx RSSI Th) to determine if the lack of Heart Beat is due to the Primary VR already repeating the Call. If no activity is found to exceed the Tx RSSI Th the VR will check again and if 3 heart beats are missed, the VR will negotiate becoming a Primary.	
Rx RSSI Thr. ⁶	-110 to -60 (-110) dBm	The VRs exchange Primary / Secondary messages on their Rx frequency while idle. Before a Primary VR sends out a Primary Heart Beat (HB), it checks for RF activity and HB exceeding the programmed 'Rx RSSI Th' on the Rx frequency. If the Primary VR does not detect any RF activity or HB exceeding the 'Rx RSSI Th', it will proceed with sending a Primary HB. If it detects HB exceeding the programmed 'RX RSSI Th', the Primary VR backs off and becomes non-Primary, on stand-by. If a HB is detected but its level is below the programmed 'Rx RSSI Th' the VR will stay a Primary and send its HB. If it detects RF activity on the Rx frequency, the Primary VR will postpone the sending of its HB until the Rx frequency is clear to ensure the HB can be successfully (without interference) received by the other VR.	
Bandwidth	Set 1 Set 2 Set 3	Selects the Adjacent channel spacing (12.5kHz or 25KHz or NPSPAC) as programmed in the 'Frequency Band Setup'.	See 'Frequency Band Setup' Screen.

Field Name	Options / Units	Description	Notes
Steering	Yes No	Enables ('Yes') or Disables ('No') portable initiated steering of the MSU mode (zone / channel). Based on the PL / DPL programmed in the PSU and received by the VR. The VR steers the MSU to the zone / channel that is associated with a specific Rx PL / DPL programmed in the VR Steering Table .	Applicable to Analog VR Modes only.
Steering Table	screen	Opens a steering Table that enables the user to program up to 14 different mobile modes per VR channel and the corresponding Rx PL / DPL codes that are used as steering triggers. When the VR receives a LPSU transmission with the programmed PL / DPL, it will steer the MSU to the corresponding MSU mode.	<p>Applicable to Analog VR Modes only.</p> <p>DVRS mode transitions to SYSTEM when steering occurs.</p> <p>Steering is only permitted to target MSU channels that allow DVRS operation in SYSTEM mode.</p> <p>Refer to Functional Description 'Mobile Mode Steering via PL/DPL' section for further details.</p>
Steering Emergency	Yes No	Default setting is 'No' (Disabled). When steering in emergency is Disabled, the VR suspend steering until the emergency is cleared. The VR disregards the programmed RX PL / DPL and repeats all traffic to the System. If enabled (set to 'Yes') the VR steering does not change when emergency has been declared.	Applicable to Analog VR Modes only.
Steering Revert	Yes No	Enables ('Yes') or Disables ('No') MSU revert to the originally selected zone / channel after the steering inbound call is complete and the Steering Hang Timer has expired.	<p>Applicable to Analog VR Modes only.</p> <p>Refer to Functional Description 'Mobile Mode Steering via PL/DPL' section for further details.</p>

Field Name	Options / Units	Description	Notes
UID TRNSL.	Yes No	The local PSU's ID and TG are replaced with the MSU's ID and TG.	Supported on digital channels only. Overrides TG Proxying and TG Translation features. Incompatible with Data Services and PSU Authentication.
PSU Scan	Yes No	Enables ('Yes') or Disables ('No') Enabling PSU Scan permits Conventional Scanning in conjunction with Talkgroup scanning for more comprehensive monitoring.	Must be enabled on all Repeater Channels that will be used by PSUs with Conventional Scan option enabled. Enabling this feature blocks some other features; refer to the PSU Scan section of the Functional Description document for further details. <i>Feature License - PSU Conventional Scan required for this field to be editable. Refer to VR Ordering Guides for order code</i>
NAC Linking	Disabled / Enabled / Compatibility	Disables / enables the NAC Linking feature. Compatibility Mode automatically downgrades NAC Linking operation when presence of older, non-NAC linking capable PSUs are detected Once downgraded, VR would handle both types of PSUs by using default/programmed Rx/Tx NACs. NAC Linking operation will automatically resume on subsequent VR activation (VR channel change, Mode change from Off to Local/System or power-up).	Supported for Channel Type→ Digital or Forced Analog. NAC Linking on VRX1000 is only allowed with Tier 3 Refer to help notes in Motorola CPS for "DVR Sync NAC Matching" field.

Mode Change

VR mode can be changed by the following methods:

- By Local PSU
- By Dispatcher / System PSU
- Automatic VR activation

Mode Change of VR by Local PSU ⁷

Remote Talkgroup Steering allows local PSU user to remotely change the TG / channel currently selected on the MSU by sending a call alert / page to the VR (using the VR ID) and transmitting a specific NAC.

If **Remote Talkgroup Steering** is required, the PSU must be programmed to transmit on the same DVR channel with different NACs, which NACs are then strapped to the desired MSU modes in the Futurecom Repeater Configurator Mobile Radio Channel Setup screen.

When the DVR receives a call alert page with given NAC

	MSU channel changing		MSU channel not changing	
	Classic	Flexible	Classic	Flexible
MSU channel	Steered to the preprogrammed channel	Steered to the preprogrammed channel	No change	No change
VR mode	Changed to SYSTEM	Starts with the MSU channel's preprogrammed mode	Changed to SYSTEM	Cycled through a pre-configured set of modes ⁸

The VR Tx NAC is as programmed and must be matched with the PSU Rx NAC! The PSU is programmed with various Transmit NACs (used for the steering) but the same Receive NAC (or F7E). The VR Rx NAC is programmed to match the PSU Tx NAC programming when no remote mode steering is needed.

⁷ Mode change by Local PSU is ONLY applicable for Digital VR Mode

⁸ See Selectable Modes on page 102 for more details.

Remote Mode change of VR by Dispatcher / System PSU

Dispatcher / System PSU can send a call alert (page) to a specific MSU ID, which in turn causes VR mode change in the following order: OFF-SYS-LOC-OFF.

The MSU can be programmed to support one of the following configurations:

- **Call Alert / Remote Activation Disabled** – the MSU does not respond to any Call Alert requests
- **Call Alert Enabled** – the MSU responds to Call Alerts addressed to its ID and does NOT initiate VR mode change
- **Remote Activation Enabled** – the MSU will acknowledge Call Alerts addressed to its ID and will initiate VR mode change provided the source ID of the Call Alert is programmed in the “VR Remote Activation IDs” table.
- When MSU is involved in any one of MSU features (emergency call, private call, status, etc.) MSU will not accept the call alert from FNE.
“VR Remote Activation: via Call Alert” feature is blocked by the MSU.

If “Generate Status on DVRS Mode Change” is enabled for a given DVRS Profile (in the APX MSU), the MSU will send back a mode change status to indicate the current VR mode (OFF, SYSTEM, LOCAL). Only the dispatcher console can interpret those status messages:

DVR MODE	STATUS VALUE
OFF	1
LOCAL	2
SYSTEM	3

Dispatcher can't force a non-primary VR to become a primary and can't activate a VR when a 'VR Disabled' mode is selected on the control head.

Mobile Radio Channel Setup

The VR operation may be enabled on some MSU modes and disabled on others as selected and programmed in the personality of the MSU interfaced to the VR.

The VR must be 'made aware' as to which TGs are 'DVR Enabled' and which are 'DVR Disabled'. The VR can be used only on the MSU modes listed in the Mobile Radio Channel Setup screen accessible via Futurecom Repeater Configurator. The Mobile Radio Channel Setup data is extracted by first exporting the MSU data (using the Motorola CPS) and then importing the data by using the **Import → Motorola XML** function of the Futurecom Repeater Configurator as described in the next paragraph.

Template files (DPD/DCD) are designed to handle a maximum of 2047 entries (comprised of a combination of channels and zones).

Importing Motorola XML File

Field Name	Range	Description	Notes
Zone #	Read Only		This field is extracted during the "Import → Motorola File" process.
Ch. #	Read Only		This field is extracted during the "Import → Motorola File" process.
Name	Read Only	This field shows name of the corresponding zone or channel. - indicates the zone name when channel # is "--" - indicates the channel name when there is a valid channel # displayed	This field is extracted during the "Import → Motorola File" process.
Pers. Type	Read Only	This field shows the corresponding MSU channel type: Trk.P25 - Channel is on an Astro Trunking system Trk.TII - Channel is on a Type II Trunking system Cnv.Analog - Analog channel on a Conventional system Cnv.P25 - Digital channel on a Conventional System Con.Mix.NonASTRO - Analog channel on a Conventional System where Rx channel can support both ASTRO digital & Non-Astro analog type signals Cnv.Mix.ASTRO - Digital channel on a Conventional System where Rx channel can support both ASTRO digital & Non-Astro analog type signals	This field is extracted during the "Import → Motorola File" process.

Field Name	Range	Description	Notes
TG#	Read Only	This field shows talkgroup # of the corresponding Trunking channel	This field is extracted during the “Import → Motorola File” process.
Emergency Revert	<u>Conventional System:</u> Selected, Zn(#)Ch(#), N/A <u>Trunking System:</u> Tactical, TG(#), N/A	<p>Reflects the Emergency Revert programming in CPS. Value is populated after importing the Motorola File.</p> <p><u>Conventional System:</u> Selected: CPS Emergency Revert Type is set to ‘Selected Channel’ for this zone/channel; MSU remains on current zone/channel for emergency alarms/calls</p> <p>Zn(#)Ch(#): CPS Emergency Revert Type is set to ‘Revert Channel’; MSU switches to this zone/channel for emergency alarms/calls</p> <p>N/A: CPS Signaling Type is set to ‘None’; Emergency alarms/calls are not transmitted</p> <p><u>Trunking System:</u> Tactical: CPS Emergency Talkback is set to ‘Tactical’ for this zone/channel; MSU remains on current zone/channel for emergency alarms/calls</p> <p>TG(#):CPS Emergency Revert Type is set to ‘Talkgroup Revert’; if PSU initiated emergency, MSU switches to Emergency Rev. Item# configured in FRC. FRC configuration will override the CPS TG(#).</p> <p>N/A: CPS Emergency Revert Type is set to ‘System Revert’; MSU switches to Emergency Rev. Item# configured in FRC.</p>	

Field Name	Range	Description	Notes
Emergency Rev.Item#	'--', 0-2047	<p>An emergency alarm/call initiated by a PSU switches the MSU to the zone/channel indicated by this item #. The MSU remains on this zone/channel for the emergency alarm/call after which it returns to the original zone/channel.</p> <p><u>When Field is Read Only:</u></p> <p>'--' : CPS Emergency Revert is not configured or the MSU is on a Conventional System; MSU remains on current zone/channel for emergency alarms/calls</p> <p>1-2047: CPS Emergency Revert Type is set to 'System Revert' and item # maps to the CPS Emergency Revert configuration (zone/channel); MSU switches to this zone/channel for an emergency alarm/call</p> <p><u>When Field is Editable:</u></p> <p>CPS Emergency Revert Type is set to 'Talkgroup Revert' and this field overrides the Emergency Revert field value</p> <p>(0): no revert; MSU remains on current zone/channel for an emergency alarm/call</p> <p>1 – 2047: MSU switches to the zone/channel associated with this item# for an emergency alarm/call</p>	<p>MSU must be on a trunking zone/channel that is configured for emergency revert in CPS.</p> <p>Applicable for PSU generated emergency alarms/calls only. Not applicable for MSU generated emergency alarms/calls.</p> <p>PSU Operation is non-proxied P25 which includes:</p> <p>Repeater Channel Setup → Channel Type → 'Analog', PSU on Analog personality with MDC Emergency</p> <p>Repeater Channel Setup → Channel Type → 'Digital', 'Forced Analog', 'Forced Analog All', or 'Mixed', PSU on ASTRO personality and PSU Talkgroup in VR TG Translation Table</p> <p>If Repeater Channel Setup → Fire Ground set to 'Yes', then Emergency Setup → Emergency Destination must be set to 'Both' or 'System'</p>

Field Name	Range	Description	Notes
Emergency Ack. Type	1. 'VR Ack'	1. VR sends Ack to PSU after MSU has transmitted alert to the FNE. If MSU is unable to transmit this emergency alert for any reason, VR will not send an Ack to the PSU.	1. Typically used when DVRS is deployed in a conventional setup without a console to acknowledge user's emergency.
	2. 'Site Ack'	2. VR proxies Emergency Alert through the MSU to the site and proxies the site acknowledgement to the local PSU.	2. Typically used when the DVRS is deployed in a trunking setup.

