MOTOROLA SOLUTIONS

MXM600 User Guide

Mobile Release 2024.1a

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Safety Information

RF Energy Exposure and Product Safety Guide for Mission Critical Devices

ATTENTION!

This radio is restricted to Occupational use only. Before using your radio, read the RF Energy Exposure and Product Safety Guide for Mission Critical Devices that contains important operating instructions for safe usage and RF energy awareness and control for Compliance with applicable standards and Regulations.

For a list of Motorola Solutions-approved antennas and other accessories, visit the following website:

https://www.motorolasolutions.com

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

The European Union's WEEE directive and the UK's WEEE regulation require that products sold into EU countries and the UK must have the crossed-out wheelie bin label on the product (or the package in some cases). As defined by the WEEE directive, this crossed-out wheelie bin label means that customers and end users in EU and UK countries should not dispose of electronic and electrical equipment or accessories in household waste.

Customers or end users in EU and UK countries should contact their local equipment supplier representative or service center for information about the waste collection system in their country.

Disclaimer

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

Chapter 1

Read Me First

This user guide covers operating basic functions and other features of your radio.

1.1 Notations Used in This Guide

This guide is designed to give you more visual cues. The following graphic icons are used throughout the user guide.

DANGER: The signal word DANGER with the associated safety icon implies information that, if disregarded, will result in death or serious injury.

WARNING: The signal word WARNING with the associated safety icon implies information that, if disregarded, could result in death or serious injury, or serious product damage.

CAUTION: The signal word CAUTION with the associated safety icon implies information that, if disregarded, could result in minor or moderate injury, or serious product damage.

ATTENTION: The signal word ATTENTION may be used without the safety icon to state potential damage or injury that is not related to the product.

IMPORTANT: IMPORTANT statements contain information that is crucial to the discussion at hand, but is not CAUTION or WARNING. There is no warning level associated with the IMPORTANT statement.

NOTE: NOTICE contains information more important than the surrounding text, such as exceptions or preconditions. They also refer the reader elsewhere for additional information, remind the reader how to complete an action (when it is not part of the current procedure, for instance), or tell the reader where something is on the screen. There is no warning level associated with a notice.

The following special notations highlight certain information:

Table 1: Special Notations

Example	Description
Menu key or **PTT** button	Bold words indicate a name of a key, button, or soft menu item.
Entering TMO tone	Italic words indicate a name of the tone.
`Powering Off`	Typewriter words indicate the HMI strings or messages displayed on your radio.
Setup → Tones → All Tones	Bold words with the arrow between indicate navigation structure in the menu items.

1.2 Feature and Service Availability

This user guide covers all available features and services for your radio. Your service provider can customize your radio to suit your individual needs.

Chapter 2

Radio Care

Proper usage and care of your radio to ensure efficient operation and long life of the product.

2.1 General Radio Care and Handling Precautions

NOTE: Always turn off your radio before plugging or unplugging any cables, remote control heads, or accessories from the radio terminal. Disconnect the power supply from the radio terminal before performing any maintenance.

- Avoid physical abuse: do not pound, drop, or throw your radio. Exposed parts, such as controls and connectors, might be damaged.
- Operating your radio without an antenna cable attached may lead to radio failure and may void the warranty.
- Do not mount anything on your radio chassis fins, which are used for heat dissipation.

Chapter 3

Maintenance and Troubleshooting

This section includes instructions on cleaning and storing the device and provides troubleshooting solutions for potential problems during radio operation.

3.1 Radio Usage

Follow these practices to avoid sending your radio for frequent services:

- Avoid scratching or using a pen, pencil or other sharp object on the surface of the screen.
- Protect your radio from extreme temperatures. Avoid leaving your radio on the dashboard of a car on a hot day, and keep it away from heat.
- Do not store in a place that is dusty, damp, or wet.
- Use a soft lens cloth to clean the device. If the surface of the screen becomes soiled, clean it with a soft cloth with 70% isopropyl alcohol.

3.2 Cleaning Guidelines

Clean your radio following the cleaning guidelines provided.

WARNING: Avoid exposing this product to contact with hot oil or other flammable liquids. If such exposure occurs, unplug your radio and clean the product immediately in accordance with these guidelines.

CAUTION:
Always wear eye protection.

Read the warning labels on compressed air and alcohol products before use.

If you have to use any other solution for medical reasons, contact Motorola Solutions for more information.

Cleaning Instructions

Do not apply liquids directly to your radio. Dampen a soft cloth or use pre-moistened wipes. Do not wrap your radio in the cloth or wipe, but gently wipe the unit.

Harmful Ingredients

Many vinyl gloves contain phthalate additives, which are often not recommended for medical use and are known to be harmful to the housing of your radio. Your radio should not be handled while wearing vinyl gloves containing phthalates, or before hands are washed to remove contaminant residue after gloves are removed. Avoid handling your radio when your hands contain harmful substances such as ethanolamine. Your hands must be completely dry before handling your radio to prevent damage to the plastic.

Cleaning Materials Required

- 70% Isopropyl Alcohol wipes
- Lens tissue

- Cotton-tipped applicators

3.3 Cleaning Outside of Your Radio

Procedure:

By using alcohol wipes, wipe down the display, housing, and buttons.

NOTE: You must not allow any pooling of liquid around the edges of the display and the buttons. Immediately dry them off with a soft, non-abrasive cloth to prevent streaking.

3.4 Cleaning the Interface Connector

Procedure:

1. Turn off your radio. See Turning Your Radio On or Off on page 43.
2. Dip the cotton portion of the cotton-tipped applicator in 70% isopropyl alcohol.
3. Rub the cotton portion of the cotton-tipped applicator along the contacts of the interface connector. Slowly move the applicator back-and-forth from one side of the connector to the other.
4. If grease and other dirt can be found on other areas of the cradle, remove it with a lint-free cloth and alcohol.
5. Allow few minutes (depending on ambient temperature and humidity) for the alcohol to air dry before turning on your radio.

3.5 TETRA and Land Mobile Radio (LMR) Troubleshooting

Your radio displays the following messages:

Table 2: TETRA and LMR Troubleshooting

Message	Message Description
`Authenticate Failure`	Your radio could not register on an authenticated system (for example, the Authentication Key is incorrect, or authentication is disabled).
`Call Canceled`	• You have canceled the call. • Barred Incoming Call or Barred Outgoing Call Profile.
`Call Ended`	• Faulty channel. Please try later. • You have ended the call.
`Call Forwarding`	The radio you are trying to call is not available and the call is being forwarded to another radio.
`Call Modified`	The call you are participating in has been modified.
`Call Preempted`	Channel being used for priority.

Message	Message Description
Decryption Failed:	An error occurred while decrypting a message or call.
Empty Entry	The number exists but the group is non-selectable.
Invalid ID	The entered number is not valid.
List Empty	There are no programmed entries in the scrolling list. Type the entry.
List Not Attached	All talkgroups in the scan list are not attached.
List Partially Attached	The scan list is active, but not all talkgroups are attached to it.
Message Delivered	Indicates mail successfully delivered.
Message Failed	Indicates mail delivery failure.
No Messages	Indicates there are no new or old messages in the Inbox.
Network Trouble	Network problems. try again later.
Received Status	You have received a status from a contact.
No Service	Your radio is outside coverage. Return to coverage.
Service Restricted	This service or feature is restricted by your service provider or it is not available.
No Answer	The called party does not answer.
No Entries	This message is displayed when accessing an empty list.
No Group	• Your radio could not perform talkgroup attachment. It keeps on trying. If it does not succeed, try another talkgroup. • Attachment failed. Your radio detached from current talkgroup. Wait until it attaches again to the current talkgroup. • Displayed when you are out of the normal coverage area of your selected talkgroup. select a new talkgroup that is valid for your working location. • Indicates a favorite group was removed from the **My Groups** folder.
No list	The network is empty.
Not Allowed To Initiate Call	You are not allowed to dial a number which is not in the address book.
Not Allowed To Transmit	Release the PTT button and try again later. You are not allowed to send a text message or a status message to a number which is not in the address book.
Overheating, Please Turn Radio Off	Your radio turns off. Keep it off for 5 minutes.
Party Busy	Called radio is busy.
Party Not Available	Called radio is out-of-range or turned off. try again later.
Please Try Again	You could not call.
Please Wait Connecting	A message during startup.
Registration Failure	Your radio could not register within the system. try again later.

Message	Message Description
Repeater available	Your radio has connected to a repeater.
Repeater not available	Your radio cannot connect to a repeater, or connection has been lost.
Restricted, own ID	You are not allowed to send message to own ISSI.
Service Denied	Invalid number. Call your service provider.
Service Not Available	This service is not available on the current network.
Service Restricted	This service or feature is restricted by your service provider, it has not been purchased, or it is not available.
TalkGrp ... cannot be deleted	Your service provider set this group so you cannot delete it from the favorite talkgroup folder.
Radio Disabled	Check with your service provider.
Unit is OK Warn:	Self-test error. A minor fault has been detected. Your radio is still fully operative. If this error recur, note the error code and contact service.
Unit Not Attached	Your radio could not attach to the system. Try another group.
Unassigned Button	The message is displayed when no feature is assigned to a button. Bad Bonk will sound.
Version Match Failure	A version mismatch is detected. Error message is displayed as a persistent notification or screen overlay.
TX E2E Key Failure	Failed to enter Group Call TX Encryption Key and Private Call TX Encryption Key.
RX E2E Key Failure	Failed to enter Private Call RX Encryption Key.
TX SDS EtE Key Failure	Failed to enter TX SDS Encryption Key.
RX SDS EtE Key Failure	Failed to enter RX SDS Encryption Key.
Failed Secure messages only	Failed to send message because of TX SDS Mismatch Secure Only or TX SDS Mismatch Clear Only.
Unable to call Call disconnected. Called party does not support encryption.	• Remote call E2EE-A disconnected. • Remote call E2EE-B disconnected. • E2EE 1 not supported. • E2EE 2 not supported.
Re-Key success	Re-key was successful.
Re-Key failure	Re-key has failed.
Re-Key ongoing	Re-key is in progress.
Re-Key ongoing timeout	Re-key progress reached timeout.
Re-Key completion timeout	Re-key completion reached timeout.

Chapter 4

MXM600 Overview

Familiarize yourself with the buttons and functions on your radio.

Control Head Overview

Figure 1: IP54 Remote Ethernet Control Head

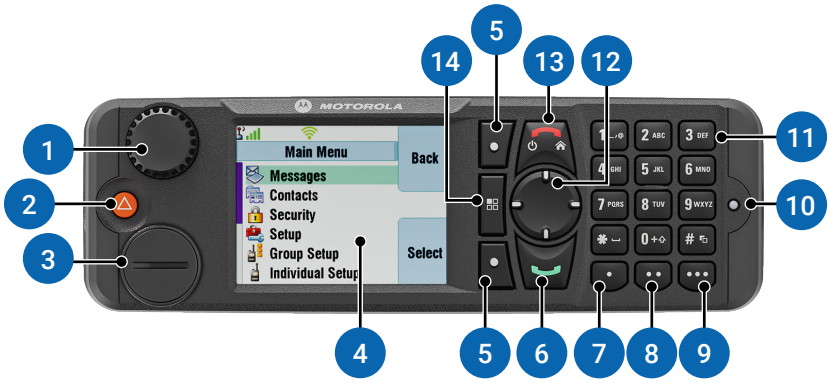


Figure 2: IP67 Remote Ethernet Control Head

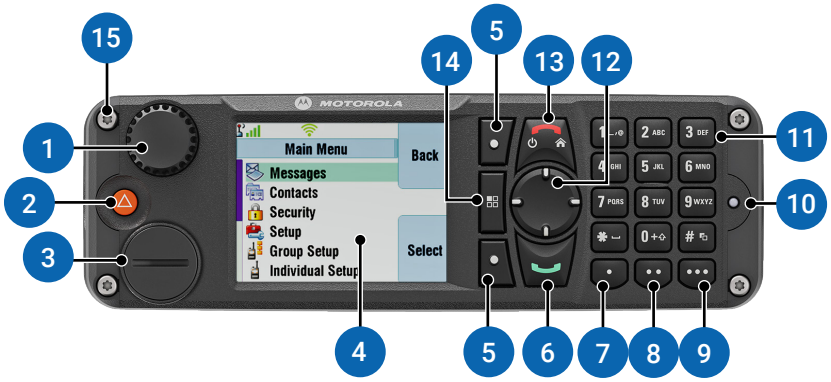


Table 3: Controls and Indicators – IP54 or IP67 RECH

Annotation	Name	Description
1	Large Rotary Control Knob	• Rotate to set the volume. • Press and rotate to select a different talkgroup. • Press and hold the Rotary Knob to lock or un-lock it.

Annotation	Name	Description
2	Emergency Button	Press and hold the **Emergency** button to enter Emergency Operations. **NOTE:** To turn on your radio using **Emergency** button during Emergency Operations, check with your service provider for configuration.
3	GCAI Connector and Dust Cover	Accessory connector, dust cover prevents dust and dirt from entering GCAI connector.
4	Horizontal Display	Features a high resolution of 480 x 640 pixels 65,536 colors. Supports scalable fonts and high-colored images.
5	Soft Key Buttons	The **Left**, **Right**, **Upper**, or **Lower** soft key selects the option shown on the display.
6	Accept/Send Key	• Press to initiate or answer duplex calls. • Press to send messages. • Press in home screen to enter Recent Dialed Calls.
7	1-Dot Button	By default: • Short press – activates or deactivates the horn and lights feature. • Long press – adjusts the backlight.
8	2-Dot Button	By default: • Short press – turns the speaker on or off. • Long press – activates or deactivates the screen saver.
9	3-Dot Button	• Short press - adjusts the backlight. • Long press – unassigned.
10	Status LED	Displays your radio status.
11	Keypad with 12 Programmable Buttons	Enters alphanumeric characters for dialing, contact entries, and text messages. The keys (0–9, *, and #) support the One-Touch Button feature. Press and hold a key to activate a one-touch function assigned to it. Buttons that can be programmed by the system administrator.
12	Navigation Key	Press Up, Down, Left, or Right Navigation key for list scrolling, while moving around the menu hierarchy, or for alphanumeric text editing. From the home screen, press to activate one of the following: • Down Navigation key – enters Recent Calls menu item.

Annotation	Name	Description
		• Up Navigation key – changes My Groups talk-group folder. • Left and Right Navigation key – toggles through the talkgroups.
13	On/Off/End/Home Key	• Press and hold to turn on or off your radio. • Press to end calls. • Press to return to the home screen.
14	Menu Key	Press to enter the main menu and the context-sensitive menu.
15	IP67 Compliant Side Cap Screw	–

Figure 3: Telephone Style Control Head (TSCH)

Figure 4: TSCH Cradle

Table 4: Controls and Indicators – TSCH and Cradle

Annotation	Name	Description
1	Large Rotary Control Knob	• Rotate to set the volume. • Press and rotate to select a different talkgroup. • Press and hold the Rotary Knob to lock or unlock it.
2	TSCH Identification Label	You can stick the color stripe or label for identification. **NOTE:** The following five colors are available for the label: • White • Green • Red • Yellow • Blue
3	Menu Key	Press to enter the main menu and the context-sensitive menu.

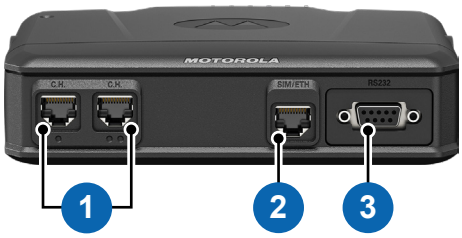
Annotation	Name	Description
4	Soft Key Buttons	The **Left**, **Right**, **Upper**, or **Lower** soft key selects the option shown on the display.
5	Navigation Key	Press Up, Down, Left, or Right Navigation key for list scrolling, while moving around the menu hierarchy, or for alphanumeric text editing. From the home screen, press to activate one of the following: ● Down Navigation key – enters Recent Calls menu item. ● Up Navigation key – changes My Groups talkgroup folder. ● Left and Right Navigation key – toggles through the talkgroups.
6	Accept/Send Key	● Press to initiate or answer duplex calls. ● Press to send messages. ● Press in home screen to enter Recent Dialed Calls.
7	Keypad with 12 Programmable Buttons	Enters alphanumeric characters for dialing, contact entries, and text messages. The keys (0–9, *, and #) support the One-Touch Button feature. Press and hold a key to activate a one-touch function assigned to it. Buttons that can be programmed by the system administrator.
8	1-Dot Button	By default: ● Short press – activates or deactivates the horn and lights feature. ● Long press – adjusts the backlight.
9	2-Dot Button	By default: ● Short press – turns the speaker on or off. ● Long press – activates or deactivates the screen saver.
10	3-Dot Button	● Short press - adjusts the backlight. ● Long press – unassigned.
11	Micro USB Port	Provides connection between your radio and a computer.
12	On/Off/End/Home Key	● Press and hold to turn on or off your radio. ● Press to end calls. ● Press to return to the home screen.
13	Horizontal or Vertical Display	Features a high resolution of 240 x 320 pixels 65,536 colors. Supports scalable fonts and high-colored images.

Annotation	Name	Description
14	Status LED	Displays your radio status.
15	Emergency Button	Press and hold the **Emergency** button to enter Emergency Operations. **NOTE:** To turn on your radio using **Emergency** button during Emergency Operations, check with your service provider for configuration.
16	Earpiece	Allows you to hear voice from calls.
17	Upper Push-To-Talk (PTT) Button	By default, this PTT button is disabled. However, your service provider can assign one of the following functions to it: • Upper PTT button works in the same way as the Lower PTT button. You can use both interchangeably. • Upper PTT supports a roof speaker. Roof speaker allows sound to be transferred through an external speaker connected to the transceiver.
18	Lower Push-To-Talk (PTT) Button	Press and hold to talk in simplex calls or to initiate a group call, release it to listen.
19	Microphone	Sends your voice to the receiving radio.
20	Hook	Allows you to attach the TSCH onto the cradle.

Transceiver Single Remote Front View

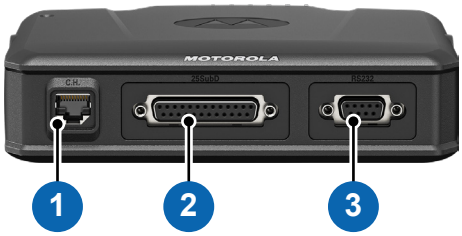
Annotation	Name
1	RJ50 Ethernet Connector (for Control Head)

Transceiver Dual Remote Front View



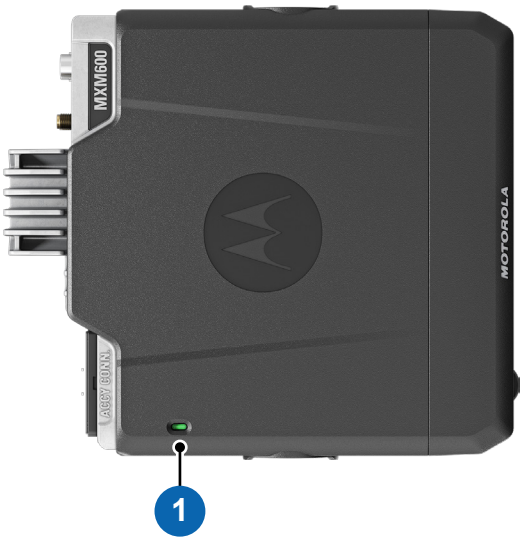
Annotation	Name
1	RJ50 Ethernet Connector (for Control Head)
2	RJ50 Ethernet Connector (for TETRA SIM Port and RJ45 Ethernet)
3	RS232 (9 SubD)

Transceiver Databox Front View



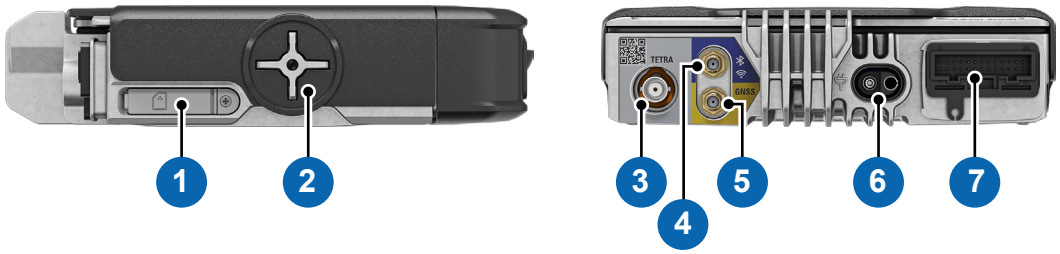
Annotation	Name
1	RJ50 Ethernet Connector (for Control Head)
2	25-Pin SUBD Connector
3	RS232 (9 SubD)

Transceiver Top View



Annotation	Name
1	Status LED

Transceiver Side and Rear View



Annotation	Name
1	TETRA SIM Card Door
2	Trunnion Mounting Point
3	TETRA Antenna Connector
4	Bluetooth/Wi-Fi Antenna Connector
5	GNSS Antenna Connector
6	Power Connection
7	26-Pin Accessory Connector

4.1

Automatic Control Head Detection

Your radio can detect the connected Control Head type automatically.

When your Control Head is plugged in, your radio loads the default basic operations or pre-defined Control Head configuration automatically and operate accordingly.