Field Name	Range	Description	Notes
	3. 'Console Ack'	3. VR proxies Emergency Alert through the MSU to the site and requests acknowledgement from the console that it has been received.	<p>3. Typically used when DVRS is deployed in a trunking setup. Requires:</p> <ul style="list-style-type: none"> Emergency Setup→VR Emergency Echo Ack to be checked. PSU CPS: Emergency Config.→Conventional Emergency Profile →Console Ack Required (DVRS) to be enabled. <p>When enabled, DVRS will proxy both FNE and Console acknowledgements to the PSU. When disabled, the DVRS will only proxy the Console acknowledgement to the PSU.</p> <p>If enabled the DVR will proxy the FNE Ack first to the PSU to prevent further emergency retries while the console ack is being processed. If disabled, the PSU will continue emergency retries until it receives the console ack.</p> <p>Should be disabled when generic PSUs are in use because they are unable to differentiate between FNE and Console acknowledgements.</p>
	4. 'Uncond. VR Ack'	4. VR acknowledges Alert from a PSU regardless of MSU's ability to proxy this alert to the FNE.	<p>4. Typically used on system analog conventional channels when MSU is unable to transmit emergency signaling (e.g.: non-ASTRO signaling type set to 'None').</p>

Field Name	Range	Description	Notes
PTT ID	Check box (checked)	Enables or Disables the pass through of the PSU PTT ID through the VR. If disabled, the MSU ID will be sent instead.	<i>When MSU channel type is analog or Type II, this field applies only to:</i> <ul style="list-style-type: none"> Analog PSU using Analog or Mixed VR channels Enhanced PSU using Mixed or Forced Analog VR channels. Exceptions when enabled: <ul style="list-style-type: none"> Analog Conventional System: MSU ID sent when local PSU ID size exceeds limit Type II Trunking System: MSU ID sent for calls (PTT/Emer PTT); Local PSU ID sent only for Emer Alert; MSU ID sent when local PSU ID size exceeds limit See notes in Analog Setup → MDC PTT ID Offset
Steer. NAC	(--) 0 to FFF Hex	Hexadecimal number used for remote change of MSU TG / channel. Must match the NAC programmed in the PSU.	Refer to the “ Remote VR Activation and Steering by PSU Call Alert (Page) ” section in VR Functional Description doc 0 or (--) indicates NO Steering
VR Ch	number	If Rptr Independent Channel Change is Disabled, this field determines which VR Channel will be automatically selected upon selection of the specified Mobile Radio Mode (TG or Channel).	The Rptr Independent Channel Change Field is found in the VR Common Setup window. Refer to Table 4 - Field Interactions Determining VR Mode on Power Up

Field Name	Range	Description	Notes
TG Mode	None Local System User Disabled OFF	Enables or Disables Slaving of the VR Mode to the selected TG. 'None' → this selection assumes no specific VR Mode is linked to the TG. The VR stays in the last mode or the Mode associated with the VR Channel. 'Local' / 'System' → This selection forces the VR Mode to change to either Local or System respectively upon selection of the TG. 'User' → The Last VR Mode that was selected by the User is in effect and the User can change it as required. 'Disabled' → VR is Disabled when this TG is selected. 'OFF' → VR is in OFF mode when this TG is selected.	The 'Disabled' setting must be selected in case of multi frequency band MSU modes (trunked or conventional) when band locking is enabled (i.e., no in-band filters are installed). In such case, if a different TG Mode is selected, the Futurecom Repeater Configurator TG Mode field will be red, and the personality can't be saved in the VR.
Manual Mode Chg.	Enabled Disabled	Enables or Disables the Mode change (SYS / LOC) via the VRS button when a specific TG is selected.	
VR Ch. All Alwd.	Yes / No	This field specifies if the user can select from any VR channel or from a limited list. The list of selectable VR channels is all VR channels if this field is configured Yes, but a more limited set of VR channels (as configured in VR Ch. List) if this field is set to No. If Rptr Independent Channel Change is Disabled, an MSU TG/Channel change will steer to the programmed VR channel, yet the user may still be able to subsequently select a different VR channel per restrictions limits defined by this field and VR Ch. List .	The Rptr Independent Channel Change Field is found in the VR Common Setup window Refer to Table 4 - Field Interactions Determining VR Mode on Power Up

Field Name	Range	Description	Notes
VR Ch. List	0 to max # of programmed DVR channels	Enables the selection of which VR channels are selectable when a specific MSU TG / Channel is selected on the MSU CH.	Applicable only if the “ VR Ch All Alwd ” field is set to “No”.
RCM (hex)	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	
Sys. Repeat	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	
Mic.Tx in Loc	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	
Non ASTRO Sign.	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	
Frequency Band	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	For APX 8500, this field is set to 'Multiband-InB' or 'Multiband-XB' depending on the DVR-MSU in-band or Crossband Configuration
TDMA X2	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	Refers to X2 type of TDMA MSU Mode.
TDMA Ph2	Read Only	This field is extracted during the “ Import Motorola XML File ” process.	Refers to Phase 2 type of TDMA MSU Mode
P25 Trunking System	MSI Non MSI 1 Non MSI 2 Non MSI 3	‘MSI’_ Default. The VR sends the ‘Status’ received from the P25 PSU to the MSU without any change. ‘Non MSI 1’ The VR adds 1 to ‘Status’ received from the P25 PSU and forwards the incremented ‘Status’ to the MSU. ‘Non MSI 2’ reserved for future use ‘Non MSI 3’ reserved for future use	Applicable only to P25 Trunking Channels.

After programming the APX MSU DVRS operation and exporting the XML file using the Motorola CPS, the data needs to be imported into the VR by using the **Import → Motorola file** function of the Futurecom Repeater Configurator. Any change to the MSU programming may require exporting and importing of a new XML file to update the VR programming personality to match that of the MSU.

Configuring the Mobile Radio Channel Settings in the VR**Hardware Setup Window**

	Field Name	Range	Description	Notes
RSSI	OFF Hysteresis	2 to 20 (5) dB	Sets the RSSI CAS OFF threshold in dB below the RSSI CAS ON Threshold (see Repeater Channel Setup window).	
	Speed	1 to 10 (5) ms	Sets the RSSI Averaging Integration Time.	
Squelch	ON Threshold	4 to 28 (16) dB SINAD	Sets the Squelch ON thresholds.	Affects Analog Mode only.
	OFF Threshold	3 to 25 (10) dB SINAD	Sets the Squelch OFF thresholds.	Affects Analog Mode only.
	Speed	10 to 150 (25) ms	Squelch Averaging Integration Time.	
FM Deviation	Audio Limit 12.5kHz 25.0kHz NPSPAC	0.75 to 2.52 (2.12) kHz		Affects Analog Mode only. Depends on the selected Channel Spacing – refer to the Frequency Band Setup . Note that the corresponding values for 25kHz channel spacing & NPSPAC are calculated based on entry for 12.5kHz
	PL 12.5kHz 25.0kHz NPSPAC	0.19 to 0.60 (0.38) kHz		Affects Analog Mode only. Depends on the selected Channel Spacing – refer to the Frequency Band Setup . Note that the corresponding values for 25kHz channel spacing & NPSPAC are calculated based on entry for 12.5kHz
	PL STE Duration	120 to 250 (150) ms	PL Squelch Tail Elimination Delay. Must be set to match the portable setting.	Affects Analog Mode only. If this field is programmed too short the squelch tail will not be fully eliminated. If it is programmed too long, the portable may unmute unnecessarily.
	AVRA / GPS Tone	Enable / Disable Check box	Enables or Disables a notification tone at MSU speaker when AVRA or GPS causes repeater mode to change	
AVRA	Automatic VR Activation (AVRA)	Enable / Disable Check box	Enables or Disables the Automated VR Activation (AVRA) Option.	

Field Name	Range	Description	Notes
AVRA, Primary / Secondary Preference Input	AVRA Function	<p>Activate Only</p> <p>Activate / Deactivate</p> <p>Toggle</p> <p>If AVRA is Enabled then this field can be set to one of the following:</p> <p>‘Activate Only’ → Once the VR is ON it can not be switched OFF via the AVRA trigger. It can only be switched OFF from the MSU CH.</p> <p>‘Activate / Deactivate’ → If the AVRA trigger is de-asserted, the VR automatically switches ON or OFF.</p> <p>‘Toggle’ → The VR is switched OFF every second time the AVRA trigger is asserted.</p>	<p>Only applicable if AVRA is Enabled.</p> <p>The ‘Activate / Deactivate’ setting is typically used when the AVRA trigger is a Portable charger. Removing the portable from the charger switches the VR ON (System Mode). Placing the Portable back in the charger switches the VR OFF.</p> <p>The ‘Toggle’ setting is typically used when the AVRA trigger is a car door switch. Closing the door the first time does not deactivate the VR.</p>
	AVRA Uses VIP on CH	<p>Enable / Disable</p> <p>Check box</p> <p>This field must be set to Enabled when the AVRA trigger is wired up to a VIP I/P on the Mobile Radio Control Head or DEK.</p>	<p>Corresponding configuration required in CPS</p>
	Input Polarity	<p>Active High</p> <p>Active Low</p> <p>Defines the VR ON / OFF trigger polarity when an external switch is wired to pin 1 of the DB15 connector on the DVR Auxiliary cable (7W083X06-01).</p>	<p>Applicable when the VR ON / OFF activation trigger is wired to the DVR Auxiliary cable.</p> <p>Not applicable when the VR ON / OFF trigger is wired to the mobile radio CH VIP.</p> <p>If set to Active High, leaving Pin 1 on the Auxiliary Cable disconnected is Active, and grounding Pin 1 is Inactive.</p> <p>If set to Active Low, grounding Pin 1 on the Auxiliary Cable is Active and leaving Pin 1 disconnected is Inactive.</p>
GPS Driven Deactivation ⁹	GPS Driven Deactivation	<p>Enable / Disable</p> <p>Check box</p> <p>Enables or Disables the GPS Driven Deactivation feature</p>	<p>Only allowed if license for feature has been obtained. If enabled, a Speed Threshold and/or a Distance Threshold must be specified</p>
	Speed	<p>Enable / Disable</p> <p>Check box</p> <p>Enables or Disables use of Speed Threshold to deactivate repeater</p>	
	<i>Speed Threshold</i>	<p>5 to 100 (15) mph</p> <p>8 to 160 (24) km/h</p> <p>Used to trigger VR deactivation</p>	<p>Only applicable if Speed is enabled. Value for km/h is approximate based on value in mph.</p>
	<i>Speed Units</i>	<p>mph, km/h</p> <p>Determines whether speed threshold is expressed in terms of “miles per hour” or “kilometers per hour”</p>	<p>Only applicable if Speed is enabled</p>

⁹ Refer to How-to section below for details on how to program the GPS driven deactivation feature

Field Name	Range	Description	Notes
<i>Threshold Logic</i>	Or, And	Determines whether VR deactivation is driven by reaching either speed or distance threshold, or whether both thresholds must be met to trigger repeater deactivation	Only applicable if both Speed and Distance are enabled. IF "And" is chosen, then VR deactivation occurs when both speed and distance thresholds are met.
Distance	Enable / Disable Check box	Enables or Disables use of a distance threshold to deactivate repeater	
<i>Distance Threshold</i>	400 to 10,000 (2500) feet 121 to 3049 (762) meters	Used to trigger VR deactivation	Only applicable if Distance is enabled. Value for meters is approximate based on value in feet.
<i>Distance Units</i>	feet , meters	Determines whether Distance Threshold is expressed in terms of feet or meters	Only applicable if Distance is enabled
AVRA Interaction: Deactivate upon	AVRA followed by GPS , AVRA or GPS	When used together with AVRA, determines if AVRA deactivate must be followed by GPS threshold(s), or whether either (AVRA or GPS) trigger is sufficient to cause repeater deactivation	Only applicable if AVRA is configured for "Activate / Deactivate" function
Fallback to AVRA when no GPS signal	Enable / Disable Check box	Determines whether a lack of GPS signal should allow automatic deactivation to occur without reaching the configured GPS threshold(s). If enabled, DVRS will wait for the configured amount of time for GPS signal to be restored, and then proceed to disable without GPS confirmation.	Only applicable if AVRA is configured for "Activate / Deactivate" function, and GPS Driven Deactivation is configured for "AVRA followed by GPS". GPS signal may be unavailable due to lack of satellite signal, or user disabling GPS at the MSU control head.
<i>Fallback Timer</i>	0.5-25.5 Minutes (0.5)	The amount of time the DVRS will wait for GPS signal to be restored, and then proceed to disable without GPS confirmation.	Only applicable if AVRA is configured for "Activate / Deactivate" function, and GPS Driven Deactivation is configured for "AVRA followed by GPS".
Primary / Secondary Preference	None / Stationary	When a Primary VR is moving within a GPS Driven Deactivation scene boundary and comes in range of another Primary VR, this field determines which VR will be Primary and which will be Secondary. None (default) indicates no preference and Primary is determined randomly. Stationary prioritizes the stationary unit as Primary and the moving VR as Secondary.	For this field to be available, there must be a GPS Driven Deactivation feature license AND the GPS Driven Deactivation feature must be enabled (see GPS Driven Deactivation checkbox, above).

	Field Name	Range	Description	Notes
Battery	Low Battery Alarm	0 to 13 (10) Volts	When the DC supply voltage drops 0.5V above the programmed threshold, a ' BATTERY LOW ' warning is displayed, and the VR sends warning tones to the portables over the air. If the voltage drops below the programmed level, the VR is disabled and ' BATTERY LOW ' alternates with ' VR ERROR ' on the MSU CH display and the VR Transmitter is inhibited. When the battery voltage reaches 0.8 V above the programmed level the alarm condition resets and the VR resumes normal operation.	
	Engine Start Alarm	0 to 9 (0) Volts	VR is typically programmed to OFF mode upon power up. If not, the Engine Start Alarm field may be enabled to prevent the VR from transmitting when the voltage drops below the programmed threshold during engine start up.	Useful only in installations where the VR is programmed to power up in System or Local mode. Recommended VR Power up mode is OFF, so this option is not typically used
	MSU RF Bypass Switch	(Checked) / Unchecked	When checked, bypasses the MSU filter when an In Band DVRS Disabled channel is selected	Required for all in-band applications. The following configuration is also required: Hardware Setup → Relay Use → Relay 1 = MSU RF Bypass Sw.
	Band Lock	Enable / Disable	In some in-band application, the Band Lock feature may need to be disabled even though there is no in-band filter provided with the VR. The typical application for Disabling the Band Lock is a Fixed VR installation where all the required isolation (min 70dB) is provided by antenna separation and no in-band filter is required.	If the MSU RF Bypass Switch option is enabled, this field is ignored. If the MSU RF Bypass Switch option is disabled, this field determines the MSU behavior if the MSU and VR operate in the same frequency band.
	External Master Light	(Checked) / Unchecked	This field needs to be enabled (checked) to control activation of an external light indicating when a VR is Primary or Permanent Primary.	This option requires external switching logic and hardware (provided by installer). Relay Use → Relay 2 must be set to 'Master Light' due to the Auxiliary Cable wiring.
Relay Use*	Relay 1*	'Not Used' ('MSU RF Bypass Sw.') 'Master Light' 'LOC Mode Light' 'SYS Mode Light' 'VR ON light' 'External Alarm' 'Duplexer Bypass Sw.'	This field identifies the option that is controlled by the Relay 1 output of the VR auxiliary cable.	Relay 1 must be assigned to the MSU RF Bypass Switch if the option is installed- option included with all in-band VRs.