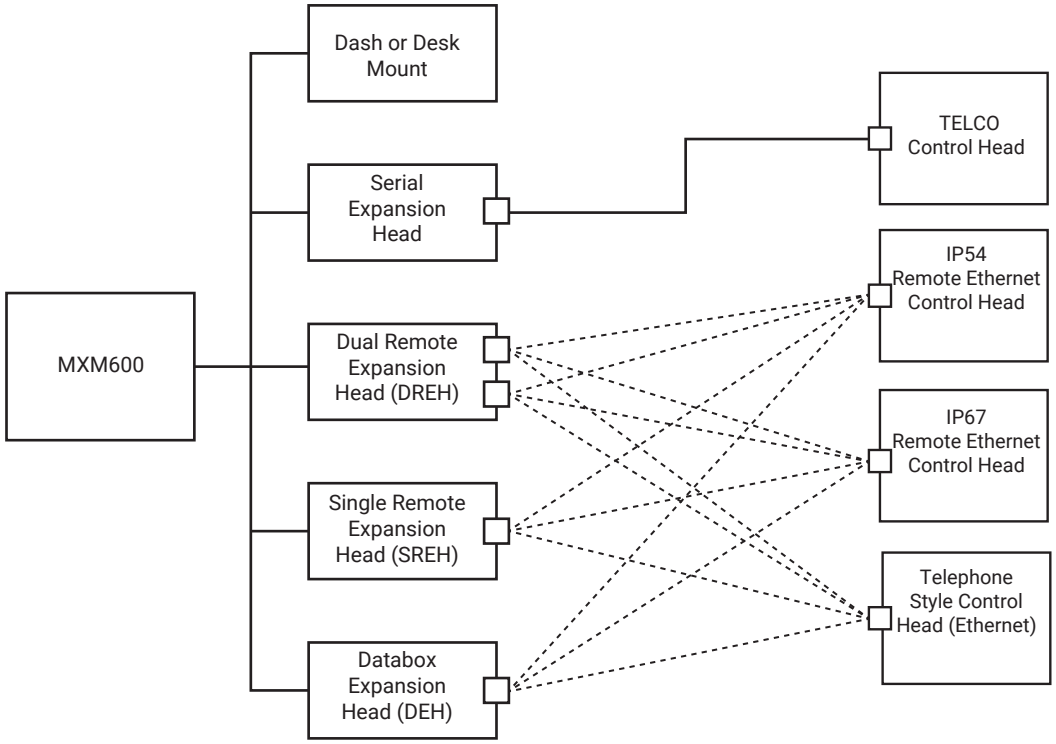
NOTE: Make sure to plug in the expansion head and Control Head properly before turning on your radio.

The following are the basic operations:

- Idle screen
- Current talkgroup
- Radio menu navigation
- Basic voice call

You can specify your Control Head configuration for Audio Accessory, GPIO settings, and others in the list of Control Head profiles in radio Codeplug.

Figure 5: Sample of Configuration



4.2

Automated Radio Model Detection

Your radio can detect the connected expansion head type during runtime automatically.

You can configure a single general codeplug for your different radio models, including Dash or Desk, Single Remote, Dual Remote, and Databox with or without Control Heads in your fleet. Your radio operates only with relevant codeplug fields to the model type.

4.3
Automated Control Head Software Update

This feature automatically updates the software on connected Control Heads with the transceiver software, if needed.

This feature includes updating firmware, user interface language, and screen saver. This feature is supported for all Control Head types, such as Dash or Desk Control Head, IP54 RECH, IP67 RECH, TSCH, and legacy serial NGCH and Motorcycle Control Head. The Control Head software must be MR2024.1 or above for this feature to work.

4.4
Control Heads Configuration

The following are the possible configurations of the MXM600:

- Remote Mount installation with IP54 Remote Ethernet Control Head (IP54 RECH)
- Remote Mount installation with IP67 Remote Ethernet Control Head (IP67 RECH)
- Remote Mount installation with Telephone Style Control Head (TSCH)
- Remote Mount installation with TELCO Control Head
- Dual Control Head installation with two IP54 RECH
- Dual Control Head installation with two IP67 RECH
- Dual Control Head installation with two TSCH
- Dual Control Head installation with mixed IP54 RECH and IP67 RECH
- Dual Control Head installation with mixed IP54 RECH and TSCH
- Dual Control Head installation with mixed IP67 RECH and TSCH
- Multi Radio Control installation with IP54 RECH
- Multi Radio Control installation with IP67 RECH
- Multi Radio Control installation with TSCH
- Dash Mount
- Desk Mount

NOTE: Update the MTM5000 Control Head to MR2024.1 software or a newer version before connecting to the MXM600 transceiver. Before connecting to CPS or ITM Programming, you must power up the MXM600 transceiver with MTM5000 Control Head setup once.

4.5
Dual Control Head

This feature allows you to use two control heads with one transceiver. The control heads are of equal importance and have almost identical functionality, the only difference is second PTT installed on the Telephone Style Control Head.

In Dual Control Head mode, when you press **Menu** → **Setup** you can choose between two control heads: **CH1** and **CH2**. Almost all menu items inside them are common for both control heads, except for: **Set Volume**, **Accry Setup**, and **Font Level** (provided that control heads are different). These menu items are configured separately for each control head.

NOTE: If this feature is enabled by your service provider, appropriate icons appear on the display.

Check with your service provider default accessory selections and your radio behavior for all types of calls as each control head can have different setup.

4.5.1
Interactions Between Control Heads

Your service provider can connect one transceiver with either one of the following options:

Two Identical Control Heads
Both control heads have identical resolution and soft-key area location. Identical screens are displayed on both control heads. Only the following can be used:

- Two IP54 Remote Ethernet Control Heads (IP54 RECH)
- Two IP67 Remote Ethernet Control Heads (IP67 RECH)
- Two Telephone Style Control Heads (TSCH)
- Mixed IP54 RECH and IP67 RECH

Two Different Control Heads
Both control heads have different resolution, soft-key area location, or both. Any combination of supported control heads can be used. The active screen is displayed on the operating control head while an idle screen is displayed on the other control head.

You can use both control heads interchangeably for the same activity (for example, writing a message). If you start an activity on one control head you can continue it on the second, provided that token is free.

Token is a right to use a key or button for a period of time. If you press a key or button on one control head, token activates on it, and no one can press anything on the second control head until token time passes. After you release the key/button, token becomes available again and can be taken over by the second control head. When token is activated, Key Press Token icon is visible on the display. By default, token time is set to 3 seconds.

NOTE: Token does not apply to **Emergency** button and **On**/**Off**/**End**/**Home** key. These can be pressed on both control heads at any time.

4.5.2
Dual Control Head Link

Dual Control Head Link is a connection that occurs when both control heads are properly connected to the transceiver and can communicate.

When the Dual Control Head Link is established, control heads play a tone and display Dual Control Head icon. Full functionality is available on both devices.

When one control head cannot connect to the transceiver when turning on, your radio displays Single Control Head icon and enters Single Control Head mode.

When one control head disconnects from the transceiver during operation:

- The active control head displays Link Error icon.
- The inactive control head displays Link Error and shows Link Error display (if power is available).

Turning on/off one control head results in simultaneous turning on/off the second control head.

4.5.3
Audio Accessories

Depending on a call type, voice can be routed to Control Heads and audio accessories connected to them in different ways.

During an outgoing group call, the voice can be heard either on one Control Head or on both Control Heads (depending on your service provider's settings).

During an incoming group call, the voice is always heard on both Control Heads. However, if two accessories are connected to one Control Head (to the front and the rear connector), voice is transferred through only one of them, the one with higher priority. Priority is the following (from the highest): handset (must be off-hook), HSM, external speaker.

Private calls are always transferred to the Control Head that receives a call.

Only one microphone/PTT can be opened at a time. The microphone that is pressed as first is allowed to initiate the transmission.

NOTE: The voice routing is not applicable for the Bluetooth Headset since the Bluetooth Headset is always set as the highest priority.

4.5.4
Transmission Monitor

This feature, if enabled, allows you to monitor group calls and hear ongoing voice transmission. You service provider can configure it to work in one of the following ways:

- Call initiated on CH1 is heard on CH2.
- Call initiated on CH2 is heard on CH1.
- Call initiated on any CH is heard on both control heads.

4.5.5
Keys Interactions

If any key except **Emergency** button and **On**/**Off**/**End**/**Home** key are pressed on any control head, Key Press Token icon is displayed and all keys on the other control head are blocked. This behavior is called token and means the right to use a key or button for a period of time.

NOTE: Your service provider can adjust the time that the keypad is blocked on the other control head. At any time **Emergency** button and **On**/**Off**/**End**/**Home** key can be pressed on both control heads.

4.6
Multi Radio Control

NOTE: This is a Software Selling Feature.

The Multi Radio Control feature allows you to control two radios from a Control Head. You can monitor one task force and communicate with another task force simultaneously. For example, when an incident commander requires management of an incident group and a response group.

The configuration of this feature involves two radios connected in sequence to the Control Head. Both radios must have this feature enabled and programmed in the configuration tool. You can decide which radio operates as the primary or secondary radio. The Multi Radio Control feature is not applicable to a dual Control Head, or a third-party Control Head configuration.

You can initiate the Radio Selection option from your radio menu or menu shortcut. You can also change to the next available radio using the One-Touch Button.

A brief notification is displayed on the Control Head when the unselected radio receives the following calls:

- Incoming Call Out
- Incoming Emergency Alarm

- Incoming Emergency Call
- Incoming Individual Call

4.6.1
Selecting Radios

The Control Head only controls one radio at a time.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Radio Selection**.
3. Select one of the following options:
   - **Radio 1**
   - **Radio 2**

Result: The Radio Selection Tone sounds when a radio is selected using the One-Touch Button or the Radio Selection menu.

NOTE: To enable the Radio Selection Tone feature, check with your service provider.

4.7
OEM Control Head

NOTE: This is a Software Selling Feature.

This feature allows you to connect an Original Equipment Manufacturer (OEM) or third-part Control Head to the transceiver Rear Accessory Connector (RAC). The display of the OEM Control Head has the same functionality and look as a Motorola Solutions Control Head.

The OEM Control Head can be used in one of the following modes:

Single Control Head mode
The OEM Control Head is the only Control Head connected to the transceiver.

Dual Control Head mode
The OEM Control Head is connected to the transceiver together with either IP54 Remote Ethernet Control Head (IP54 RECH), IP67 Remote Ethernet Control Head (IP67 RECH), or Telephone Style Control Head (TSCH).

4.8
Data Box Radio

This feature allows the transceiver to work without a control head in a special data box mode. In this mode, the data box radio is controlled through Peripheral Equipment Interface (PEI) with AT commands or TNP1 commands.

The data box radio is a feature that provides you support when you are using the transceiver with third-party radio-controlling devices.

Your radio automatically enters data box mode when no control head is connected.

When your radio is operating in data box mode, all features applicable to a radio with TELCO Control Head are supported. Features requiring interface interactions are not supported in data box mode.

Your radio in data box mode supports the following Software Selling Features:

- Global Navigation Satellite System (GNSS)
- Multi-Slot Packet Data
- Enhanced Security
- Radio User Assignment (RUA) or Radio User Identity (RUI)
- Permanent Disable
- Permanent Disable v2
- Secondary Control Channel (SCCH)
- Short Data Service (SDS) Remote Control
- Direct Mode Operation (DMO) Repeater Mode
- DMO Gateway Mode
- End-to-end (E2E) SDS
- Ignore Local Site Trunking (LST) Sites

4.9 One-Touch Buttons

The One-Touch Button (OTB) feature allows you to activate a feature by pressing and holding the programmable button.

NOTE:
You can also assign features to the option buttons of Remote Speaker Microphone (RSM) accessories.

4.9.1 One-Touch Button Features

Table 5: One-Touch Button Features

Feature	Description
Activation of Covert Mode	Turns Covert Mode on or off.
Add Bluetooth Device	Activates scanning for Bluetooth devices.
Any Network	Selects any network.
Any Talkgroup Network	Selects any talkgroup network.
Assign	Assigns a feature to the One-Touch Button using the configuration tool.
Change Audio Profile	Changes to the specific audio profile.
Change RF Power Class	Changes the RF power class of your radio.
Change Talkgroup	Changes the talkgroup to the one programmed by your service provider.
Disconnect All Connected Bluetooth Devices	Disconnects all Bluetooth devices connected to your radio.
Display Bluetooth Generic Attribute Profile (GATT) Sensors Battery Levels	Displays the battery levels of all paired Bluetooth GATT-based sensor devices.
Display GATT Service Data	Displays the GATT-based sensor data.