Field Name		Range	Description	Notes
	Relay 2*	'Not Used' 'MSU RF Bypass Sw.' '(Master Light)' 'LOC Mode Light' 'SYS Mode Light' 'VR ON light' 'External Alarm' 'Duplexer Bypass Sw.'	This field identifies the option that is controlled by the Relay 2 output of the VR auxiliary cable.	The Master Light option is the most common use for Relay 2 and is set as the default value.
	Relay 3*	'(Not Used)' 'MSU RF Bypass Sw.' 'Master Light' 'LOC Mode Light' 'SYS Mode Light' 'VR ON light' 'External Alarm' 'Duplexer Bypass Sw.'	This field identifies the option that is controlled by the Relay 3 output of the VR auxiliary cable.	For Rackmount with External Alarm option, Relay 3 must be set to External Alarm
	Temperature Alarm	Min/OFF (0) Default (70) Max (100) Range 50-100	Alarm will sound when temperature sensor in repeater exceeds programmed temperature threshold (measured in degrees Celsius).	Only accessible if Hardware Setup→Relay Use→Relay 3→External Alarm is selected
	Output Power Alarm	Min/Default (OFF) (0) Max 5dB	Alarm will sound when output power of repeater is <i>exceeded</i> by the value programmed, or if there is a loss of power.	Only accessible if Hardware Setup→Relay Use→Relay 3→External Alarm is selected
AFC	Cumulative	Enable Disable	Enables or Disables the Cumulative Automated Frequency Control (AFC) tuning.	Default setting is Enable. Set to Disable during calibration.
	Fast	Enable Disable	Enables or Disables the Fast AFC tuning.	Default setting is Enable. Set to Disable during calibration.
	Tactical VR	Enable / Disable Check box	If a VR is to be used as a tactical repeater (without any mobile radio interfaced to it) this field must be set to Enable.	A Tactical VR model requires a different Power cable that allows the VR to be powered up by itself i.e., does not require a powered up MSU connected to it.

***Relay Use Notes:**

1. All Lights and associated external logic are to be provided by installer.
2. External Alarm for Rackmount DVR
3. Duplexer Bypass Switch option not currently available.
4. Refer to DVR-LX Installation Guide for further information

MSU Data

This screen provides MSU data for information purposes only.

PSU IDs Allowed

This menu screen is used to specify PSU IDs (or range of IDs) that can be affiliated on the system via DVRS. If analog portables are used and MDC ID pass through is required, then the PSU MDC ID must be enabled on the System and included in the PSU ID Data list of the VR. By default, the range is set to '0' to '- ', which means that all PSU IDs are allowed to talk through the DVRS. This screen is Password protected. To view the range of IDs the User needs to enter a password. The default password for viewing table is "psu".

VR Remote Activation IDs

This screen allows the user to enter the console or system radio IDs of units that can page the MSU and toggle the VR mode. The default list is empty i.e., when the MSU is paged, the VR mode is not changed. If the MSU is programmed to have the remote activation enabled, then any Call Alert Page to the MSU ID from a system unit whose unit ID is programmed in the VR Remote activation ID table, will trigger VR mode change. In addition, a Group Page to a TG the MSU belongs to will toggle the VR mode as described above.

PSU NAC Table

NACs are assigned to PSUs for TX/RX/Steering purposes and are also used for the NAC Linking feature. The VR needs a complete list of NACs being used by PSUs for TX/RX/Steering purposes so it can avoid utilizing those NACs for NAC Linking.

When the VR chooses a NAC for the NAC Linking feature, it avoids NACs listed in following locations:

- **Repeater Channel Setup** window→ Tx NAC/Rx NAC values
 - Note: NAC value F7E is used to represent any NAC; F7E needs to be further defined in the PSU NAC table (see bullet below regarding explicit list)
- **Mobile Radio Channel Setup** window→ Steer. NAC values
- **PSU NAC Table** window
 - Explicit list of PSU NACs represented by F7E used in Repeater Channel Setup

A NAC may be listed in one or more of the windows, however each NAC only needs to be listed in one location. To ensure there are enough NACs available for the NAC Linking feature, a minimum of 256 NACs must be left unassigned in the three locations above.

Use the + icon to add one record to the table for each unique NAC range or NAC value. The Mode Dec/Hex button will toggle NAC values between decimal and hexadecimal values.

Field Name	Range	Description	Notes
Start / Single (Hex / Dec)	0 to FFF (0) Hex 0 to 4095 (0) Dec	NAC value not to be used for NAC Linking feature. If there is a corresponding End value, this value is the beginning of a range of NAC values.	Clicking on the Mode Dec / Hex button above table rows will toggle values between Dec / Hex
End (Hex / Dec)	- - to FFF (- -) Hex - - to 4095 (- -) Dec	- - is used for individual NAC values. When entering a range of NAC values, this is the last NAC value in that range.	Clicking on the Mode Dec / Hex button above table rows will toggle values between Dec / Hex

Analog Setup

Field Name		Range	Description	Notes
System Mode Tones	Trailing	Check box (unchecked)	Enables (checked) or Disables (unchecked) the Trailing Tones sent by the VR to the Local PSUs to indicate state of the transmission. The tones are sent at the end of LPSU transmission.	Affects Analog VR Mode when used with Trunked MSU mode only. The tones are heard by all LPSU users that are on the selected VR channel since they are sent over the air (not generated in the LPSU).
	Lead	Check box (unchecked)	Enables (checked) or Disables (unchecked) the Lead Go Ahead Tones sent by the VR to the Local PSUs to indicate successful / unsuccessful system channel access. The tones are sent at the beginning of LPSU transmission. The LPSU user needs to do 'double PTT' to be able to hear the Lead tones.	Affects Analog VR Mode when used with Trunked MSU mode only. The tones are heard by all LPSU users that are on the selected VR channel since they are sent over the air (not generated in the LPSU).
Local Mode Tones	Trailing	Check box (unchecked)	Enables (checked) or Disables (unchecked) the Trailing Tones sent by the VR to the Local PSUs to indicate successful / unsuccessful VR transmission. The tones are sent at the end of LPSU transmission.	The tones are heard by all LPSU users that are on the selected VR channel since they are sent over the air (not generated in the LPSU).
	Lead	Check box (unchecked)	Enables (checked) or Disables (unchecked) the Lead Go Ahead Tones sent by the VR to the Local PSUs to indicate successful / unsuccessful VR transmission. The tones are sent at the beginning of LPSU transmission. The LPSU user needs to do 'double PTT' to be able to hear the Lead tones.	Affects Analog VR Mode when used with Trunked MSU mode only. The tones are heard by all LPSU users that are on the selected VR channel since they are sent over the air (not generated in the LPSU).
	Portable Trunk Simulated Access	Check box (unchecked)	Enabled (checked) only when the PSU user is expected to do 'Double PTT' and Leading Tones are enabled.	
	DTMF Remote Control Code	Up to 5 digits.	Upon receiving a matching DTMF sequence from a PSU, the VR switches from OFF or Local to System Mode. The VR and PSU must be programmed with the same DTMF sequence.	The PSU must be programmed with * as the last DTMF sign, for example 1234*.

Field Name		Range	Description	Notes
	MDC Decode Delay Time	0 to 1000 (0) ms	<p>Set to 200 ms more than MDC 'System Pretime' programmed in PSU.</p> <p>If set to 390 ms or less, the VR will wait for MDC signaling to be decoded before proceeding. If MDC is decoded VR will proceed accordingly (initiate call, emergency handling, etc.).</p> <p>If set to 400 ms or more, the VR ignores PSU emergency retries for the duration of the timer to allow proper processing of a decoded MDC1200 emergency to the system and sending of emergency Ack to the PSU.</p>	<p>If the PSU MDC 'System Pretime' is set to 50ms, this field should be programmed as 250ms.</p> <p>If the PSU MDC 'System Pretime' is set to 700 to 800ms, this field should be programmed as 1000ms.</p>
	MSU Mode Steering Hang Time	0 to 60 (0) sec	<p>When programmed to 0, the MSU stays on the steered mode after the PSU inbound call is over.</p> <p>If programmed to >0, the VR forces the MSU to return to the original MSU mode when the PSU inbound call ends and the programmed timer expires.</p>	<p>Applicable when Steering is Enabled.</p> <p>Refer to Functional Description 'Mobile Mode Steering via PL/DPL' section for further details.</p>
	Microphone Signaling	None Leading Trailing Both	Specifies the type of MDC or TPS signaling sent by the VR to the Local PSUs upon MSU Microphone PTT.	TPS signaling is applicable to TPS VR Channels only.
Encrypted Call Support	Inbound Calls Enabled	Enable / Disable Check box	When enabled the VR can proxy P25 encrypted calls while an analog VR channel is selected. Does not support DVRS enhancements. (Generic PSU calls only when selected repeater channel type is ANALOG.) Feature not supported if MSU channel is TDMA capable.	Requires Outbound Call Audio field set as Digital. Otherwise leave unchecked.

Field Name		Range	Description	Notes
	Outbound Call Audio	Digital Clear Warning Tones	<p>Digital: VR repeats encrypted calls from the FNE as a digital P25 encrypted call. Requires Inbound Calls Enabled to be checked. See Inbound Calls Enabled for limitations.</p> <p>Clear: VR repeats encrypted calls as a clear analog signal if the MSU has the required encryption key loaded. If MSU does not have the appropriate key to decrypt call VR does not repeat.</p> <p>Warning Tones: DVR will not repeat any audio and will instead repeat a tone intermittently while the encrypted call is ongoing. Does not require MSU to be encrypted. This keeps the channel busy so a local PSU does not transmit while the MSU is receiving.</p>	Applicable when selected repeater channel is selected for analog audio (Analog, Mixed (when in analog hang time) and FA-ALL)
Simplex	Simplex PPI Interval	Disabled 500 to 10000ms	When enabled (Simplex Analog VR channels only), the VR will periodically interrupt transmissions during System outbound calls and check for PSU activity. If PSU activity is detected, the VR will drop the outbound call repeat and give higher priority to the PSU Inbound call.	Applicable to Simplex Analog VR channels only.
	Fallback in Analog Simplex Mode Enabled	Check box (unchecked)	If enabled (checked), a non-Primary VR that detects a valid Inbound or Outbound Call will monitor for Primary VR repeating the call and if such is not detected, the non-Primary VR will repeat the call. The non-Primary VR only temporarily repeats the call and does not become a Primary when Primary repeat is not detected. The first few seconds of the Inbound or Outbound Call are always lost while the non-Primary VR is checking for Primary repeat and deciding if fallback is needed. MSU MIC PTT will key up both the VR and the MSU.	Applicable to Simplex Analog VR Mode only.
	PSU Analog Audio Queuing	500 to 1300 (1250) ms	Defines the analog audio buffer, which prevents the loss of audio at the beginning of transmission while the MSU is acquiring channel grant. Longer time value may cause the PSU user to hear the tail end of his own transmission.	Applicable to Trunking systems where system access channel grant may take 1000 – 1500ms.

Field Name		Range	Description	Notes
	MDC PTT ID Offset	0 to 16711680 (0) Hex	<p>This value is added to the PSU MDC ID while proxying a call to a P25 Trunking system. This allows a set of local PSU IDs that have a smaller range than the system to be shifted into the valid range of system IDs.</p> <p>For example, an offset of 100 000 + PSU ID 1 means the ID sent to the MSU would be 100 001. The offset can also be used to decrease ID values received from the System. For example, with an offset of 100 000, when an ID comes in from the system as 100 002, an ID of 2 is sent to the PSU.</p>	<p>1. Mobile Radio Channel Setup → PTT ID field should be set to Disabled so that the MSU IDs will always be used for the following scenarios:</p> <ul style="list-style-type: none"> when PSUs have different MDC PTT ID Offset values (from 2 different agencies) when the system has the smaller range of IDs compared to the range of local PSU IDs <p>2. PSU MDC IDs are limited up to 0xFFFE. If an outbound call is received with an ID above the MDC ID limit, the VR will send an ID of 1 to the PSU.</p>
PSU Priority	Outbound Takeover by Voice Allowed	Check box (unchecked)	<p>When enabled (checked), the VR allows an analog PSU voice call to takeover when the MSU is receiving from the system and the VR is repeating this outbound call. When disabled (unchecked), the VR ignores all inbound calls from a PSU and continues repeating the outbound system call.</p>	<p>If the MSU is unable to proxy the call and Block Fallback to Local Repeat is unchecked, the DVR drops the outbound system call and the PSU call is repeated locally by the DVR.</p> <p>DVR DUPLEX REQUIRED</p>
	Outbound Takeover by Signaling Allowed	Check box (unchecked)	<p>When enabled (checked), the VR allows analog PSU signaling to take over when the MSU is receiving from the system and VR is repeating this outbound call. When disabled (unchecked), the VR ignores all signaling requests from a PSU and continues repeating the outbound system call.</p>	<p>Outbound Takeover by Signaling setting is dependent on Outbound Takeover by Voice Allowed.</p> <p>DVR DUPLEX REQUIRED</p>

Field Name		Range	Description	Notes
	Local to System Call Upgrade Enabled	Check box (unchecked)	<p>When a Call from a Local PSU (affiliated through the VR) has been put in the Queue by the System or blocked by MSU conflicting service, and System grant is received during the VR's Local repeat of the PSU Call, one of the following occurs:</p> <p>* if the Local to System Call Upgrade Enabled is checked → the VR promotes the Local Call to System so that the remainder of the PSU Call is repeated to the System Users or</p> <p>* if the Local to System Call Upgrade Enabled is unchecked → the VR repeats the Call Locally only until the Call is completed.</p>	<p>Requires Block Fallback to Local Repeat to be unchecked.</p> <p>This is only applicable if the fallback local repeat was caused by:</p> <ol style="list-style-type: none"> 1) No response from the system (System channel acquisition timeout) 2) No trunking resource available (Queue response from System) 3) MSU Conflicting Service (e.g.: MSU menu call menu open) <p>If the call request to the system by the MSU was denied/rejected the local repeat does not upgrade to a system call.</p>

VR Common Setup

Field Name		Range	Description	Notes
	Local Mode Allowed	Check box (checked)	Enables / Disables Local VR Mode selection by the User through the control head or remote activation methods.	To prevent fallback to local repeat when system not available, refer to "Block Fallback to Local Repeat"
	Rptr Independent Channel Change	Check box (checked)	When Enabled (checked) the VR channel can be selected independently from the selected MSU channel. When Disabled (unchecked), the VR channel is strapped to the selected MSU channel.	Refer to Table 4 - Field Interactions Determining VR Mode on Power Up
Power UP Options	Mode	Fixed Last Programmed	Specifies the VR Mode upon Power Up. When 'Programmed' is selected, the VR Mode is as programmed for the selected VR channel or MSU Mode.	If AVRA is Enabled, then Power Up mode is driven by the AVRA input.
	Fixed Mode	System Local OFF	Specifies the VR Mode when Fixed Power up option is selected. Typical recommended setting is OFF.	Default setting for vehicular mount models is OFF
	Channel	0 to max. value programmed in Repeater Channel Setup. 0 displayed as 'Disable'	Specifies the Default VR Power up Channel.	When set to 'Disable' (default) the VR reverts to the last used channel upon power up.

Field Name	Range	Description	Notes
Inactivity Timer	0 to 120 (0) min	If the VR is not active (does not receive any local PSU calls) for the programmed period, it will automatically switch from System or Local to OFF Mode. The VR sends warning tones to alert the Local PSU users every minute during the last 5 minutes prior to switching OFF.	Outbound calls, received by the MSU and repeated by the VR will not reset the timer.
Display	PTT ID	Check box (checked)	Enables / Disables the display of Portable PTT ID on the Control Head.
	TG ID	Check box (unchecked)	Outbound calls TG ID is displayed (when enabled) during proxied calls as well.
	Hang Time	0-5 (0) sec	Determines the hang time during which the ID remains displayed after the call has ended.
Repeater Active Tones	Check box (unchecked)	Controls the sending of tones when the VR changes to System mode. The tones are transmitted over the air to all Local PSUs tuned to the same VR conventional channel.	<p>Tones are sent for the following mode changes:</p> <ul style="list-style-type: none"> - OFF to SYS - LOC to SYS <p>When Local Mode Active Tones field is enabled, the tones are sent as outlined for that field instead of as outlined above.</p> <p>Refer to Table 5 - Repeater Active Tones enabled</p>
Local Mode Active Tones	Check box (unchecked)	Controls the sending of tones when the VR changes to Local mode. The tones are transmitted over the air to all Local PSUs tuned to the same VR conventional channel. These tones will be sent in addition to the tones when the VR changes to System mode.	<p>Requires enabling of the Repeater Active Tones field and now tones will be sent according to the following mode changes instead:</p> <ul style="list-style-type: none"> - OFF to LOC - OFF to SYS <p>Additionally, tones will be sent for the following mode changes for Analog/Mixed VR Channels:</p> <ul style="list-style-type: none"> - LOC to SYS - SYS to LOC <p>Refer to Table 6 - Repeater Active Tones & Local Mode Active Tones enabled</p>

Field Name	Range	Description	Notes
VR Active Warning Tone Interval	0 to 255 (0) sec	When the VR is in either Local or System Mode, it can be programmed to sound "VR Active" Tones in the MSU Speaker. This field specifies the repeat interval between those tones.	
MSU Mic call Local Repeat in LOC Mode*	Check box (checked)	<p>When the VR is in the LOCAL mode, this setting determines if MSU Mic calls are repeated by the VR to the Local PSUs (when checked/enabled) or not (when unchecked/disabled). This option is related to 'MSU System PTT in Local Mode' option in the MSU CPS which enables MSU Mic call repeat to system while VR is in LOCAL mode. Typically, in LOCAL mode Mic calls are repeated only to Local PSUs by disabling 'MSU System PTT in Local Mode' and enabling 'MSU Mic Call Local Repeat in LOC Mode' option.</p>	<p>*DVR / DVR-LX ONLY field</p> <p>In single VR user applications this option could be used to disable local repeat and prevent audio feedback from MSU Mic and LPSU when the user is inside the vehicle.</p> <p>If 'MSU System PTT in Local Mode' option in MSU is enabled, MIC audio is transmitted to system.</p> <p>Refer to Table 3 - Summary of Local Mode Microphone Audio Handling - Programmable Options</p>

Field Name	Range	Description	Notes
MSU Mic call Local Repeat in SYS Mode	Check box (checked)	<p>When the VR is in the SYSTEM mode, this setting determines if MSU Mic calls are repeated by the VR to the Local PSUs.</p> <p>When disabled (unchecked) the VR does not transmit Mic audio to the LPSUs when the MSU Mic is PTT-ed and the VR is in the SYSTEM mode.</p> <p>When enabled (checked), MSU Mic call audio is transmitted by both the MSU and the VR when the VR is in SYSTEM Mode. This is default option for VR.</p>	In single VR user applications this option could be used to disable local repeat and prevent audio feedback from MSU Mic and LPSU when the user is inside the vehicle.
VR Activation via MSU Mode Change	Check box (unchecked)	Enables / Disables the VR activation by changing the selected MSU Mode. If disabled and the VR is in OFF mode, changing the MSU selection to a new mode programmed for SYSTEM or LOCAL will not cause any change to the VR mode (VR stays OFF). If enabled and the MSU mode is changed to a new one programmed for an active mode, then the VR will switch from OFF to SYSTEM or LOCAL respectively.	<p>This field is only considered when the user changes MSU mode via the control head channel selector. It is not used when modifying MSU mode via remote steering.</p> <p>If Rptr Independent Channel Change = OFF, and VR Activation via MSU Mode Change = ON, then all fields within the Power Up Options frame should be disabled/greyed.</p>
System Channel Acquisition Time	600 to 6000 (2000) ms	Determines the VR wait time for the system grant before the VR decides what tones (Ack or NACK) must be sent to the Local PSUs and starts local repeat.	This timer also determines the maximum number of retries that will be made by the VR to acquire a system channel. These retries are sent every second so if the intent is to allow 2 retries, the timer needs to be set to 1800 – 2000ms to allow sufficient response time.

Field Name	Range	Description	Notes
This VR ID ☐	0 to 16777215 (MSU ID) 0 displayed as 'MSU ID'	Specifies the ID of the VR, which is used for remote VR mode and TG change.	If set to 'MSU ID' the VR will assume the ID of the currently interfaced MSU. Refer to “Remote VR Activation and Steering by PSU Call Alert (Page)” section in VR Functional Description document
Block Fallback to Local Repeat	Checkbox (unchecked)	When this box is checked and the MSU can't reach the system, this prevents the DVR/DVR-LX from repeating locally.	
MSU RF Bypass Switch Extension (APX 8500 and All Band Antenna)	Checkbox	Bypasses the MSU filter when a cross band channel is selected.	Required for inband application for APX8500 w All Band antenna. The following configuration is also required: Hardware Setup → MSU RF Bypass Switch = checked (enabled) Refer to DVR-LX Installation Guide for further information

Table 3 - Summary of Local Mode Microphone Audio Handling - Programmable Options

VRX1000:

MSU CPS MSU System PTT in Local Mode	Tx Mic Audio to FNE / system	Tx Mic Audio To Local PSUs	Comment
<input type="checkbox"/>	No	Yes	Typical setting
<input checked="" type="checkbox"/>	Yes	No	

DVR / DVR-LX:

MSU CPS MSU System PTT in Local Mode	VR FRC MSU Mic Call Local Repeat in LOC Mode	Tx Mic Audio to FNE / system	Tx Mic Audio To Local PSUs	Comment
<input type="checkbox"/>	N/A*	No	Always	*Mic audio always goes to local PSUs regardless of FRC field configuration
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Yes	No	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Yes	Yes	

Table 4 - Field Interactions Determining VR Mode on Power Up

FIELD: Rptr Independent Channel Change	FIELD: VR Activation via MSU Mode Change	VR Mode on Power Up is Determined By
Disabled	Enabled	Follows TG Mode for the selected MSU channel, as configured on the Mobile Radio Channel Setup window
Disabled	Disabled	Power Up Options
Enabled	Disabled	Power Up Options
Enabled	Enabled	Power Up Options

Table 5 - Repeater Active Tones enabled

Channel/Transition	OFF → SYS	OFF → LOC	LOC → SYS	SYS → LOC
Analog	✓	-	✓	-
Digital	✓	-	✓	-
Mixed	✓	-	✓	-
Forced Analog	✓	-	✓	-
TPS	✓	-	✓	-
Forced Analog All	✓	-	✓	-

Table 6 - Repeater Active Tones & Local Mode Active Tones enabled

Channel/Transition	OFF → SYS	OFF → LOC	LOC → SYS	SYS → LOC
Analog	✓	✓	✓	✓
Digital	✓	✓	-	-
Mixed	✓	✓	✓	✓
Forced Analog	✓	✓	-	-
TPS	✓	✓	-	-
Forced Analog All	✓	✓	-	-

MSU Interface Setup

Field Name		Range	Description	Notes
	VR Language Selection	'English' 'French'	Specifies the VR Language Selection, which should match the MSU language selection.	If the MSU is using a different language selection besides English or French, the VR should be set up for English.
	Number of Impolite Retries	0 to 15 (5)	Specifies the number of impolite retries sent by the VR to the System upon receiving an Emergency Alarm from the PSU.	Applicable to Conventional MSU Mode. It is recommended that a longer sequence is programmed in the VR compared to what is programmed in the PSU.
	Number of Polite Retries	0 to 15 (5)	Specifies the number of polite retries sent by the VR to the System upon receiving an Emergency Alarm from the PSU.	Applicable to Conventional MSU Mode. It is recommended that a longer sequence is programmed in the VR compared to what is programmed in the PSU.
	Number of Emergency Retries	0 to 15 (5)	Specifies the number of Emergency retries sent by the VR to the System upon receiving an Emergency Alarm from the PSU.	Applicable to Trunked MSU Mode
	Fast Retries Timer	500 to 1500 (750) ms	Amount of time the VR will wait for a response from Trunking system to a previous request.	
	Slow Retries Timer	1000 to 5000 (3000) ms	Amount of time the VR will wait to allow conventional system to respond to a previous request.	
	Response Pending Timer	500 to 2000 (750) ms	Amount of time the VR will wait for a response. VR will stop retries but hold off from sending other Proxy Requests until it receives a response or the timer expires.	
VR UI	Menu Timeout	0 to 120 (5) s	Specifies the VR Selection Menu Timeout	0 = No Timeout
	Short DVRS Button Press	'VR Menu' 'VR Activation / Deactivation'	Specifies the Short DVRS Button press selection assignment. VR Menu: Provide access to multiple VR functions on the mobile control head display. VR Activation/Deactivation: Toggle active state of VR.	

Field Name	Range	Description	Notes
Long DVRS Button Press	<p>'None'</p> <p>'VR Activation / Deactivation'</p> <p>'Permanent Primary Control'</p> <p>'VR Menu'</p>	<p>Specifies the Long DVRS Button press selection assignment.</p> <p>None: Button press does nothing.</p> <p>VR Activation/Deactivation: Toggle active state of VR.</p> <p>Permanent Primary Control: Behaviour depends on configuration. (See notes column)</p> <p>VR Menu: Provide access to multiple VR functions on the mobile control head display.</p>	<p>Permanent Primary Control depends on Primary/Secondary Setup → Permanent Primary → Status and Control fields.</p> <p>When Status and Control are both checked, long button press always promotes the VR to Active Permanent Primary.</p> <p><i>Standby PP → Active PP</i> <i>Active PP → Active PP</i></p> <p>If only Control is checked, long button press always toggles Permanent Primary state on/off.</p> <p>Exception: if VR is currently Standby Permanent Primary, long button press promotes it to Active Permanent Primary.</p> <p><i>Primary → Active PP</i> <i>Secondary → Active PP</i> <i>Active PP → Primary/Secondary*</i> <i>Standby PP → Active PP</i></p> <p>*depending on presence of another PP</p>

Emergency Setup

	Field Name	Range	Description	Notes
Analog Emergency	Analog Signaling Type	Disable MDC1200 ANI-5 Tones	Determines the type of emergency signaling used by the Local Analog PSUs. When ANI-5 Tones is selected, the PSU must be programmed to transmit 4 Tones followed by B - for example 1234B. The Emergency Ack sent by the VR to the PSUs will be the same tones followed by A (i.e., 1234A)	Affects Analog Mode only.
	Display PSU Emergency ID	Enable / Disable Check box	Enables / Disables display of the Local PSU Unit ID on the MSU control head of the current Primary VR during the processing of an Emergency.	The PSU Unit ID will also appear on the display of the other local PSUs if they are programmed accordingly. The local PSU ID during Emergency may also be displayed on the dispatcher console.
	Send Emergency Ack. Tones	Enable / Disable Check box	Enables / Disables the Emergency Ack Tones sent by the VR to Analog PSUs.	Affects Analog Mode only. All Tones sent by the VR in Analog Mode are heard by all PSUs tuned to the same VR Channel, which PSUs are within the VR radio coverage area.
	Portable Ack Required	Enable / Disable Check box	Enables / Disables the Emergency Ack signaling sent by the VR to the PSU when the VR receives a PSU Emergency Alarm.	Default setting is Enabled.
	Attempts Timeout	30 to 255 (30) s	After decoding an Emergency request from a PSU, a Secondary VR waits for the duration of this timer and if no other emergency request is received from the PSU, the counter will be cleared. If another emergency request is received, the VR will increment the counter accordingly – refer to the Attempts Counter Setting.	

Field Name	Range	Description	Notes
Attempts Counter	0 to 10 (4)	Determines the number of PSU Emergency attempts a Secondary VR will need to detect before it switches to Primary System Mode and processes the Emergency to the System. This counter is reset when the VR sends an Ack to the PSU or when the Attempts Timeout timer expires.	When set to 0 – the Secondary VR will not monitor if the PSU Emergency is being serviced by a Primary VR or not.
ANI 5 Tone Types	EEA CCIR EIA	Determines the ANI 5-Tone Type. Must match the Analog PSU programming.	Affects Analog Mode only.
FG Emergency Destination	Local System Both	Determines the routing of Emergency message received by the VR from a Local PSU on a FG enabled VR channel.	Applicable to VR channels which have FG signaling enabled.
Block Emergency Call State	Yes / No	<p>YES - While in Emergency Call State, if 'Block Emergency Call State' is set to 'YES', VR would forward all calls received from the analog PSUs without leading PTT ID as regular calls and not emergency calls.</p> <p>NO - While in Emergency Call State, if 'Block Emergency Call State' is set to 'NO', VR would forward all calls received from the analog PSUs without leading PTT ID as emergency calls.</p>	<p>Applicable to Analog VR mode and analog PSUs only.</p> <p>If emergency alarm or call was declared by an analog PSU, the VR enters Emergency Call State and remains in this state until all the MDC PSU emergencies are cancelled by the PSU or VR.</p> <p>The VR Emergency Call State is cancelled by pressing the DVRS button, by preprogrammed emergency cancel timer or remotely via Emergency Cancel ANI code.</p>
Emergency Cancel	Analog Signaling Type	Disable ANI 5 to Tones DTMF	If enabled, the VR will clear the emergency upon detection of the programmed Emergency Cancel Code. Affects Analog Mode only.