Feature	Description
Display Heart Rate	Displays the heart rate value received from the connected GATT-based heart rate sensor.
Display Operational-Tactical Address (OPTA)	Displays the OPTA.
DMO Preemptive Short Data Service (SDS)	Sends the next DMO SDS or status message with elevated priority.
Flip Display	Rotates the display by 180°. Flip Display is the default function for the upper **Side** button.
High or Low AI-Noise Suppressor	Toggles the AI-based Noise Suppressor between High AI-Noise Suppression or Low AI-Noise Suppression.
Home Only	Selects only home network.
Home Talkgroup on Home Network	Selects only home network and home talkgroup network.
Inactive One Touch Key 0	The one-touch function assigned to the **0** key remains inactive until you press and hold the button twice. **NOTE:** A single press and hold on the **0** button calls out the **+** symbol.
Initiate Call-Out Fallback	Sends a Call-Out Fallback Alert.
Location Information Protocol (LIP) Report	Sends a message with the location of your radio to a dedicated address or Selected Talkgroup (DMO Only).
Lock to Current Network	Selects the current network only.
Phone and Private Automatic Branch Exchange (PABX) Call Setup	Initiates a PABX call to a predefined entry in the contact list.
Phone Call Setup	Initiates a phone call to a predefined entry in the contact list.
Prefer Talkgroup Network Shortcut	Displays the Prefer Talkgroup Network menu.
Private Call Setup	Initiates a simplex or duplex private call to a predefined entry in the contact list, or to the last group call originator.
Reset to Default	Resets your radio to default settings.
Radio Messaging System (RMS) Human-Machine Interface (HMI) Menu	Opens the RMS menu without activating RMS mode.
RMS Mode Activation or Deactivation	Toggles the RMS feature on or off.
Radio User Identity (RUI) Log On or Log Off	Toggles the RUI feature of your radio.
Scan for Bluetooth Devices	Activates scanning for Bluetooth devices after the OTB assigned to the Add Bluetooth Device function is pressed.
Select Talkgroup Network Shortcut	Displays the Select Talkgroup Network menu.
Selecting Audio Profiles	Changes the audio profile of your radio.

Feature	Description
Send Double Push PTT Tone (D-PTT)	Sends the D-PTT tone to the currently used talkgroup.
Send Predefined Template (PDT)	Sends a predefined message to a dedicated address.
Send Status Message	Sends a dedicated status message to a dedicated address.
Send User-Defined Template (UDT)	Sends a user-defined message to a dedicated address.
Speaker Enable or Disable per Call	Enables or disables the loudspeaker for a duration of the ongoing call. **NOTE:** Available only in Car Kit mode.
Switch to Previously Selected Talkgroup	Changes the talkgroup of your radio to the previously selected talkgroup (DMO or TMO).
SIM Card End-to-End Encryption	Enables or disables End-to-End Encryption on the SIM card.
Timed Talkgroup Change	Makes a predefined talkgroup the selected talkgroup for a specified amount of time. While you are using the predefined talkgroup, the second press of the One-Touch Button results in: ● your radio returns to the original talkgroup. ● your radio restarts the timer before returning to the previously selected talkgroup. ● no action on your radio, depending on the configuration. After the timer expires, your radio returns to the previously selected talkgroup.
Toggle Backlight	Toggles the backlight on or off.
Toggle Backlight Intensity	Regulates the backlight intensity.
Toggle Bluetooth Discoverable Mode	Turns Discoverable Mode on or off.
Toggle Bluetooth GATT Sensor HMI Alerts	Toggles Bluetooth GATT Sensor HMI Alerts on or off.
Toggle BSI Encryption Enabled or Disabled	Enables or disables BSI encryption.
Toggle Call Forwarding	Toggles Call Forwarding on or off.
Toggle Car Kit Speaker Permanent On or Off	Permanently turns the Car Kit speaker on or off.
Toggle DMO or TMO	Toggles between TMO and DMO modes.
Toggle Extra Zoom	Turns Extra Zoom on or off.
Toggle Hi or Low Audio	Toggles audio between the external earpiece and the main speaker. Hi or Low Audio is the default function for the lower **Side** button. This feature is supported in emergency Full Duplex Private Calls (FDPC) mode. Press the One-Touch Button to toggle high or low audio state during incoming or outgoing emergency FDPC.

Feature	Description
Toggle Horn and Lights	Toggles the horn and lights indication. Available only in Car Kit mode if the Horn and Light feature is enabled.
Toggle Remote Speaker Microphone (RSM) with Earpiece	Activates or deactivates the RSM earpiece.
Toggle Screen Saver	Activates or deactivates the Screen Saver feature.
Toggle Speaker During Call	Enables or disables the loudspeaker during a call. Available only in Car Kit mode.
Toggle Talkgroup Scan	Turns the Talkgroup Scan feature in TMO Mode on or off.
Toggle Transceiver GPIO	Toggles the Transceiver General Purpose Input Output (GPIO) GPIO1 and/or GPIO2 on or off.
Toggle Transmit Inhibit Mode (TXI)	Turns TXI on or off.
Turn Bluetooth On or Off	Turns Bluetooth on or off.
Turn Repeater Mode On or Off	Turns Repeater Mode on or off.
Unassigned	Your radio displays `Unassigned Button` when no feature is assigned to this button.
Universal Time Display	Displays universal time on the home screen.
Volume Down	Decreases the volume by one level.
Volume Up	Increases the volume by one level.
Wi-Fi	Turns Wi-Fi connection on or off.

4.9.2
One-Touch Dial

The One-Touch Dial feature allows you to call by pressing and holding one of the numeric keys, **1**–**9**.

If you press an unassigned key, your radio displays a negative indication message.

NOTE:
If the One-Touch Button feature is disabled, the One-Touch Dial is disabled as a consequence.

In Radio Messaging System (RMS) mode, the One-Touch Button feature is disabled.

Chapter 5

Getting Started

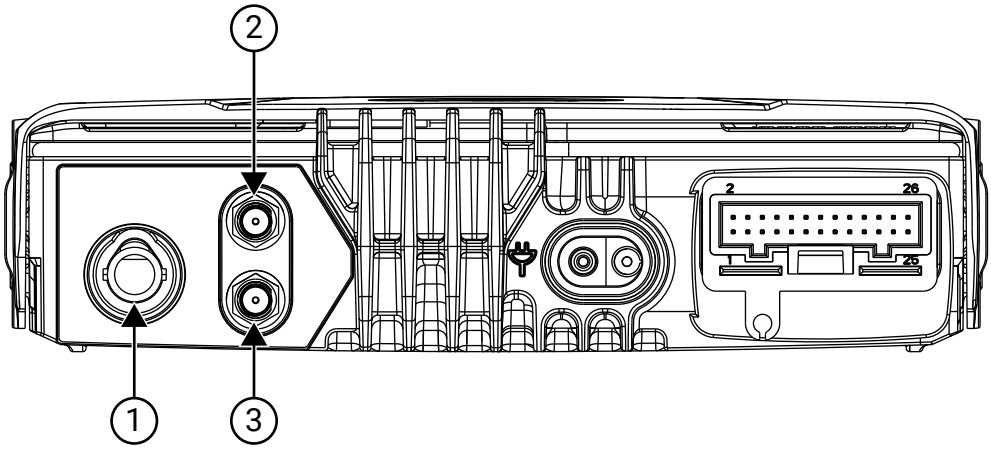
Familiarize yourself with basic information on how to use your radio.

5.1

Attaching or Removing the Antenna

Prerequisites: Use only the antenna intended for your radio. Using other antennas can result in significant range loss due to poor Radio Frequency (RF) performance.

Figure 6: Rear Ports



Number	Description
1	TETRA Antenna port
2	Bluetooth or Wi-Fi port
3	Global Navigation Satellite System (GNSS) port

Attaching the Antenna

Procedure:

1. Connect the Bluetooth or Wi-Fi cable of the external antenna to the transceiver Bluetooth or Wi-Fi port.
2. Connect the Global Navigation Satellite System (GNSS) cables of the external antenna to the transceiver GNSS port.
3. Turn the connector sleeve on each cable to lock the cables to the transceiver.
4. Connect the TETRA cable of the external antenna to the transceiver TETRA port.
5. Turn the connector head of the cable to lock the cable to the transceiver.

Removing the Antenna

Procedure:

1. Turn the external TETRA antenna cables anticlockwise.
2. Remove the antenna from your radio.
3. Turn the external GNSS antenna cables anticlockwise.
4. Remove the antenna from your radio.
5. Turn the external Bluetooth or Wi-Fi antenna cables anticlockwise.
6. Remove the antenna from your radio.

5.2

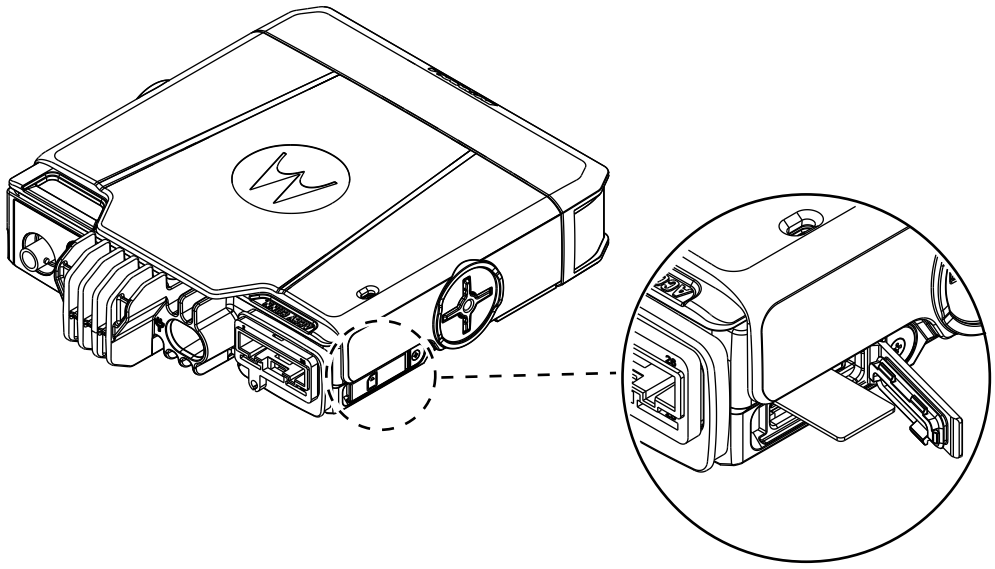
Inserting or Removing the SIM Card

Inserting the SIM Card

Procedure:

1. Flip open the TETRA SIM card holder door on the transceiver.

   Figure 7: SIM card holder door



2. Insert the TETRA SIM card into the card slot. Ensure that the gold contact area is facing downward.
3. Close the TETRA SIM card holder door.

   CAUTION: Ensure that the dust cover is fully closed after it is opened. Water seal failure can occur if the dust cover is not closed properly.

Removing the SIM Card

Procedure:

1. Flip open the TETRA SIM card holder door on the transceiver.
2. To remove the TETRA SIM card from the card slot, push the SIM card to dislodge it.
3. Close the TETRA SIM card holder door.

   CAUTION: Ensure that the dust cover is fully closed after it is opened. Water seal failure can occur if the dust cover is not closed properly.

5.2.1
External TETRA SIM Card Priority

When you insert a TETRA SIM card into the external TETRA SIM reader, it gets prioritize over the internal TETRA SIM card. The internal TETRA SIM card remains deactivated as long as an external TETRA SIM card is plugged in.

5.3
Turning Your Radio On or Off

Familiarize yourself on how to turn on or turn off your radio.

Turning Your Radio On

Procedure:

Press and hold the **Power On** button until the display light comes on.

IMPORTANT: Do **not** press any key until your radio is turned on.

Result:
Your radio performs a self-check and registration routine. After successful registration, your radio is in service.

NOTE: If Covert Mode is activated, your radio turns on without visible and audible notification.

Turning Your Radio Off

Procedure:

Press and hold the **Power Off** button.

5.4
PIN Code Authentication

If pre-set by your service provider, your radio has active PIN Code Authentication, which helps you increase security and protect your radio against unauthorized use.

The BSI PIN code is read from the TETRA SIM card and cannot be changed or disabled. However, the general PIN code read from the codeplug configuration can be changed and disabled using radio HMI or

codeplug. If you are unable to unlock your radio, you cannot send or receive any call, nor adjust the volume level with the **Rotary Knob**.

You are asked to enter the PIN code each time you turn on your radio.

NOTE:
If your radio is using BSI PIN authentication, the radio disables the general PIN authentication.

5.4.1
Unlocking Your Radio

Prerequisites: Radio displays `Unit Locked Enter Code`.

Procedure:

Enter the PIN code at the prompt.

NOTE:
For radios with general PIN authentication, the PIN length is a fixed 4-digit code. For radios with BSI PIN authentication, the PIN length is configurable by your service provider up to a maximum of 8-digit code.

Your radio enters the default home display.

5.4.2
Unblocking Your Radio

If you have entered the incorrect PIN code for more than three times (by default), use the PIN Unblocking Key (PUK) to unblock your radio.

Prerequisites: Radio displays `Unit Blocked Enter PUK`.

Procedure:

1. Enter the PUK code at the prompt.

   NOTE: The PUK is a primary code provided by your service provider. For radios with general PUK authentication, the PUK length is a fixed 8-digit code. For radios with BSI PUK authentication, the PUK length is configurable by your service provider up to a maximum of 8-digit code.

   When PUK code is successfully entered, radio displays the PIN code prompt.

2. Enter the PIN code at the prompt.

   NOTE: If change PIN option is enabled by your service provider, you are able to change your PIN code. Enter your new PIN code twice to change the PIN code.

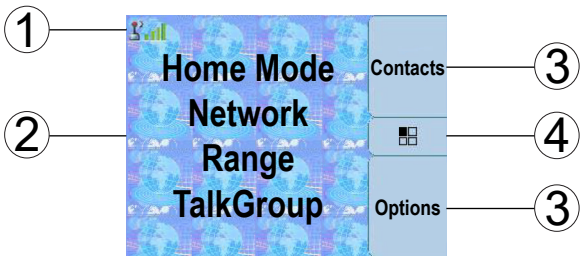
Chapter 6

Display and Keys

Familiarize yourself with the default home screen and keys elements of your radio.

6.1 Default Home Screen

Figure 8: Default Home Screen with Icons



Annotation	Description
1	Status icon area
2	Text display area
3	Soft key area
4	Menu/Context sensitive icon

6.2 Soft Key

Table 6: Colors of the Soft Key Area

The colors of the Soft Key area changes according to the mode your radio is in.

Color		Mode or State
Light Blue		• Normal Trunked Mode Operation (TMO) • Normal Direct Mode Operatio (DMO)
Light Orange		• Emergency Mode • Disaster Alert Call
Olive		Local Site Trunking Mode

Color		Mode or State
Yellow		Call Out – Standby
Red		• Call Out – Alert • Radio is out of coverage during TMO Mode
Green		Call Out – Accepted
Blue		Radio Messaging Service (RMS)
Gray		Radio User Assignment (RUA) – Limited service

Table 7: Soft Key Changes During a Call

During a call, label of the right Soft Key indicates the next possible change. Accessory default setup is:

Soft Key Label	Audio Setting
Spkr	Audio goes to the main speaker (`Speaker HIGH` is displayed)
Erpce	Audio goes to the earpiece (`Speaker LOW` is displayed)

6.3
Idle Display

The terminals provide access to all services from the main idle display.

Your service provider can configure the idle display. The idle display can show the following:

- Icons on the status area (top line):
  - Status icons in Trunked Mode Operation (TMO) signal level icon.
- In default configuration non-BSI radio in TMO displays:
  - Line 1: Network status or network identification (`No Service` or MCC/MNC or MCC/MNC Alias).
  - Line 2: Selected Group Folder.
  - Line 3: Selected Group.
  - Lines 4, 5: Home Mode Display Text (if available).

- Line 5: Time and Date (if available).

  NOTE:
  In case the time and date information for a specific language cannot be displayed in one line in the zoom or standard mode, the information is displayed in two lines. The time and date overwrite the second line of Home Mode Display if any.

  If your radio is out of range in TMO Mode, your radio displays the `No Service` message, the text display area turns light red, and the soft key area turns red.

- Soft key labels and optional menu icon.
- An optional wallpaper background.

From the idle display, you have easy access to stored target lists:

- Pressing the **Up** key accesses the favorite talkgroups list.
- Pressing the **Down** key accesses the recent calls lists.
- Pressing the **Send** key accesses the last dialed numbers list.
- Pressing the **Contacts** softkey accesses the address book.

6.4 Configurable Idle Screen

Your service provider can configure the information that is displayed on the idle screen below the status icon area. The displayed information depends on your radio configuration and services supported.

- Audio Profile Name
- BSI Registration Status
- Radios with the Gateway feature enabled (Selling option):
  - Gateway Background Mode (with one of the reasons for entering the mode):
    - Configuration
    - TMO Failure
    - Gateway Detected
    - Repeater Call
    - DMO Call
    - Unknown
  - Gateway TMO Zone
  - Gateway TMO Talkgroup
  - Gateway DMO Zone
  - Gateway DMO Talkgroup
- Home Mode
- Individual Short Subscriber Identity (ISSI)
- International Talkgroup Link Alias
- Network (No Service, or Mobile Country Code (MCC)/Mobile Network Code (MNC), or Networks Alias)
- Operational-Tactical Address (OPTA)
- Radio Status
- Range

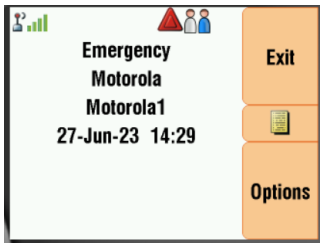
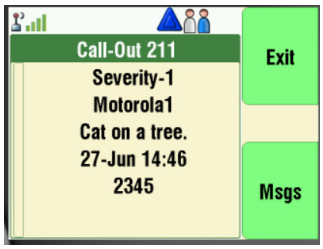
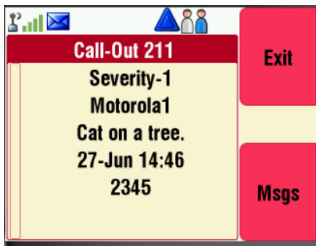
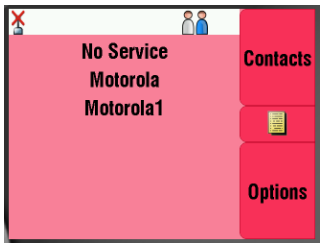
- RMS/FMS (Selling option)
- Scan List Alias
- Secondary Talkgroup Alias
- Talkgroup Alias
- Time and Date

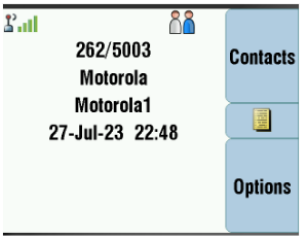
Order and visibility of these items are also subject of the Configurable Idle Screen settings.

6.5
Display Features

Your radio utilizes colors to highlight certain special situations:

Table 8: Display Features

Situation	Display Images
When your radio is in an emergency mode/call	
When in the call-out mode (alert received state, standby state, accept the state)	 
When your radio is out of coverage in TMO mode	

Situation	Display Images
In the RUA/RUI, when you are logged on or pseudo logged on	

Your radio has two font size levels that you can choose using the menu.

The backlight can be provisioned to operate in one of the following modes:

Semi-Auto
Pressing a provisioned One-Touch Button toggles the on/off state of the backlight. The backlight is also turned off automatically when the backlight timer runs out.

Auto
Pressing any key automatically turns on the backlight.

The backlight remains on until the backlight timer runs out, or if a provisioned One-Touch Button is pressed to turn it off. You can also toggle between the modes using the menu.

Your radio supports an option to display a screen saver when the radio has been idle for a set time, or when you explicitly activate it. The screen saver consists of an image, which can be provisioned from any GIF image, a text string, which can also be provisioned, and the date and time. When the screen saver is being displayed, any key input or incoming service causes the screen saver to deactivate.

6.6
Display Orientation

The display on the Telephone Style Control Head (TSCH) can rotate, which increases readability and facilitates operation. When a single TSCH, or a combination of TSCH and Remote Ethernet Control Head (RECH) (IP54 or IP67 RECH) is used, the following display orientation is possible:

- When the TSCH is off-hook, the display orientation is portrait.
- When the TSCH is on-hook, the display orientation can take one of the following positions (depending on your service provider configuration):
  - Fixed portrait
  - Clockwise
  - Counterclockwise

Chapter 7

LED Indicator

Table 9: LED Indicator for Transceiver and Control Heads

Indication	Status
Solid green	• Radio is in transmitting process. • Repeating call.
Blinking green	• Radio is turned on. • In service or idle. • Switching modes from TMO to DMO.
Solid red	• Out of service. • Radio fails to check for updates
Blinking red	• Connecting to the network. • Switching modes from DMO to TMO.
Solid orange	• Transmit inhibit in service. • Channel busy in DMO. • Radio interference in DMO.
Blinking orange	Incoming call.
No indication	• Radio is turned off. • Radio is in Covert Mode.
Red and orange interchanging	• Radio does not detect Certificate Enrollment.

Chapter 8

Icons Indicator

Familiarize yourself with the icons on your radio.

8.1 Status Icons

Status icons appear when your radio is engaged in certain activities or when you have activated certain features.