Field Name	Range	Description	Notes
ANI Code	number	This field specifies the Emergency Cancel ANI / DTMF Code sequence. Must match the Analog PSU programming.	Affects Analog Mode only. Applicable only if the Emergency Cancel Signaling Type Field is Enabled. The PSU must be programmed with * as the last DTMF sign, for example 456*.
Timeout	OFF to 1200 sec	If programmed ,the VR will automatically clear the emergency upon expiration of the programmed timer. For details refer to Notes¹ below.	Affects all modes.
Digital Emergency	VR Emergency Echo Ack Enabled	If enabled, the VR proxies the FNE Ack first to the PSU to prevent further emergency retries while the console Ack is being processed. If disabled, the PSU continues emergency retries until it receives the console ack. Should be disabled when generic PSUs are in use because they are unable to differentiate between FNE and Console acknowledgements.	Applicable when Mobile Radio Channel Setup → Emergency Ack. Type is set for Console Ack and PSU is configured for Console Ack Required (DVRs) (APX CPS, Emergency Config. → Conventional Emergency Profile)
	Portable Ack Required	Enables / Disables the sending of low level Ack by the VR to the PSU upon receipt of an Emergency Alarm.	The Emergency Ack type is sent by the VR depending on its programming – VR Ack / Site (FNE) Ack or Console Ack. Default setting is Enabled.
	TG1 Translation Enabled	When enabled and a PSU emergency is received (on default TG1), the VR translates the TG ID to match the currently selected MSU TG ID. This way the emergency is announced on the selected MSU TG, not on TG 1, which may not exist in the specific Trunking system.	Applicable to Fireground Analog, Mixed and TPS type VR channels.

Field Name	Range	Description	Notes
Switch VR from LOC to SYS if MSU in Emergency	Enable / Disable Check box	When the VR is in the LOC mode and the user presses the Emergency button on the MSU CH the VR will switch from LOC to SYS mode when this option is enabled (box is checked). If the option is not enabled, the VR stays in LOC mode after Emergency is declared on the MSU.	

Note 1:

If Emergency Cancel Timeout is set to OFF:

- If VR receives Emergency Alarm Request from LPSU it issues command to MSU to revert to the zone/channel specified in the Mobile Radio Setup Screen. After processing Emergency DVR sends command to MSU to revert to the original zone/channel.
- If VR receives Emergency Alarm Call from LPSU it issues command to MSU to revert to the zone/channel specified in the Mobile Radio Setup Screen and then proxy call to MSU on reverted zone/channel. VRS will stay on the reverted zone/channel indefinitely until LPSU cancels Emergency.

If Emergency Cancel Timeout is set to the value from 5 to 1200 sec:

- If VR receives Emergency Alarm Request from LPSU it sends command to MSU to revert to the original zone/channel after timeout expires.
- If VR receives Emergency Alarm Call from LPSU and Emergency Cancel Timeout already expired it issues command to MSU to revert to the zone/channel specified in the Mobile Radio Setup Screen and then proxy call to MSU on reverted zone/channel. After call is finished VR will send command to MSU to revert back to the original zone/channel after timeout expires.
- If LPSU cancels Emergency during Emergency Cancel Timeout timer running VR will revert MSU to the original zone/channel.

Tone Setup

The tones setup screen allows programming of custom tones / tone sequences, which are sent by the VR to the Analog PSUs during Analog Mode of operation only.

If no custom tones are programmed, the VR will send the default sets of tones.

NOTE:

The tones sent by the VR in analog mode are heard by all analog PSUs, which are tuned to the same VR channel and are within the VR RF coverage area.

Station ID Setup

Morse Code

The Morse code option needs to be programmed only when a VR is to be used as a fixed repeater and the FCC rules require transmission of Repeater ID via Morse Code.

Digital Setup

	Field Name	Range	Description	Notes
Call Setup	Pass Queue Response To PSU	Enable / Disable Check box	If a Local PSU (affiliated through the VR) PTTs and the Call is Queued by the Trunking System, the VR does one of the following: * if the Pass Queue Response Box is checked → the VR sends a Queue message to the PSU and forces the PSU to wait until System grant is received or * if the Pass Queue Response Box is unchecked → the VR enables the PSU Call to be repeated locally (to the other Local PSUs while it is not repeated on the System side).	
	Local to System Call Upgrade Enabled	Enable / Disable Check box	When a Call from a Local PSU (affiliated through the VR) has been put in the Queue by the System or blocked by MSU conflicting service, and System grant is received during the VR's Local repeat of the PSU Call, one of the following will occur: * if the Local to System Call Upgrade Enabled is checked → the VR promotes the Local Call to System so that the remainder of the PSU Call is repeated to the System Users or * if the Local to System Call Upgrade Enabled is unchecked → the VR repeats the Call Locally only until the Call is completed.	This setting is applicable if the Pass Queue Response to PSU is Disabled i.e., Unchecked or the System Channel Acquisition time (see System Setup 2) has been exceeded.
	Pass Deny Response To PSU	Enable / Disable Check box	If a Local PSU (affiliated through the VR) PTTs and the System sends back a Deny response, the VR does one of the following: * if the Pass Deny Response Box is checked → the VR sends a Deny message to the PSU and the call is cancelled. * if the Pass Deny Response Box is unchecked → the VR enables the PSU call to be repeated locally (to the other Local PSUs) but not to the System.	

	Field Name	Range	Description	Notes
Individual Call Setup	Private Call Setup Timeout	5 to 60 (30) sec	Determines the time a Local PSU waits after initiating a Private Call to another Local PSU to receive a reply from the destination Local PSU. If the timer expires before the destination PSU replies, the VR cancels the Private Call. Must be set to match the settings of the PSU.	Affects Private Calls between Local PSUs only. The VR handling of Private Calls between Local and System PSUs is based on the Timeout settings of the P25 System.
	Private Call Hang Timeout	10 to 60 (10) sec	If no PSU activity is detected for the duration of this timer, the VR cancels the Private Call and is ready for servicing other calls.	
	Telephone Interconnect CCT	OFF to 60 (OFF) minutes	If a telephone call between a local PSU and the Trunking system is processed by a given VR and the call exceeds the programmed timer, the call will be automatically disconnected. This timer applies to phone calls only.	
	Telephone Interc. Hangtime	10 to 60 (10) sec	If no call activity is detected for the duration of this timer, the VR cancels the phone call.	
	P25 Frame Sync Detection Timer	30 to 255 (100) ms	Upon Carrier Activated Squelch (CAS) activation, if the VR digital decoder does not detect P25 Frame sync before this timer expires, the VR analog decoders will be switched on (i.e., PL / DPL, DTMF, MDC1200...).	Applicable to Mixed Mode VR Channels only.
	VR Ch Mixed Mode Hold Timer	0 to 255 (10) sec	This timer determines the VR Mode Hang Time. If VR receives a call from an Analog PSU, the VR will stay in Analog mode until this timer expires. Any System reply received before the timer's expiration will be transmitted in Analog Mode. The timer is started when the originating Analog PSU dekeys. Upon expiration of the timer, the VR switches to digital repeat mode.	Applicable to Mixed Mode VR Channels only. When a Mixed Mode VR channel is selected, the default VR mode is P25 Digital. For details on Analog Call Handling when timer is running see Table 7: Analog Group Call Handling when Mixed Mode Hold Timer Running

	Field Name	Range	Description	Notes
	Enforce TG Matching	Check box (unchecked)	When this box is unchecked (default), it allows Local PSU users to switch to different TGs and their calls to be proxied by the VR regardless of the selected MSU TG (if it is 'DVRs Enabled'). When this box is checked, the Local PSU and MSU must be on the same TG to establish communications. If the Local PSU and the MSU are on different TGs, the Local PSU will not be able to affiliate and as a result it will not be able to make calls until the TG selection is matched.	Applicable to Digital & Mixed Mode only.
PSU Priority	Inbound Takeover Allowed	Check box (unchecked)	When enabled (checked), the VR gives higher priority to a LPSU call initiated during an ongoing LPSU call.	
	Outbound Takeover by Signaling Allowed	Check box (unchecked)	Enables / Disables the PSU Signaling takeover when the MSU is receiving and VR repeating an outbound call.	
	Outbound Takeover by Voice Allowed	Check box (unchecked)	Enables / Disables the PSU Voice takeover when the MSU is receiving and VR repeating an outbound call.	
	Network Status Reporting Interval	0 to 255 (45) sec	Determines the intervals for sending Trunking Network Status messages (Failsoft, Out of Range or Site Trunking) as well as 'Local Mode' Indication to the Local PSUs.	The Local PSU will wait two times the programmed interval before it declares being Out of Range.
	PSU Digital Audio Queuing	700 to 1800 (1250) ms	Defines the digital audio buffer, which prevents the loss of audio at the beginning of transmission while the MSU is acquiring channel grant. Applicable to Trunking systems where system access channel grant may take 1000 – 1500ms	Reducing the buffering time provides lower throughput delay, however, may result in truncated audio when accessing the system due to poor coverage takes longer.
	P25 Preamble Length	7.5 to 265 (40) ms	This setting must be matched with the APX PSU programming to ensure adequate PSU unmuting.	

	Field Name	Range	Description	Notes
	PSU Affiliation Timeout	0 to 72 (12) hrs	Determines the time a PSU ID will be kept in the VR affiliation table without detecting any activity from the PSU. After the timer has expired, the VR deregisters the PSU and sends a deregistration request to the system.	Recommended setting should match that of the 'Affiliation Inactivity Timeout' of the System
	Adaptive Power Control Enabled	Check box (unchecked)	If this box is checked the VR sends P25 messages to the Local PSUs to adjust their transmit power depending on the received signal strength. Enabling this feature is NOT recommended in applications where more than one PSU are used with a single simplex VR since it will affect the PSU-to-PSU communications range. If this box is unchecked the Portable power levels will be set to the codeplug default.	Extends the battery life of the XTS / APX Generic and 'DVRs Enabled' Portables when they are operated in digital mode.
	Pass Scan Indication to PSU	Check box (unchecked)	When this box is checked, the local PSU icon will indicate that the audio is coming from the MSU's landed channel.	
PSU Authentication	Allow Local Repeat for System Authentication Failed PSUs	Check box (unchecked)	When enabled (checked), VR allows Local-Only calls from Local PSUs that failed System Authentication.	Feature License - Authentication required for this field to be editable. Refer to Ordering Guide for order code
	Declare Duplicate ID condition after N Generic PSU calls	Disable, 0 to 7 (0) attempts	When enabled and the PSU ID is authenticated, declare Duplicate ID only after receiving programmed Number of consecutive voice call attempts from generic PSU (calls are not preceded by call request).	Disable on Simplex channel if Talkaround (TA) upon no DVRs communication * is enabled on PSU. Feature License - Authentication required for this field to be editable. Refer to VR Ordering Guides for order code

	Field Name	Range	Description	Notes
PSU Initiated VR Mode Change	Classic Operation	Check box (checked)	When enabled (checked), on receiving a call alert (Page) from Local PSU the VR can steer MSU channel and change VR mode from OFF / LOCAL to SYSTEM mode.	<ul style="list-style-type: none"> - VR Mode changes to SYSTEM regardless of programmed Repeater Channel Setup→VR Mode or Mobile Radio Channel Setup→TG Mode for the channel. - Refer to Table 8 - Mode Change Handling for all scenarios including exception where SYSTEM mode is not allowed. - Classic Operation is recommended for vehicular deployment
	Flexible Operation	Check box (unchecked) Selectable Modes: SYSTEM, LOCAL, OFF all checked by default	If enabled, on receiving a call alert (Page) from Local PSU the VR can steer MSU channel and change VR mode to that programmed for the MSU channel or cycle through VR modes (SYSTEM, LOCAL & OFF) based on checkboxes selected	<ul style="list-style-type: none"> - Selecting only OFF checkbox is not allowed in Flexible operation. - Upon MSU Channel Steering, the Mobile Radio Channel Setup→TG mode assigned to the channel takes priority. - Flexible Operation is more suitable for Fixed Location deployment - When LOCAL is checked: VR Common Setup→Local Mode Allowed field must be checked

*Note for operation on Authentication capable systems:

- On Simplex VR channel, when Talkaround (TA) upon no DVRS communication is enabled in the PSU programming, consider disabling Duplicate ID detection from Generic PSU voice call on VR by setting **Declare Duplicate ID condition after N Generic PSU calls** to Disable.
- It is recommended to disable BL; since due to the System Authentication timing, the VR may process messages/emergency alerts from a non-authenticated duplicate ID LPSU.

Table 7: Analog Group Call Handling when Mixed Mode Hold Timer Running

PSU TG in TG Translation Table	VR Common Setup → Block Fallback to Local Repeat	Result
Yes	N/A	Voice repeated locally and sent to MSU
No	Unchecked	Voice repeated locally
	Checked	Call is denied. User must wait until timer expires to make a PSU call.

Table 8 - Mode Change Handling

Allowed VR Modes		VR Channel Config					VR Mode Allowance Rules
		User	Local	Local-Fixed	System	System-Fixed	
MSU Channel Config	Off	OSL	OSL	OSL	OSL	OSL	All modes allowed
	Local	OSL	OSL	OSL	OSL	OSL	All modes allowed
	System	OSL	OSL	OSL	OSL	OSL	All modes allowed
	Local-Fixed	OL	OL	OL	OL	OL	LOCAL / OFF only
	System-Fixed	OS	OS	OS	OS	OS	SYSTEM/OFF only
	None	OSL	OSL	OL	OSL	OS	Follow VR Channel restrictions
	User	OSL	OSL	OSL	OSL	OSL	All modes allowed
	Disabled	D	D	D	D	D	Always DISABLED
		(O=OFF, S=SYSTEM, L=LOCAL, D=DISABLED)					

Summary of “Display PSU Duplicate ID” warning functionality:

- If Duplicate PSU ID is detected, VR displays warning message on Control Head’s VR line (top line)
- Message is displayed in the following format is DUPL: PsuldNumber (for example **DUPL: 3565**)
- Duplicate ID warning Message is alternating with primary display messages at the same rate as other VR warning messages (2 seconds for warning / 6 seconds of primary message)
- VR would “remember” and alternate up to 10 different duplicate IDs
- Duplicate IDs warning will remain alternating on display until VR is powered down / restarted
- VR keeps the warning even after VR is deactivated (VR mode is changed to OFF). This allows user to drive back to the station and report duplicate ID incident to communication personnel.