Table 10: Trunked Mode Operation (TMO) Icons

Icon	Name	Description
	In Service	Transmission is available.
	No Service	Transmission is not available.
	Signal Strength	The more bars, the stronger the signal.
	Migration	Your radio is registered to a foreign network.
	Broadcast Call	Your radio is in a Broadcast Call.
	Gateway Mode	Your radio is operating as a gateway in Gateway Mode.
	Scan	Talkgroup scanning is activated on your radio.
	Packet Data or Multi-Slot Packet Data (MSPD)	The more blue sections on the icon, the faster the data transfer. ● Four gray sections – Context activated and data idle. ● One blue section – Packet Data is active. ● Two blue sections – Multi-Slot Packet Data is active.
	Maximum RF Transmit Level	Hi – High-power class (Class 2)
		M – Medium-power class (Class 2L)
		L – Low-power class (Class 3)

Table 11: Direct Mode Operation (DMO) Icons

Icon	Name	Description
	Direct Mode Call	Your radio is receiving a Direct Mode call. The more bars, the stronger the signal.
	Direct Mode	Your radio is in Direct Mode, a radio-to-radio communication.
	Repeater Mode	Your radio is operating as a repeater in Repeater Mode. This icon blinks when your radio is in Repeater Background Mode.
	DMO Gateway Communication Mode	The **Gateway** option is selected. • Solid – Your radio synchronizes with the gateway. • Blinking – Your radio is not synchronizing, or attachment is happening. • No icon – Radio-to-radio and repeater communication.
	DMO Repeater Communication Mode	The **Repeater** or **GW + Rep**option in DMO Mode is selected. • Solid – Your radio detects the repeater. For example, your radio receives a presence signal. • Blinking – Your radio does not detect the repeater yet, or attachment is happening. • No icon – Radio-to-radio and gateway communication.
	Automatic DMO Mode Enabled	Indicates that Automatic DMO is enabled.
	Automatic DMO Mode Disabled	Indicates that Automatic DMO is disabled.
	Maximum RF Transmit Level	Hi – High-power class (Class 2)
		M – Medium-power class (Class 2L)
		L – Low-power class (Class 3)

Table 12: General Icons

Icon	Name	Description
	All Ring Tones Off	• The volume is set to zero when **Volume Adj. Mode** is set to **Common**. • Both Simplex and Duplex ring volume is set to zero when **Volume Adj. Mode** is set to **Individual**.

Icon	Name	Description
	Simplex Ring Muted	• The Simplex ring volume is set to zero. • The Duplex ring volume is set to more than zero.
	Duplex Ring Muted	• The Duplex ring volume is set to zero. • The Simplex ring volume is set to more than zero.
	Speaker Off	Audio will not sound through the speaker.
	Audio Profile Selected	An audio profile associated with an icon is active. **NOTE:** For more details on audio profiles available for your radio, contact your service provider.
	Horn and Lights	Your radio detects an activated external alarm. For example, the horn and lights are activated.
	GNSS (Global Navigation Satellite Systems)	• Solid – Your radio detects a fixed location. • Blinking – Your radio is acquiring a fixed location. This feature is an optional setting and may not be enabled on your radio.
	RUI Logged on	You are logged on into your radio.
	RUI Pseudo Log On	You are in a pseudo logon state.
	RUI Packet Data	You are in a pseudo logon state when the Packet Data feature is activated and an active data session is in progress.
	RUI Packet Data	You are in a pseudo-logon state when the Packet Data feature is activated and the external device sets up a data connection with your radio.
	Emergency	Your radio is in Emergency Operation. • Solid – The Emergency Operation starts. • Blinking – Your radio is in an emergency receiving state.
	Disaster Alert Call	Your radio is in a Disaster Alert Call.
	List Scrolling	The **Rotary Knob** is in list scrolling mode.
	New Message Has Arrived	Your radio receives a new message from a different user profile.
	New Message in Inbox	You have unread messages in your **Inbox**.
	Unread WAP Message	A new page is loaded to the browser.
	Call-Out	Indicates Call-Out alert.

Icon	Name	Description
	Call-Out Alert Arrived	Your radio receives a new Call-Out message.
	Call-Out Alert Unread	You have unread alerts in the **CO Box**.
	End-to-End Encryption (E2EE)	Solid, when the E2EE is enabled: ● for the selected talkgroup, ● for the highlighted private number, ● for the manually entered private number, ● when transmitting voice in Group Calls, ● when transmitting voice in Simplex Private Calls. Blinking, when the E2EE is enabled: ● when receiving voice in Group Calls, ● when receiving voice in Simplex Private Calls, ● during encrypted Duplex Private Calls.
	SDS End-to-End Encryption (E2EE)	A Short Data Service (SDS) message or message recipient address is encrypted. In High Security mode, your radio only processes encrypted information. This icon is always visible when you are in the messages menu such as **Inbox**.
	Unread (New) WAP Message	You have not entered **WAP Box** since the last WAP message received. Blinking – The priority is high.
	WAP Message Icon	Displayed next to the priority WAP message in the message list view.
	WAP Message Time	Displayed next to the create date in the message list view.
	WAP Message Expiration	Displayed next to the expiry date in the message list view.
	WAP Message Title Icon	Displayed next to the title along with the text in the message list view.
	Keys Locked	Indicates that the keys are locked.
	Non-Secured Call in TMO	Blinking – Air encryption is not available when your radio is in TMO and attempts to connect to a gateway.
	Non-Secured Call in DMO	Blinking – Air Encryption is not available when your radio is in DMO. This icon appears after you press the **PTT** button.
	Remote Control	Your radio is being remotely controlled and some commands are being executed in the background. For example, your radio is being controlled by special SDS messages or triggered to send a GNSS location report.

Icon	Name	Description
	Radio Selection	Indicates that the next available radio is selected.
	Bluetooth Connected	Bluetooth is enabled, and at least one device is actively connected to your radio.
	No Bluetooth Connection	• Solid – No active Bluetooth connection is detected on your radio. • Blinking – Bluetooth is enabled, and your radio is in the Discoverable Mode or connecting to a remote device.
	Earpiece Connected	An earpiece is connected to your radio.

Table 13: Bluetooth Icons

Icon	Name	Description
	PTT POD	Indicates Bluetooth Push-to-Talk (PTT) pod.
	Headset	Indicates Bluetooth headset.
	Sensor (GATT)	Indicates Bluetooth Generic Attribute Profile (GATT) based sensor devices pairing.
	Data Device (SPP)	Indicates Serial Port Profile (SPP) device is detected.

Table 14: Wi-Fi Icons

Icon	Description
	Wi-Fi operation in progress.
	Over-the-Air Programming (OTAP) over Wi-Fi update is available.
	Wi-Fi status is turned off.
Wi-Fi Signal Strength	
	Wi-Fi signal is excellent.
	Wi-Fi signal is good.
	Wi-Fi signal is average.

Icon	Description
	Wi-Fi signal is poor.
	Wi-Fi signal is unavailable.
Wi-Fi Signal Strength for Secured Networks	
	Wi-Fi signal is excellent for secured networks.
	Wi-Fi signal is good for secured networks.
	Wi-Fi signal is average for secured networks.
	Wi-Fi signal is poor for secured networks.
	Wi-Fi signal is unavailable for secured networks.
Wi-Fi Signal Strength for Open Networks	
	Wi-Fi signal is excellent for open networks.
	Wi-Fi signal is good for open networks.
	Wi-Fi signal is average for open networks.
	Wi-Fi signal is poor for open networks.
	Wi-Fi signal is unavailable for open networks.

Table 15: Enhanced Dual Control Head

Icon	Name	Description
	Dual Control Head	Indicates that Dual Control Head feature is enabled. Both control heads are connected to the transceiver.
	Single Control Head	Indicates that Dual Control Head feature is enabled. Only one control head is connected to the transceiver.
	Link Error	Indicates that connection between the control head and the transceiver is lost. For example, the connection is lost due to an error.
	Key Press Token	Indicates that one of the control heads reserves the key press token.
	CH1	Indicates that particular activities or settings apply to Control Head 1. Control Head 1 is a control head connected to port 1 on the expansion head.

Icon	Name	Description
	CH2	Indicates that particular activities or settings apply to Control Head 2. Control Head 2 is a control head connected to port 2 on the expansion head.
	Speaker 1 Off (Low Audio)	Indicates that audio will not sound through the speaker of Control Head 1.
	Speaker 2 Off (Low Audio)	Indicates that audio will not sound through the speaker of Control Head 2.
	Speakers Off (Low Audio)	Indicates that speakers of both control heads are off.
	All Tones Off Duplex and Simplex Ring Muted	• All alert tones are off. • Both Simplex and Duplex ring volume is set to zero. • Applicable to Control Head 1.
	Simplex Ring Muted	• The Simplex ring volume is set to zero. • The Duplex ring volume is set to more than zero. • Applicable to Control Head 1.
	Duplex Ring Muted	• The Duplex ring volume is set to zero. • The Simplex ring volume is set to more than zero. • Applicable to Control Head 1.
	All Tones Off Duplex and Simplex Ring Muted	• All alert tones are off. • Both Simplex and Duplex ring volume is set to zero. • Applicable to Control Head 2.
	Simplex Ring Muted	• The Simplex ring volume is set to zero. • The Duplex ring volume is set to more than zero. • Applicable to Control Head 2.
	Duplex Ring Muted	• The Duplex ring volume is set to zero. • The Simplex ring volume is set to more than zero. • Applicable to Control Head 2.

8.1.1

Talkgroup Icons Selection

Talkgroup icons are used to indicate that a talkgroup has a special function, show the status of network selection, and/or show the talkgroup properties. A talkgroup without an icon does not have a special function attached to it.

Talkgroup icons are displayed next to the talkgroup alias on idle display and when scrolling through the common or favorite folders.

NOTE: When in Direct Mode Operation (DMO), Trunked Mode Operation (TMO) talkgroups are not shown in common folders.

Table 16: Trunked Mode Operation (TMO) Talkgroup Icons

Icon	Talkgroup in Common Folders	Talkgroup in Favorite Folders	Instance when the Icon is Displayed
	Displayed in TMO Mode	Displayed in TMO Mode	When the selected talkgroup is a SIM TMO talkgroup, and is not registered to a SIM network. A single network is available.
	—	Displayed in DMO Mode	When the selected talkgroup is a SIM TMO talkgroup. A single network is available.
	Not displayed	Displayed in TMO Mode and DMO Mode	When the selected talkgroup is a normal TMO talkgroup. A single network is available.
	Displayed in TMO	Displayed in TMO Mode and DMO Mode	When the selected talkgroup is an ISI or Any network TMO talkgroup. Multiple networks are available.
	Displayed in TMO	Displayed in TMO Mode and DMO Mode	When the selected TMO ISI talkgroup is not assigned to a home network. Multiple networks are available.
	Displayed in TMO		When the selected TMO normal talkgroup is not assigned to the current network. A single network is available.

Table 17: Direct Mode Operation (DMO) Talkgroup Icons

Icon	Talkgroup in Common Folders	Talkgroup in Favorite Folders
	Displayed when a DMO talkgroup is selected.	

Table 18: General Icons

Icon	Talkgroup in Common Folders	Talkgroup in Favorite Folders
	Display when your radio is registered to a network that is not the home network. **NOTE:** This icon is also known as a Migration icon. The icon is displayed only on the top as a status icon.	
	Displayed when your radio is locked to a current single network. The selected ISI talkgroup or Any Net talkgroup allows multiple networks.	

8.1.2
Menu Icons

The following icons make it easy to identify the menu items at first glance.

Table 19: Menu Icons

Icon	Name	Description
	Main Menu Items or Context-Sensitive Menu	It is assigned to **Menu** when the main menu items or context-sensitive menu are active.
	Messages	Send status messages. Send text messages (free text or according to user defined or predefined templates). Received messages in **Inbox**.
	Contacts	Add, search, edit, or erase entries in the contact list.
	Browser	Starts the WAP browser.
	Security	Lets you turn on or off, verify security features, and change passwords.
	Setup	Allows you to customize your radio.
	Group Setup	Contains additional menu items for Scanning Talkgroups features.
	Favorites	Contains shortcuts to frequently used talkgroups and contact numbers.
	My Info	Displays information about your radio and its numbers.
	Recent Calls	Contains a list of recent calls.
	Shortcuts	Allows you to view and manage shortcuts to menu items.
	Radio User Identity (RUI)	Allows you to log in and log out of your radio.
	Networks	Allows you to select a network.
	Location	Displays location of your radio.
	Packet Data	Allows you to send data from your radio to other devices.
	Services	Allows you to manage Broadcast, Assistance, and Disaster Calls.