Primary / Secondary Setup¹⁰

	Field Name	Range	Description	Notes
Primary / Secondary Processing	All VR Channel Types except for Analog	Checkbox (checked)	Enables / Disables the Primary / Secondary processing.	
	Analog VR Channels	Checkbox (checked)	Enables / Disables the Primary / Secondary Processing on analog channels only.	Only accessible if Primary/Secondary Processing → All VR Channel Types except for Analog checked
Permanent Primary	Status	Checkbox (unchecked)	If this box is checked the VR will always be forced into Permanent Primary State. Programming more than one VR as a Permanent Primary may result in interference and loss of communications.	Only accessible for Digital channels if Primary/Secondary Processing → All VR Channel Types except for Analog checked. Only accessible for Analog channels if Primary/Secondary Processing → Analog VR Channels checked.
	Control	Checkbox (unchecked)	The user may change the VR status through the DVRS menu options (Control Head Menu Options: DVRS→PM) or through a long DVRS menu button press, if configured. (FRC Configuration: MSU Interface Setup→Long DVRS Button Press)	Only accessible if Primary/Secondary Processing → All VR Channel Types except for Analog is checked
	Behaviour	Text Field (display only)	Describes permanent primary behaviour of a VR based on the combination of Status and Control fields configuration.	Refer to Table 9: Permanent Primary Behaviours for full list of Permanent Primary Behaviours

¹⁰ Primary/Secondary operation is not applicable with Booster PA

	Field Name	Range	Description	Notes
	Allow Secondary VR to take over OOR Primary	Checkbox (unchecked)	If MSU connected to a Primary VR becomes out of range of the system, a VR operating as secondary will become Primary and repeat local PSUs and Systems communication when this option is enabled. Same option ensures a Secondary VR on its Home system becomes Primary when the current Primary VR is from a foreign system.	Only accessible if Primary/Secondary Processing → All VR Channel Types except for Analog is checked
	Heartbeat Interval	3 to 60 (5) sec	Determines the time intervals at which a Primary or Permanent Primary VR transmits Heartbeat messages to all other VRs in the area.	'Heartbeat' messages are part of the Static BL Algorithm Phase and are transmitted on the VR Rx frequency. Only accessible if Primary/Secondary Processing → All VR Channel Types except for Analog is checked
	Primary / Secondary Preference	None Stationary N/A	This field displayed here for reference purposes only. Refer to Hardware Setup → GPS Driven Deactivation → Primary / Secondary Preference field	
Busy Lockout	Busy Lockout: Outbound Voice Communication and Heartbeat	Checkbox (checked)	Enables / Disables the dynamic phase of the Busy Lockout Algorithm for Outbound Voice calls and sending of Heart Beats.	Applicable to both Analog and Digital VR Mode. Applicable for Simplex and Duplex.
	Busy Lockout: Inbound Voice Communication	Checkbox (checked)	Enables / Disables the dynamic phase of the Busy Lockout Algorithm for Inbound Voice calls.	Applicable to both Analog and Digital VR Mode. Applicable for Duplex only.

Table 9: Permanent Primary Behaviours

Status Field	Control Field	Permanent Primary Behaviour	PM Button Press	DVRS Long Button Press
			VR Initial State → Button Press → VR Final State	
Checked	Checked	VR operates as Permanent Primary unless in range of another Permanent Primary. Then, the Primary/Secondary feature determines the Primary unit.	Standby PP → Active PP Active PP → Active PP	
Checked	Unchecked	VR always operates as Permanent Primary even when in range of another Permanent Primary	N/A	
Unchecked	Checked	VR operates as Permanent Primary via control head button press unless in range of another Permanent Primary. Then, the Primary/Secondary feature determines the Primary unit.	Primary → Active PP Secondary → Active PP Active PP → Primary/Secondary* *depending on presence of another PP	
			Standby PP → Secondary	Standby PP → Active PP
Unchecked	Unchecked	VR never operates as a Permanent Primary.	N/A	

Maintenance Screens

Two screens are provided for maintenance purposes: **Monitoring screen** and **RSSI setup screen**.

The Configurator's Monitoring Screen is provided to assist the field technician with VR setup and troubleshooting.

The VR **RSSI Setup** screen is provided to assist the users with optimizing the voting algorithm parameters by creating a typical real-life scenario for VR operation and running some automated VR tests.

Using the Monitoring Screen

The Futurecom Repeater Configurator Monitoring Screen is provided to assist the field technician with VR setup and troubleshooting.

The Monitoring screen provides real time indication of the RSSI level, SINAD, RF Power, PL detection etc. as described below.

IMPORTANT!

It must be noted that the Monitoring screen application is not intended to replace the use of properly calibrated test equipment in the field.

Field		Description
	Transmitter Mode	Can be set to either "Tx-Disable" or "Tx-Enable".
	TX ON	Does not require user input. Used to indicated Tx On (checked) or Tx Off (unchecked)
	PTT	Offers three settings: PTT ON – VR keys up on selected channel and using programmed setting (channel type, PL / DPL, NAC etc.) PTT OFF – VR Transmitted is idle CARRIER – VR Transmitter is keyed up with carrier only (no modulation). Limited to 10 minutes max key up time. To use PTT ON or CARRIER, the "Test Mode" field must be set to YES and "Transmitter Mode" must be set to Tx-Enable.
Repeater CAS	Status	Indicates the Carrier Activated Squelch (CAS) status (Idle or Active) of the VR
	RSSI	Indicates the Carrier Activated Squelch (CAS) status of the VR with respect to the programmed RSSI thresholds on the selected DVR channel.
	SqI	Indicates the Carrier Activated Squelch (CAS) status of the VR with respect to the programmed Squelch thresholds on the selected DVR channel.
RSSI	dBm	Displays the RSSI of the VR in dBm
	µV	Displays the RSSI of the VR in µV
	PL	Displays presence of the programmed PL / DPL decoded by the VR.
	SINAD	Displays the calculated SINAD of the VR received signal.
	AVRA/Motion Input	Displays the state of input as interpreted for AVRA (Active or Inactive) and as interpreted for Primary/Secondary Preference (Stationary, Motion or N/A)
RF Power	dBm	Displays the VR Tx Power (in dBm) when the VR transmitter is keyed up.
	W	Displays the VR Tx Power (in W) when the VR transmitter is keyed up.
	Mobile RUS	Indicates when the Mobile radio is receiving a valid signal (Active or Idle).
	Mobile PTT	Activated when the MSU MIC is PTT-ed.
	Temp	Displays the current controller temperature.
	PA_t	Displays the current PA temperature.
	Test Mode	Must be set to YES to use the PTT or P25 Rx Modem Test options.
	Oper. State	Indicates current VR state – Primary, Non-Primary, Permanent Primary or OFF.
	Ant. Sw.	Indicates the Antenna switch position; Normal or BL Reversed.
P25 Rx Modem Test	Test Mode	Set to YES to measure BER (for test procedure see "BER Test Setup")
	BER	Displays instant Bit Error Rate
	BERm	Displays averaged Bit Error Rate

BER Test Setup

The following is required to be able to measure BER on the Futurecom Repeater Configurator Monitoring Screen:

1. Connect a Radio Communication Testset or equivalent to the VR Antenna port and set it up as described below:
 - Program TX frequency matching the programmed VR Rx Frequency
 - PATTERN 1011
 - MODULATION P25
 - NAC 293
 - ALGID 80
 - MFID 00
 - TGID 1
 - SID 000001
2. Set the Test Mode AND P25 Rx Modem Test – Test Mode to 'YES'
3. Lower the Radio Communication Testset transmit level until desired BER Threshold is observed on the Monitoring screen.

RSSI Setup

The VR **RSSI Setup** screen is provided to assist the users with optimizing the voting algorithm parameters by creating a typical real-life scenario for VR operation and running some automated VR tests as described below.

The screenshot shows the 'RSSI Setup' window with a blue title bar and a toolbar. The main area contains several configuration sections:

- Num. of Channels:** 10
- This VR ID:** 1225
- Operating Mode:** Local (dropdown)
- Local Mode Allowed:** Enable (dropdown)
- Channel 1:**
 - Frequency: 764
 - Power: -133.2 dBm
 - Internal VR Status: 6800
- RSSI Thresh.:** -127.0 dBm
- Busy Lc.Th.:** -80 dBm
- Tx RSSI Thr.:** -60 dBm
- Rx RSSI Thr.:** -80 dBm
- Margin:** -6 dBm, -3 dBm, -3 dBm, -4 dBm (dropdowns)
- Set Test Mode:** OFF (dropdown)
- Set Remote Test Mode:** OFF (dropdown)
- VR in Test Mode:** No (checkbox)
- Remote VR in Test Mode:** No (checkbox)
- Remote VR ID:** 0
- Progress:** in progress 0.0 sec. to the end
- Buttons:** RSSI ON Level Test, Busy Lock. Thresh. Test, Primary Range Test

Field Name	Range	Description	Notes
Num. of Channels		Displays the total number of channels configured for the VR in the repeater channel setup window.	
This VR ID		Displays the ID assigned to the VR configured in the VR Common Setup window.	
Operating Mode	OFF Local System	Allows the user to switch between different VR operating modes OFF, SYSTEM and LOCAL if Local Mode is enabled.	Local mode must be enabled to operate the VR in Local mode; if this is not enabled and local operation mode is selected there will be an error.
Local Mode Allowed	Enable Disable	Enables / Disables Local VR Mode selection by the user.	
Channel -- XXX	(1) – (number of channels programmed in Repeater Channel Setup window)	Displays the channel number and name that the VR is current on. User can change the VR channel by entering a number that is within the limit of the total VR channels. The associated channel name is displayed to the right. Channel number and name are the same as the Repeater Channel Setup window.	
Channel – dBm		Displays the current strength of the signal received by the VR on the selected channel in dBm	
Channel – Internal VR Status		This field is intended for use during Futurecom Support team live session.	
RSSI Thresh.	Read Only	Sets the margin for RSSI threshold (sensitivity) to cover worst case scenarios due to varying RF conditions.	This field displays the result of the RSSI ON Level Test .
RSSI Thresh. Margin	-6 – 10 dBm (-6)	Sets the margin for RSSI ON threshold to cover worst case scenarios due to varying RF conditions.	
Busy Lc. Th.	Read Only	Sets the threshold used by the VR during the busy lockout phase in the simulcast prevention algorithm.	This field displays one result of the Busy Lock Thresh. Test .
Busy Lc. Th. Margin	-6 – 10 dBm (-3)	Sets the margin for Busy Lockout threshold to cover worst case scenarios due to varying RF conditions.	
Tx RSSI Thr.	Read Only	Refer to Repeater Channel Setup	This field displays one result of the Busy Lock Thresh. Test .
Tx RSSI. Thr. Margin	-6 – 10 dBm (-3)	Sets the margin for the Tx RSSI Threshold to cover worst case scenarios due to varying RF conditions.	

Field Name	Range	Description	Notes
Rx RSSI Thr.	Read Only	Refer to Repeater Channel Setup	This field displays the result of the Primary Range Test .
Rx RSSI Thr. Margin	-6 – 10 dBm (-4)	Sets the margin for the Rx RSSI Threshold to cover worst case scenarios due to varying RF conditions.	
Set Test Mode	OFF ON	Sets the VR in auto test mode to carry out RSSI On Level Test, Busy Lock, Threshold Test & Primary Range Test. In Test mode the VR displays this "Warning 2000" on the control head.	
VR in Test Mode	Yes No	Indicates if the VR is currently in a test mode.	
Set Remote Test Mode	OFF ON	Sets the secondary VR in auto test mode to carry out Busy Lock Threshold Test & Primary Range Test.	A second VR in remote (secondary) mode and local or systems operating mode must be present, its ID set as the 'Remote VR ID', and 'Set test Mode' set to ON to set this field to ON. When set to ON, both VRs display "Warning 2000" alternatively in the control head. "Enter Remote Test Mode - Command Failed" is displayed in the window if the stated conditions are not met.
Remote VR in Test Mode	Yes No	Indicates if the remote (secondary) VR is currently in test mode.	
Remote VR ID:	Max = 16777215 Default = 1 Min = 0	Allows the user to provide the ID of the remote (secondary) VR to connect to for the Busy Lock Threshold Test and Primary Range Test.	
xxx in progress xxx sec. to the end		Indicates the current test being run and how much time remains to complete the test.	

Field Name	Range	Description	Notes
RSSI ON Level Test		<p>Allows the user to start an automated RSSI ON Level Test that sets up the RSSI ON Threshold levels for the desired coverage area.</p> <p>Test involves a primary VR and a remote PSU located at the boundary of the desired coverage area.</p> <p>The remote PSU transmits a known signal which is received by the Primary VR and measured to determine RSSI ON Threshold level.</p> <p>On completion of the test, a check mark is placed beside RSSI Thresh. and the value for this field is modified in the repeater channel setup window.</p>	Test is performed using the configured VR power settings; power settings are not varied during the test.
Busy Lock. Thresh. Test		<p>Allows the user to start an automated test that sets up the busy lock threshold and the Tx RSSI threshold levels for the desired coverage area.</p> <p>Test involves two VRs located at the boundary of the desired coverage area and engaged in Primary Secondary interaction.</p> <p>The secondary (remote) VR transmits a known signal which is received by the Primary VR and measured to determine BL threshold level.</p> <p>On completion of the test, a check mark is placed beside Busy Lc. Th. and Tx RSSI Thr. and the values for these fields are modified in the repeater channel setup window.</p> <p>The test may fail if the levels are outside the upper and lower limits of BL threshold and/or Tx RSSI Threshold. If the test fails for the upper limit, move the secondary VR away from the primary and if the test fails for the lower limit, bring the secondary VR closer to the primary.</p>	

Field Name	Range	Description	Notes
Primary Range Test		<p>Allows the user to start an automated test that defines the primary/secondary boundary for a desired coverage area.</p> <p>Test involves two VRs located at the boundary of the desired primary/secondary coverage area and engaged in primary / secondary interaction.</p> <p>The primary and secondary VR both interact with each other to determine the Rx RSSI Threshold.</p> <p>On completion of the test, a check mark is placed beside Rx RSSI Thr. and the value for this field is modified in the repeater channel setup window.</p> <p>The test may fail if the levels are outside the upper and lower limits of Rx RSSI Threshold. If the test fails for the upper limit, move the secondary VR away from the primary and if the test fails for the lower limit, bring the secondary VR closer to the primary.</p>	<p>Test is performed using the reverse Tx power configured in the VR; Reverse TX power setting is not varied during the test.</p>

The RSSI setup screen is used to assist with the setup the following VR parameters on a per channel basis:

- RSSI Threshold (**RSSI Thresh.**)
- Busy Lockout Threshold (**Busy Lc. Th.**)
- TX RSSI Threshold (**Tx RSSI Thr.**)
- Rx RSSI Threshold (**Rx RSSI Thr.**)

Setting up the RSSI ON range

RSSI Thresh. defines the VR incident range since this is the minimum signal level the VR receiver needs to detect from the Local PSU to repeat it locally and to the System.

RSSI Thresh. is normally programmed to standard -114 dBm. However, if the user wants to test the actual levels received from a portable radio located at the desired coverage area extreme then the '**RSSI ON Level Test**' can be performed.

To execute the test, the following steps are to be followed:

1. PSU user is located at the edge of the desired coverage range and the PSU is switched to the correct channel (matching the channel selected on the VR).
2. Futurecom Repeater Configurator is running on the Primary VR and RSSI Setup window.
3. Select 'System' or 'Local' Mode in the '**Operating Mode**' Field.
4. Switch '**Set Test Mode**' to ON.
5. Press the '**RSSI ON Level Test**' button.
6. The PSU User will hear 3 short beeps and 1 long beep and must immediately press and hold the PTT for 10 seconds.
7. The VR measures the received signal level and updates the '**RSSI Thresh.**' field. The check box against the parameter is checked to indicate test completion.
8. Enter desired margin (min 6dB or higher recommended).
9. Repeat the test for all required channels.
10. Close the RSSI Setup window or proceed with the voting algorithm tests as described below.
11. Review the '**RSSI Thresh.**' levels on the 'Repeater Channel Setup' screen and save to the VR and in a DPD or DCD file as required.

Setting up the Voting Parameters (Primary / Secondary Range) ¹¹

Those automated tests are used to calibrate the range between two Primary VRs as follows:

DVRS 1 – VR with Futurecom Repeater Configurator running and RSSI Setup screen open

DVRS 2 – VR parked at the desired edge of DVRS 1 Primary Range i.e., if DVRS 2 moves any farther it should also become a Primary.

1. Run Futurecom Repeater Configurator and open the RSSI Setup screen on DVRS
2. Deploy DVRS 2 and ensure both units are on the same channel.
3. Select System or Local Mode in the '**Operating Mode**' Field.
4. Switch '**Set Test Mode**' to ON.
5. Type the ID of DVRS 2 in the '**Remote VR ID**' Box.
6. '**Set Remote Test Mode**' to ON. Note that both VR will alternate 'WARNING 2000' and VR channel / mode on the top line of the control head display.
7. Press the '**Busy Lock. Thresh. Test**' button and wait until the test is complete.
8. Note the new levels in the '**Busy Lc Th.**' and '**Tx RSSI Thr.**' fields. The two check boxes against those parameters will be checked to indicate test completion.
9. Press the '**Primary Range Test**' button and wait until the test is complete.
10. Note the new level update in the '**Rx. RSSI Thr.**' field. The check box is checked to indicate successful test completion.
11. If any of the tests fails, please repeat the test.
12. Enter required margins and repeat the tests for all desired channels.
13. Close the RSSI Setup screen and review the settings on the Repeater Channel Setup screen.
14. Save the data to the VR and DPD or DCD file as required.

¹¹ Primary/Secondary operation is not applicable with Booster PA

Troubleshooting

Software / Programming Related Problems

Most of the VR Programming problems are caused by mismatched MSU, VR and portable radio templates. Note that any updates to the MSU or the PSU templates may require corresponding changes to be made in the VR template.

All RM-OTAP related warning / error messages are displayed for 30 seconds for up to 5 power cycles. To prevent these messages from displaying, power cycle the repeater 5 times. All these messages are identified with an asterisk (*).

The following error & warning codes may be displayed on the MSU control head:

Control Head Display <i>Affichage de la tête de commande</i>	Description / Action
CALIBR ERROR <i>ERREUR CALIBR</i>	Calibration Error. Contact Futurecom.
CFG UPDT FAIL1* <i>ERR MAJ CNFG1*</i>	An error was encountered with the DCD template file. Create a new DCD file and reapply.
CFG UPDT FAIL2* <i>ERR MAJ CNFG2*</i>	Hardware part number mismatch. Ensure that the DCD file frequency information aligns with frequency band of the repeater. Also ensure that the DCD repeater model aligns with the repeater. The repeater part number information is found here: Hardware/Software Info □ Hardware Part Number: 7V087xxx (for VRX1000), 7V083xxx/7V093xxx (for DVR/DVR-LX). Then reapply the DCD file.
CFG UPDT FAIL3* <i>ERR MAJ CNFG3*</i>	Hardware model and revision mismatch. Ensure that the DCD file repeater model aligns with the repeater. The repeater model information is found here: Hardware/Software Info → Hardware Model and Revision: 001.01 (for duplex) 002.01 (for simplex). Then reapply the DCD file.
CFG UPDT FAIL4 <i>ERR MAJ CNFG4</i>	An error was encountered with the DCD template file. Create a new DCD file and reapply.
CFG UPDT FAIL5 <i>ERR MAJ CNFG5</i>	The DCD file has errors. Use FRC to edit and resolve all DCD configuration errors and then reapply.
CFG UPDT FAIL6 <i>ERR MAJ CNFG6</i>	Serial Number mismatch. Verify repeater serial number is valid for the DCD file and then reapply. See: How To Create a DCD File
CFG UPDT FAIL7 <i>ERR MAJ CNFG7</i>	DCD file is an unsupported revision type. Open and save DCD file with latest FRC and then reapply.
CFG UPDT FAIL8 <i>ERR MAJ CNFG8</i>	DCD file application failed. RM-OTAP license must be installed on repeater. Bundle license file with DCD and reapply.
DUPL: [PSUId]	If Duplicate PSU ID is detected, VR displays the warning message on Control Head's DVR line.
FW UPDT FAIL1 <i>ERR MAJ FW1</i>	An error was encountered with the firmware. Try applying again using RM. If error persists, download a new copy of the firmware bundle from MSI and reapply using RM.

Control Head Display <i>Affichage de la tête de commande</i>	Description / Action
FW UPDT FAIL2 <i>ERR MAJ FW2</i>	An error was encountered with the firmware. Try applying again using RM. If error persists, download a new copy of the firmware bundle from MSI and reapply using RM.
FW UPDT FAIL3 <i>ERR MAJ FW3</i>	Firmware encryption error. Contact Futurecom.
FW UPDT FAIL4 <i>ERR MAJ FW4</i>	Firmware packaging error. Contact Futurecom.
ID MISCONFIG	Indicates a PSU ID misconfiguration has been detected. Requires PSU ID change. Occurs when Forced Analog is being used on an analog mobile channel and the P25 ID does not translate to a valid MDC ID. Either pick a valid ID or turn off PTT ID on analog channels in Mobile Radio Channel Setup.
INCOMP MSU HW	Indicates incompatible MSU hardware (XTL MSU connected to an APX compatible VR). Ensure to connect a compatible APX MSU or change the VR to an XTL compatible model.
LIC UPDT FAIL <i>ERR MAJ LIC</i>	RM-OTAP license installation failed. Confirm serial number of repeater. Contact FC for a new license file for this repeater. Verify repeater serial number is valid for the DCD file. Bundle the new license file with DCD file and reapply. See How To Create a DCD File
LOW BATTERY <i>BATT BAS</i>	Indicates Low Battery Warning or Alarm.
MISMATCH ERROR or VR FW MISMATCH	Repeater and Motorola Mobile Radio Firmware are not compatible. Please check Futurecom website for Compatibility Chart.
NOT ALLOWED <i>INTERDIT</i>	Displayed when VR is in Off mode and user attempts to set as Permanent Primary. VR must be in System or Local Mode. OR Displayed after long pressing the DVRS button when user attempts to set VR as Permanent Primary and control not configured. Use FRC to configure Primary/Secondary Setup → Permanent Primary Control Enabled field. <i>See Primary / Secondary Setup</i>
RC ERROR 1000 <i>RC ERREUR 1000</i>	Displayed permanently indicates that both the Main and Backup EEPROM maps are corrupted, and the unit is not operational. Please contact Futurecom for further instructions on how to troubleshoot the problem.
RC ERROR 4000 <i>RC ERREUR 4000</i>	Indicates that the VR firmware has been updated but its programmed personality has not. The VR personality needs to be updated by reading the unit with the Futurecom Repeater Configurator to upgrade the EEPROM map as described in the Firmware upgrade instructions provided by Futurecom.
RF ERROR 1000 <i>RF ERREUR 1000</i>	Transceiver DSP alarm (invalid checksum). Try re-flashing the firmware and if error still present, contact Futurecom to obtain an RMA and shipping instructions.
RF ERROR 2000 <i>RF ERREUR 2000</i>	Baseband DSP alarm (invalid checksum). Try re-flashing the firmware and if error still present, contact Futurecom to obtain an RMA and shipping instructions.
RF ERROR 400 <i>RF ERREUR 400</i>	Tx synthesizer lock alarm. Use another Tx frequency, if possible. If not, contact Futurecom to obtain an RMA and shipping instructions.

Control Head Display <i>Affichage de la tête de commande</i>	Description / Action
RF ERROR 4000 <i>RF ERREUR 4000</i>	Transceiver DSP alarm (failed to load / start). Try re-flashing the firmware and if error still present, contact Futurecom to obtain an RMA and shipping instructions.
RF ERROR 800 <i>RF ERREUR 800</i>	Rx synthesizer lock alarm. Use another Rx frequency, if possible. If not, contact Futurecom to obtain an RMA and shipping instructions.
RF ERROR 8000 <i>RF ERREUR 8000</i>	Baseband DSP alarm (failed to load / start). Try re-flashing the firmware and if error still present, contact Futurecom to obtain an RMA and shipping instructions.
SCN LIST ERR	Displayed temporarily when Scan and VR are turned ON while band locking is enabled in the VR and the MSU scan list contains members using the same frequency band as the VR.
RESYNC VR-MSU <i>RESYNC VR-MSU</i>	Indicates the MSU programming has been changed but the VR template has not been updated. Requires export and import of the new MSU .XML file in the VR. When using the DVRS File, the hash in the template must match the hash in the DVRS File (FRC MSU Data → Unit Field Hash). If not, VR will report hash mismatch as "RESYNC VR-MSU".
TRANSL TG WRN <i>TRANSL TG ATT</i>	This warning is displayed when a talkgroup in the talkgroup translation table is active on the Trunking system. The VR (and respectively PSU) programming must be changed so that valid system TG IDs are not used for Translation.
VR ERROR and RC ERROR XXXX or RF ERROR XXXX (Alternating) <i>RV ERREUR</i>	Turn the VR off and then back on. If it does not correct the condition, note the exact error code and contact Futurecom to obtain an RMA and shipping instructions.
VR PROGRAMMING <i>RV PROGRAMME</i>	Indicates the VR is being programmed and the MSU is on standby.
WARNING 0400 / 0800 <i>ATTENTION 0400 / 0800</i>	Displayed upon power up only indicates that the Main / Backup EEPROM map of the VR contains corrupted data. The VR will still operate properly from the alternate EEPROM map. To fix the corrupted map, please use the latest Futurecom Repeater Configurator to read the VR. This will restore the Main / Backup EEPROM Map.
WARNING 20000 DVRS DISABLE <i>ATTENTION 20000</i>	Set the channel type to Analog or contact Futurecom to purchase a license upgrade if a different channel type is required.

The following error & warning codes may be displayed on the PC:

PC Display <i>Affichage de l'ordinateur</i>	Description / Action
FAILURE TO READ REPEATER <i>ÉCHEC DE LECTURE DU RÉPÉTEUR</i>	<ol style="list-style-type: none">1. Ensure only one instance of FRC is open2. Make a second attempt to read VR3. Re-connect USB (disconnect / connect, wait few seconds for device to be recognized, try to read VR again)4. power-cycle VR by turning MSU off and on again, wait few seconds until VR is on and USB connects, then try to read VR. If device not recognized or read fails again, try power-cycling VR one more time.5. If still unable to read, reboot PC

In case of insufficient VR Tx Power or poor sensitivity, please verify that the frequencies programmed in the VR are within the filtering specifications as indicated on the duplexer and in-band filtering labels.

Ensure the VR is only enabled on MSU Modes using the frequency plan for the specific VR Model.

Multiple issues when using DVRS with TDMA*












Symptom 1: A TDMA talkgroup is configured for “interrupt never” operation. A call on this TDMA talkgroup is in progress from a portable subscriber unit (PSU) through the DVRS to other radios. Another system subscriber unit (SSU) attempts to interrupt the call in progress. This interrupting talkgroup call is granted when it should not have been granted.

Symptom 2: When using DVRS on a TDMA talkgroup, a subscriber may experience a grant followed by a call where the PSU audio is not successfully transmitted through the system. Private calls do not experience this problem.

Resolution: Set the zone level Grant Timeout Timer in the UNCW to 2.2 seconds or greater when any DVRS units are in use.