8.1.3
Text Entry Icons

In the text entry screen, icons tell you which text entry mode and method you are using. A character counter displayed on the text entry icon indicates the amount of characters that can be entered.

Press the **#** key to toggle through the text entry modes.

Table 20: Text Entry Icons

Primary Icon	Secondary Icons	Description
abc1	abc2	TAP – no capitals
Abc1	Abc2	TAP – capitalize first letter only
ABC1	ABC2	TAP – all capitals
abc	abc	iTAP – no capitals
Abc	Abc	iTap – capitalize first letter only
ABC	ABC	iTap – all capitals

8.1.4

Inbox Icons

The inbox folder contains up to 100 new or old incoming messages, depending on the length of the messages. The **Messages** sub-menu indicates the number of the messages. For example, the indication `2/4` means that two unread and four read messages are in the inbox.

Table 21: Inbox Icons

Icon	Description
Regular Messages	
	Message is unread.
	Message is read.
Protected Messages	
	Protected Message is unread.
	Protected Message is read.
	Protected Message
General	
	The sender's name and number is in the Message View.
	The date and time of message arrival is in the Message View.

Icon	Description
	The delivery status for Store and Forward messages is received.

8.1.5
Outbox Icons

The outbox stores up to 100 sent messages that are arranged chronologically.

Table 22: Outbox Icons

Icon	Description
Regular Messages	
	Message delivery is in progress.
	Message delivery is accomplished.
	Message delivery failed.
	Outgoing message is successful.
	Outgoing message failed.
Protected Messages	
	Protected Message delivery is in progress.
	Protected Message delivery is accomplished.
	Protected Message delivery failed.
	Outgoing Protected Message is successful.
	Outgoing Protected Message failed.

8.1.6
Call-Out Icons

This is a Software Selling Feature.

Table 23: Call-Out Icons

Icon	Description
	Call-Out Message in the inbox is unread.

Icon	Description
	Call-Out Message in the inbox is read.
	Protected Call-Out Message in the inbox is unread.
	Protected Call-Out Message in the inbox is read.
	Call-Out Message in the outbox is read.
	Protected Call-Out Message in the outbox is read.

8.1.7
Radio Messaging System Icons

This is a Software Selling Feature.

Table 24: Radio Messaging System (RMS) Icons

Icon	Description
	A new RMS status message is received.
	An RMS status message is sent.
	RMS Box Read Message
	RMS Box Unread Message

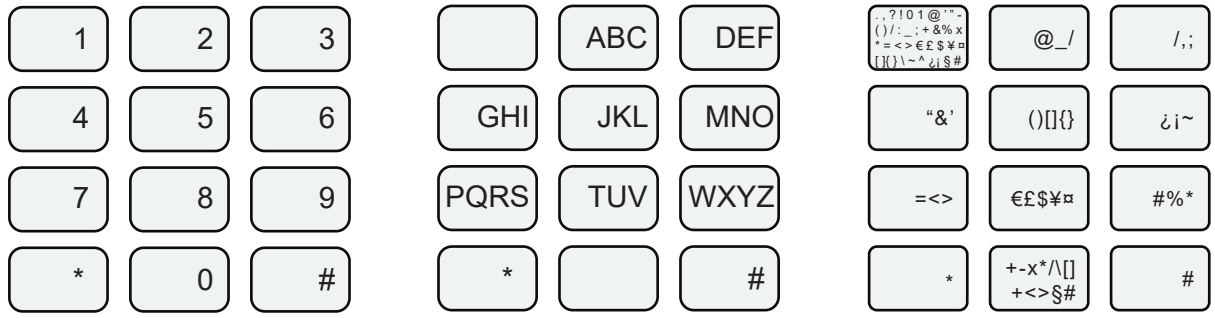
Chapter 9

Keypad Overview

Familiarize yourself with the keys on your radio.

9.1 Alphanumeric and Symbol Keys

List of keys and characters in Alphanumeric Mode for TAP or iTAP.



Numeric Key View | Alphabetic Key View | Symbol Key View

Table 25: Alphanumeric and Symbol Keys

Numeric Keys	Alphabets	Symbols
1	Not applicable	. , ? ! 0 1 @ ’ ” - ( ) / : _ ; + & % × * = < > € £ $ ¥ ¤ [ ] { } \ ~ ^ ¿ ¡ § #
2	A B C a b c	@ _ \
3	D E F d e f	/ , ;
4	G H I g h i	” & ’
5	J K L j k l	( ) [ ] { }
6	M N O m n o	¿ ¡ ~
7	P Q R S p q r s	= < >
8	T U V t u v	€ £ $ ¥ ¤
9	W X Y Z w x y z	# % *
0	Not applicable	+ - × * / \ [ ] = < > § #

9.2

Functions of Keys

Table 26: Functions of Keys

Key	Description
Menu	Press to open an active context-sensitive menu.
Select	Press to select the highlighted choice and place the selection in the main text area.
Delete	Press once to delete the last entered character. Press and hold to clear the entire main text area.
Up Navigation	In TAP, press to reject word completion and scroll up. In TAP, press to change the previous letter from lowercase to uppercase.
Down Navigation	In TAP, press to reject word completion and scroll in the text area. In TAP, press to change the previous letter from uppercase to lowercase.
Left Navigation	Press to navigate to the left. Press and hold to repeat. In TAP, if a word completion is available, press to reject the completion.
Right Navigation	Press to navigate to the right. Press and hold to repeat. In TAP, if a word completion is available, press to accept the word.
Send	Press to start calls or send messages. Disabled in browser active state.
End	Press to end calls. Press to deactivate the browser.
0 to **9**	In numeric mode, press to enter a digit at insertion point.
Any numeric key	Press and hold to enter TAP or iTAP alphanumeric mode. Press and hold to enter numeric mode. In TAP, press to reject word completion and continue entering text. A new word completion starts after TAP timeout.
0	Press to run through single shift, uppercase, and lowercase functions.
*	Press to insert a space. In TAP, press to reject word completion and insert a space. Press to enter a new word into the user dictionary. Press and hold to enter a carriage return.
#	Press once to run through **Symbol**, **Numeric**, **Primary**, and **Secondary** entry modes.

Key	Description
	Press and hold to return to the default entry mode.

9.3 Browser Keys Usage

When the browser is active, the following usage described occurs inside or outside the editor.

Table 27: Browser Keys Interactions

Key Press	Action
0–**9** key	• In the editor: enters a digit and/or character depending on the text entry mode selected. • Outside the editor: in a numbered list, selects the required item list.
0–**9** key (hold)	• In the editor: standard use. • Outside the editor: hotkey for navigating to the numbered bookmark.
* key (press or hold)	In the editor, inserts a space.
# key (press or hold)	Brings up the Text Input pane, while in editor. Otherwise, sounds a wrong key press.
Left or **Right** Soft key	Selects the option that appears in the display directly above the left and right soft key (part of the page).
Up Navigation key	While in list of options, moves up one line.
Up Navigation key (hold)	Moves up on page.
Down Navigation key	While in list of options, moves down one line.
Down Navigation key (hold)	Moves down on page.
Left Navigation key	• Moves to the previous pane. • In the editor: moves left.
Left Navigation key (hold)	Functions as backward.
Right Navigation key	• Moves to the next pane. • In the editor: moves cursor to the right and inserts space if at the end of the word.
Right Navigation key (hold)	Functions as forward.
Center of Navigation keys (hold)	Auto-repeat.
Menu key	Brings up the browser menu.
End key	Press to deactivate the browser.
Send key	Disabled in browser active state.
Rotary Knob	Used for volume adjustment only.

Key Press	Action
Emergency button	Deactivates the browser. Your radio enters Emergency Mode.

Chapter 10

General Operations

Get to know the general operations of your radio.

10.1 Writing Text

This section provides information on entering texts on your radio.

10.1.1 Selecting Text Entry Modes

Prerequisites: Your radio displays the text entry screen.

Procedure:

1. Press **Menu** → **Entry Mode**.
2. Select one of the following options:
   - **Primary** – for entering alphanumeric characters.
   - **Numeric** – for entering numbers only.
   - **Symbol** – for entering symbols only.
   - **Secondary** – for entering alphanumeric characters (this mode is optional and you have to add it to the list). It is convenient when you use one language, and sometimes wish to switch to another one.

   NOTE: In the text entry screen, you can also press **#** key repeatedly to toggle through the entry modes.

10.1.2 Selecting Text Entry Methods and Languages

Prerequisites: Your radio displays the text entry screen.

Procedure:

1. Press **Menu** → **Entry Setup**.
2. Use the **Right** or **Left** navigation key to select one of the following options:
   - **TAP** – Enter letters, numbers, and symbols by pressing an alphanumeric key one or more times.
   - **iTAP** – Allows your radio to predict each word as you press an alphanumeric key.

   NOTE: You can use these methods in the languages programmed in your radio.

10.1.3

Writing in iTAP Alphanumeric

This feature allows you to write quicker. For example, try to write **David 232!**

Prerequisites: Your radio displays the text entry screen.

Procedure:

1. Press **Menu** → **Entry Setup** → **Prim.**.
2. Select **iTAPEnglish** and press **Back**.
3. Press **Menu** → **Entry Mode**.
4. Select **Primary**.
5. Press **3** key.

   The alternative row opens and shows **D E F 3**.

6. Continue entering the letters by pressing one key for each letter. Press **2**, **8**, **4**, and **3** keys.

   NOTE: Automatic shift to upper case is used at the beginning of a message, after punctuation followed by space, or for the first letter of a word created as a new contact entry.

   The alternative row highlights **David**.

7. Press ***** key.
8. Press **2** key and scroll the alternative row by pressing **Right** Navigation key to reach **2**.

   It automatically changes the entry mode to **Numeric**.

9. Press **3** and **2** keys.
10. Press and hold **1** key until **0** at the end changes to **.**.

    The alternative row highlights **232.**.

11. Scroll the alternative row by pressing the **Right** Navigation key to reach the required symbol.
12. Press **Select**.

Result: You have entered **David 232!**.

10.1.4

Writing in TAP Alphanumeric

Prerequisites: Your radio displays the text entry screen.

Procedure:

1. Press **Menu** → **Entry Setup** → **Seco.**.
2. Select **TAPEnglish** and press **Back**.
3. Press **Menu** → **Entry Mode**.
4. Select **Secondary**.
5. Press the key labeled with the desired character, once for the first character, twice for the second, and so on.

Example:

To enter letter s, press **7** key four times. To enter number 7, press the **7** key five times. If you do not press a key for a few seconds, the character is accepted, and the cursor moves to the next position.

10.1.5
Word Locking

This feature allows you to add the words that are not in the dictionary.

Prerequisites: Your radio displays the text entry screen.