*See *Appendix 2 – Grant Timeout Timer*

Appendix 1 – VR Status Display

MSU CH DISPLAY ICON / MESSAGE	DVRS STATUS DESCRIPTION
Steady 	VR is in a Primary State
Steady 	Primary VR Receiving
Steady 	Primary VR Transmitting
Steady 	Primary VR Receiving and Transmitting ¹²
Flashing 	VR is in a Secondary State
Flashing 	Secondary VR Receiving
Steady 	VR is in a Permanent Primary State
Flashing 	VR is in a Permanent Primary 'On Standby' State (there is another Permanent Primary already present in the area)
Steady 	Permanent Primary VR Receiving
Steady 	Permanent Primary VR Transmitting
Steady 	Permanent Primary VR Receiving and Transmitting ¹²
VR SERVICE	VR is in Service Mode (during re-flashing of the firmware).
VR ERROR	VR Detected Error. Display toggles between VR ERROR and the actual error code / number.
VR IN RESET	VR is being reset
VR DISABLED	VR Disabled on Selected MSU TG / Mode

¹² Not applicable to VRX1000

Appendix 2 – Grant Timeout Timer

Motorola Solutions Technical Notification (MTN-0053-18-NA)

TITLE: Multiple issues when using DVRS with TDMA

TECHNOLOGY: DVRS (digital vehicular repeater system)

SYMPTOMS:

Symptom 1: A TDMA talkgroup is configured for “interrupt never” operation. A call on this TDMA talkgroup is in progress from a portable subscriber unit (PSU) through the DVRS to other radios. Another system subscriber unit (SSU) attempts to interrupt the call in progress. This interrupting talkgroup call is granted when it should not have been granted.

Symptom 2: When using DVRS on a TDMA talkgroup, a subscriber may experience a grant followed by a call where the PSU audio is not successfully transmitted through the system. Private calls do not experience this problem.

MODELS / SYSTEM RELEASES / KITS / DATECODES AFFECTED:
DVRS

SEVERITY RECOMMENDATION:

Low / Maintenance - Perform if system exhibits above symptoms

ROOT CAUSE / DEFINITIVE TEST:

Delayed audio from the PSU causes the grant timer to expire before the DVRS/PSU audio is detected at the RF site.

WORKAROUNDS AND CORRECTIVE ACTIONS: NA

RESOLUTIONS AND REPAIR PROCEDURES:

Set the zone level Grant Timeout Timer in the UNCW to 2.2 seconds or greater when any DVRS units are in use.

PARTS REQUIRED (HARDWARE / SOFTWARE): NA

ADDITIONAL INFORMATION: NA

REFERENCE THE FOLLOWING DOCUMENTS/PROCESSES FOR INSTALLATION PROCEDURES: NA

WHEN TO APPLY RESOLUTION:



















After reboot ___
After (re)installation ___
After upgrade ___
After power cycle ___
After database restoration ___
After failure ___
On FRU replacement ___
During maintenance ___
Immediately ___
As instructed X ___
Information only ___

LABOR ALLOWANCE:

This is an informational bulletin. No labor warranty is implied, intended or authorized for U.S. Domestic Partners / Customers. Other regions should follow their own standard procedures.

For assistance with this bulletin please contact your MSI Technical support centre
https://www.motorolasolutions.com/en_us/support.html

Appendix 3 – Icon Legend

Icon	Title	Description
	Font	Allows selecting font type, style, size, colour, and effects
	Application Reset	Clears all data in the application memory
	Com Port Log	Contains communication between FRC and repeater – used for debugging
	Application Log	Contains details that may be required when accessing technical support
	Find	Search function by field name and/or field values
	Change User Level	Used to switch between default user and admin access
	Eeprom maintenance	Used for debugging
	Info	Contains all technical data in an exportable format
	Deployment Configuration	Allows re-ordering, copying, and clearing of deployments
	Status Report	Lists the number of occurrences for errors, warnings, and more info from the repeater (resets on power cycle)
	Status Log	Lists each error, warning, and more info from the repeater (resets on power cycle)
	Status EEprom Log	Displays errors, warnings, channel or deployment changes, and system status
	Set date and time	View or set date and time on the device
	Undo	Undo last action
	Copy	Copy selected content
	Paste	Paste selected content
	Minimize/Restore	Minimize/Maximize window
	Help	Access Help function

Appendix 4 – CPS VR Related Programming

CPS → Radio Ergonomics Configuration → Controls		
Sub Menu	Field	Reference
Control Head	General → Feature	Feature Programming - ICM
Menu Items	General → Conventional Selected Menu Items	VR Basic Programming Feature Programming - ICM
	General → Trunking Selected Menu Items	VR Basic Programming Feature Programming - ICM
Keypad Mic and Accessories	General → Conventional Feature	VR Basic Programming
	General → Trunking Feature	VR Basic Programming
Radio VIPs	General → Input Feature	Feature Programming - AVRA

CPS → DVRS Configuration → DVRS Wide → General		
Sub Menu	Field	Reference
	DVRS Hardware Enable	VR Basic Programming
	VIP Control of DVRS	Feature Programming - AVRA
	In Car Monitor	Feature Programming - ICM
	DVRS Sync Fields Hash	Troubleshooting

CPS → DVRS Configuration → DVRS Profiles → General		
Sub Menu	Field	Reference
	DVRS Profile Name	VR Basic Programming
	DVRS Remote Activation	Feature Programming - Remote Activation
	Generate Status on DVRS Mode Change	Feature Programming - Generate Status on DVRS Mode Change
	<i>Generate Status on DVRS Mode Change Holdoff (sec)</i>	Feature Programming - Generate Status on DVRS Mode Change
	<i>Generate Status Alternate Mode</i>	Feature Programming - Generate Status on DVRS Mode Change
	ICM Allowed	Feature Programming - ICM
	Local Mode – Outbound System Repeat in Local Mode	Feature Programming - Local Repeat/Fallback
	Local Mode – MSU System PTT in Local Mode	Feature Programming - Local Repeat/Fallback
	System Mode – Local Tx Fallback	Feature Programming Feature Programming- Local Repeat/Fallback
	Proxy Time Out Timer (sec)	VR Fine Tuning
	Proxy Limited Patience (sec)	VR Fine Tuning
	<i>Proxy RFSS Response Time (ms)</i>	VR Fine Tuning
	Suspend Scan on DVRS Active	Feature Programming - MSU Scan

CPS → Conventional Configuration → Conventional Personality 'Y'		
Sub Menu	Field	Programming Guide Link/Reference
General	DVRS Profile Selection	How to Program TPS Signaling
RX Options	RX Voice/Signal Type	
TX Options	TX Voice/Signal Type	
Signaling	Non-ASTRO → Signaling Type	
	ASTRO Talkgroup → Talkgroup	
	Features → Incident Signaling Type	

CPS → Trunking Configuration → Trunking Personality 'Y'		
Sub Menu	Field	Reference
	General → DVRS Profile Selection	VR Basic Programming

PSU VR RELATED PROGRAMMING

CPS → Conventional Configuration → ASTRO Talkgroup List		
Sub Menu	Field	Reference
	Talkgroup List	Talkgroup Proxying Talkgroup Translation

CPS → Conventional Configuration → Conventional System → DVRS		
Sub Menu	Field	Reference
	DVR Sync NAC Matching	How to Program NAC Linking Feature
	Emergency Blocked in Failsoft	
	Call Type	
	TA After DVRS No Communication Attempts	
	Prefer Talkaround in NoComms	
	Talkaround Audio Mode	
	Out of DVRS Range Time (sec)	
	Fast Retry Timer (ms)	
	Attachment Retries	
	Phase 2 System Compatibility	
Dynamic Regrouping	Dynamic Regrouping Enable	
Dynamic Regrouping	Zone	
Dynamic Regrouping	Channel	
Timers	Individual Call Max Target Ring Time (sec)	
Timers	Private Call Max initial Ring (sec)	
Timers	Force Unmute Time (ms)	
Timers	PTT Warning (ms)	
Timers	Busy Update Time (sec)	
Timers	Response Pending Time (sec)	

CPS → Conventional Configuration → Conventional Personality		
---	--	--

Sub Menu	Field	Reference
	Signaling → ASTRO → ASTRO Rx Unmute Rule	Talkgroup Proxying Talkgroup Translation
	ASTRO Talkgroup → Talkgroup	
	ASTRO Talkgroup → Talkgroup List	
	ASTRO Talkgroup → Selection Type	
	Frequency Options → ASTRO Talkgroup ID	

CPS → Zone Channel Assignment		
Sub Menu	Field	Reference
	Channels → Personality	Talkgroup Proxying
	Channels → Conventional Frequency Option	Talkgroup Translation

Glossary

Keyword	Description
ACK	Acknowledgement of communications.
AVRA	Automated VR Activation. VR Option which permits automated activation of the VR by either using a VIP input on the MSU CH / DEK or a pin on the VR Auxiliary cable. Requires external logic / switch, not provided with the VR hardware.
Authentication	To prevent unauthorized access for Conventional ' DVRS Enabled ' PSU, Authentication key can be loaded on the authentication capable ' DVRS Enabled ' PSU.
Band Lock	When enabled, causes the MSU to block usage of the same frequency band as the VR while the VR is active. Enabled by default when no in-band filter is present.
BL	Busy Lockout – dynamic voting phase (follows the static Primary / Secondary phase) of the VR simulcast prevention algorithm.
Channel	A group of characteristics, such as transmit / receive frequency pairs, radio parameters, encryption encoding etc.
Coded Squelch	Tone Private-Line (PL) or Digital Private-Line (DPL). Used on conventional channels for signal validation.
Conventional	Refers to radio-to-radio communications, sometimes through a base station repeater or vehicular repeater.
Dispatcher	An individual who has radio system management duties.
DPD File	VR personality file saved as file_name.DPD .
DPL Coded Squelch	A continuous sub-audible data signal transmitted with the carrier. See Coded Squelch.
DVR	Digital Vehicular Repeater.
DVR Mode	Determines the communication exchange capabilities between System Users and Local Portable Users; Can be set to OFF, LOCAL or SYSTEM.
DVRS	When a Vehicular Repeater (VR) is interfaced with an MSU, the complete equipment package is referred to as a Digital Vehicular Repeater System (DVRS).
'DVRS Enabled' PSU	APX™4000, APX™6000 or APX™7000 Portable Radio with enabled DVRS operation.
EPR File	File containing VR personality (DCD/DPD) and calibration data of the specific VR unit. Typically saved in the following format xxxxxxxx.epr where xxxxxxxx is the SN of the specific VR.
FCC	Federal Communications Commission.

Keyword	Description
FNE	Fixed Network Equipment – Trunking or Conventional System Infrastructure
Forced Analog Mode	Hybrid VR Mode of operation where communications between the VR and the P25 ' DVRS Enabled ' PSUs are digital while the voice communications are forced to be analog when a non-P25 channel / TG is selected on the MSU. When a P25 channel / TG is selected on the MSU the VR operates in Digital mode. Applicable only to ' DVRS Enabled ' PSUs.
Forced Analog All Mode	Hybrid VR Mode of operation where communications between the VR and the P25 ' DVRS Enabled ' PSUs are digital while the voice communications are forced to be analog for all types of channels selected on the MSU. Applicable only to ' DVRS Enabled ' PSUs.
Heart Beat	P25 Message periodically sent by a Primary VR to other VRs during Primary / Secondary processing.
HUB	Hang Up Box – refers to the MSU Microphone being on hook or off hook.
ICM	In Car Monitor – when enabled in the MSU, allows the MSU user to monitor voice traffic to and from the local PSU
Inbound Call	A Call transmitted by Local PSU and received by the VR.
Local Mode	VR Mode which provides extended portable-to-portable voice and data range by repeating Local PSU (optionally MSU) communications without keying up the Mobile radio interfaced to the VR.
Local PSU	PSU switched to the VR channel and used for communication with the VR
Local Tx Fallback	When enabled, the MSU mic audio is routed and transmitted locally by the VR.
Mode	MSU / PSU - A programmed combination of operating parameters. VR – OFF, SYSTEM or LOCAL (see VR Mode)
Motorola File	CPS generated file accessible from the DVRS Export Menu, typically in XML file format.
MPE	Maximum Permissible Exposure.

Keyword	Description
MSU	Mobile Subscriber Unit
NAC	Network Access Code – used in P25 mode for validation of P25 radio communications, similar to the use of PL / DPL in analog mode. Also used for VR Steering.
NID	Network ID - see Network Access Code (NAC)
Outbound Call	System Call received by the MSU.
Over the Air Programming (OTAP)	Over the Air Programming of the VR using Mobile Radio CPS.
PSU	Portable Subscriber Unit.
PSU Scan	This feature allows a scan list to be attached to PSU that is configured with DVRS as its system type. This enables an Enhanced PSU to support conventional scan feature.
PTT	Push to talk. The PTT engages the transmitter (of the Portable or Mobile radio and / or VR) when pressed.
RF	Radio Frequency. Part of the general frequency spectrum 10kHz - 10,000,000 MHz.
RSSI	Received Signal Strength Indicator.
S/N	Serial Number
System Mode	VR mode which provides extended voice and signaling communications between System Users and Local Portable Users over the selected VR channel / Mobile Radio Mode.
Talkgroup	A group of radio users who communicate with each other by using the same communication path.
Talkgroup Translation	Feature where the PSU talkgroup is translated by the VR to match the currently selected MSU talkgroup.
Trunking	The automatic sharing of radio frequencies by large number of users based on communication path sharing for the length of a conversation.
Futurecom Repeater Configurator	Vehicular Repeaters (VR) Programming Software Application
VR	Futurecom line of Vehicular Repeaters. It applies to one of the following products: VRX1000, DVR and DVR-LX®.

Reference

Compatibility Chart

DVRS: VR Compatible APX Mobile Radios and

DVRS: VR Compatible XTS / APX Portable Radios list

[Futurecom Website](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX](#) → [Firmware](#) → [Compatibility Charts](#)

Vehicular Repeater (VR) User's Guide Template

[Futurecom Website](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX](#) → [User Guide](#) → [Vehicular Repeater \(VR\) User's Guide Template](#)

Over the Air Programming Via Radio Manager User Guide

[Futurecom Website](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX](#) → [User Guide](#) → [Over the Air Programming Via Radio Manager](#)

VR Ordering Guides

[Futurecom Website](#) → [Support](#) → [Documentation and Software](#) → [DVR-LX® - Digital Vehicular Repeater](#) → [Ordering Guide](#)

[Futurecom Website](#) → [Support](#) → [Documentation and Software](#) → [VRX1000 - Vehicular Radio Extender](#) → [Ordering Guide](#)

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