Procedure:

1. Press **Menu** → **Entry Setup** → **Prim.**.
2. Select **iTAPEnglish** and press **Back**.
3. Enter the word. Scroll the alternate line for a word option. Each option is successively highlighted and partially locked.
4. Enter the second part of the word. The first part remains unchanged (locked). The newly entered letters are highlighted and then locked while you scroll to the next word option.
5. Press the ***** key. The word is placed in the text area with a space and automatically added to the dictionary.

10.1.6
Adding Words to Dictionary

This feature allows you to create the word in the dictionary. Every language has a dictionary of its own. Words (including alphanumeric abbreviation) can be formed.

Procedure:

Create the word in the dictionary.

Once you enter a word followed by space, it is automatically stored in the dictionary.

NOTE: The word appears as a choice whenever you press the same key combination in the future.

10.2
Keypad Lock

The keypad lock feature allows you to lock the keypad to avoid accidentally pressing a key.

By default, while the keypad is locked, all keys are inoperative except for the **Power** and **Emergency** buttons. When an incoming emergency call is received, the **PTT** button automatically unlocks for the call duration.

When the keypad is locked, your radio displays one of the following:

- **Nothing** - no notification is displayed.
- **Notification Only** - `Keys Locked` is displayed.
- **Notification and Instruction** - `Press Menu and * to Unlock` is displayed.

You can set the display option in the codeplug. By default, it is set to **Notification and Instruction**.

Your service provider can determine which of the following elements are also inoperative while the keypad is locked:

- PTT button (also on accessories)

  NOTE: Your service provider can set to lock all **PTT** buttons, or only your radio PTT button.

- Volume Control
- Talkgroup Selection
- Side buttons
- Lock on Start-Up
- The Power-Off button

Automatic Keypad Lock

The automatic keypad lock is a feature enabling your radio to lock its keypad automatically after a defined period. Your radio allows activating or deactivating the feature using the HMI.

If the feature is enabled, after a defined time of inactivity the keypad locks automatically. Any user activity restarts the Automatic Keypad Lock timer. When the keypad locks automatically, your radio displays `Keypad auto locked`. You can change the time value required for the automatic lock through the HMI.

10.2.1 Locking or Unlocking the Keys or Buttons

Procedure:

Press **Menu** key and ***** key.

NOTE: The **Emergency** button is not locked. Entering Emergency Mode unlocks all keys.

10.3 Selecting Talkgroups

Follow these procedures to select talkgroup manually. If the selected talkgroups is an InterSystem Interface (ISI) talkgroup, your radio can migrate to another talkgroup linked network, changing the talkgroup automatically.

Procedure:

From the home screen, use one of the following methods:

- Press **Left** or **Right** Navigation key. Press **Select** to confirm.
- Select **Options** → **TG by abc**. Enter a talkgroup name and select the talkgroup name from the list.
- Select **Options** → **TG by Folder**. Select a folder (for example, **Favorite**) and then a talkgroup name.

  NOTE: Your radio can access up to three levels of the folder structure.

10.3.1
Talkgroup Dialing by Index

Talkgroup dialing by index allows a radio to make group calls using the talkgroup speed dial number, or in other words, the Talkgroup ID, or Index. If configured, talkgroup dialing by index also includes user-defined speed numbers.

With the talkgroup dialing by index option enabled, you can use the keypad and press the talkgroup speed dial number followed by the * key. For example, to call a talkgroup whose ID is 19, press **1**, **9**, and * from the keypad and then select the **Attach** soft key when viewing the offered talkgroup information. To start the group call, press the **PTT** button.

10.3.2
Selecting Talkgroups by Index

Procedure:

1. From the home screen, enter talkgroup speed number and *.
2. Press **Attach**.

   NOTE: To start a group call, press the **PTT** button.

10.3.3
Using Timed Talkgroup Change

This feature allows you to switch a selected talkgroup between the currently selected talkgroup and a predefined talkgroup (TMO or DMO), making the predefined talkgroup the selected talk group for a predefined time by using a One-Touch Button (OTB). After the timer expires, your radio returns to the previously selected talkgroup.

Prerequisites: Timed Talkgroup Change is assigned to an OTB.

Procedure:

1. Press the programmed OTB.
2. Your radio switches the selected talkgroup to the predefined talkgroup for a predefined amount of time.

   During the predefined time your radio initiates or joins group communication (SDS, status SDS, or call) on the predefined talkgroup as the selected talkgroup.

   Your service provider can assign a function to the second press of the OTB to:

   - Return to previously selected talkgroup
   - Restart the predefined time
   - No action
3. When the timer expires (potentially after being restarted a number of times) your radio switches to the previously selected talkgroup.

Chapter 11

System and Operation Mode

This chapter contains information on available systems and modes that your radio can operate in.

11.1 System Support

Your radio operates on the Dimetra IP 5.x, 6.x, 7.x and 8.x releases and Dimetra IP Compact. It also operates on previous versions of Dimetra; from Release 3.8 and on.

Your radio is designed to operate optimally on the Dimetra IP system. Your radio operates properly on all SwMIs that comply with the below list of IOP features defined by the TETRA And Critical Communications Association (TANDCCA). Official IOP certificates can be downloaded from the TANDCCA web page at http://www.tandcca.com/interoperability/interoperability-certificates-and-test-reports/.

TMO TIP:

- TIP Core TTR 001-01, TIP – Part 1: Core
- TIP SDS TTR 001-02, TIP – Part 2: Short Data Service
- TIP DGNA TTR 001-03, TIP – Part 3: Dynamic Group Number Assignment
- TIP Auth TTR 001-04, TIP – Part 4: Authentication
- TIP PD TTR 001-05, TIP – Part 5: Packet Data
- TIP AI Migration TTR 001-06, TIP – Part 6: Air Interface Migration
- TIP FSSN TTR 001-07, TIP – Part 7: Fleet Specific Short Number
- TIP SS-AL TTR 001-09 TIP – Part 9: Ambience Listening
- TIP E2EE TTR 001-10, TIP – Part 10: End to End Encryption (Selling option)
- TIP AIE TTR 001-11 TIP – Part 11: Air Interface Encryption
- TIP SI TTR 001-12, TIP – Part 12: Service Interaction
- TIP Enable/Disable TTR 001-13 TIP – Part 13: Enable or Disable
- TIP LIP TTR 001-19, TIP – Part 19: Location Information Protocol
- TIP CF TTR 001-20, TIP – Part 20: Call Forwarding
- TIP Callout TTR 001-21, TIP – Part 21: Call Out (Selling option)

DMO TIP:

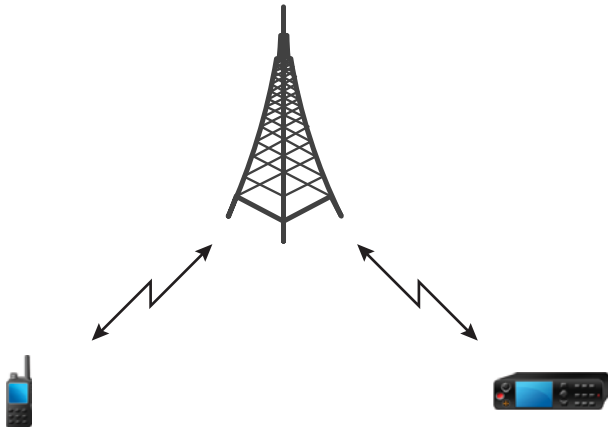
- TIP DCore TTR 002-01, DMO TIP – Part 1: DMO Core
- TIP DGate TTR 002-02, DMO TIP – Part 2: DMO Gateway
- TIP DRep TTR 002-03, DMO TIP – Part 3: DMO Repeater Type 1
- TIP DE2EE TTR 002-04, DMO TIP – Part 4: DMO End to End Encryption
- TIP DAIE TTR 002-05, DMO TIP – Part 5: DMO Air Interface Encryption

11.2
Trunked Mode Operation

Trunked Mode Operation (TMO) requires the switching and management infrastructure.

TMO enables various voice and data communication types. Examples are group calls and short data service messages. TMO also enables access to features related to infrastructure such as packet data.

Figure 9: Trunked Mode Operation

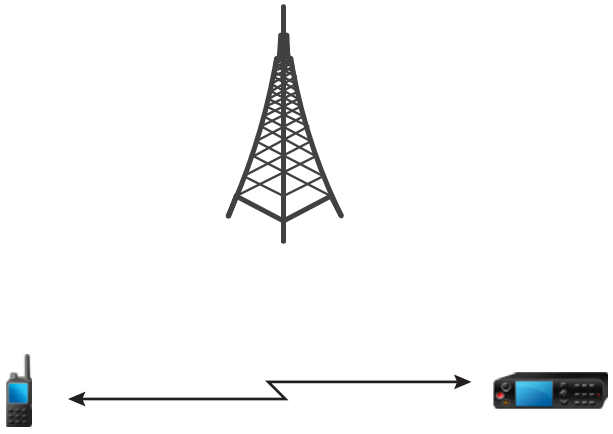


11.3
Direct Mode Operation

Direct Mode Operation (DMO) is a mode of simplex operation where radios communicate directly without the need of a network.

NOTE: For those who use DMO mode, you are recommended to apply DMO SCK for data confidentiality.

Figure 10: Direct Mode Operation



11.3.1
Automatic DMO

NOTE: This is a Software Selling Feature.

When your radio detects the unavailability of TETRA control channel, your radio should automatically switch from TMO mode to Automatic DMO. If it senses the presence of a control channel, your radio switches back to TMO mode.

Enabling and disabling the Automatic DMO feature is configurable through the Radio HMI if enabled in the configuration tool.

When Automatic DMO is active, your radio supports the following operations:

- Your radio receives direct calls addressed to the selected DMO talkgroup, private DMO calls, and Short Data Service (SDS) messages.
- The group calls, private calls, and SDS messages initiated are configured in DMO.
- DMO Talkgroup change.
- Support all types of DMO communication mode change (for example, MS-MS, using Gateway, using Repeater, and using Gateway + Repeater)

NOTE:
The assigned Toggle DMO or TMO overwrites Automatic DMO when Automatic DMO is active and enters DMO mode once it is turned on.

Private Calls are not supported when your radio enters Automatic DMO through a gateway.

11.3.2
Entering TMO or DMO Mode

Entering TMO Mode

Procedure:

1. From the home screen, press **Options**.
2. Select **Trunked Mode**.

Entering DMO Mode

Procedure:

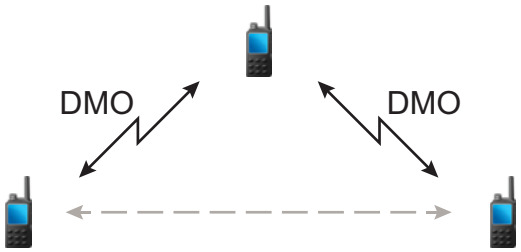
1. From the home screen, press **Options**.
2. Select **Direct Mode**.

11.4
Repeater Mode

NOTE: This is a Software Selling Feature.

The Repeater Mode provides repeater connectivity between radios operating in the DMO Mode. Only radios on the same talkgroup can communicate with each other through the repeater. Also, only one repeater can be used in one setup. Chain repeaters are not allowed.

Figure 11: Repeater Mode Operation



A DMO repeater is used to extend the DMO range by retransmitting received information from one radio to another. It retransmits group calls, private calls, and data on a given frequency.

The repeater sends presence signal periodically on a free channel to allow other radios to synchronize on a given frequency.

The communication between radios and the DMO repeater is logically divided in two links. The term “primary link” is used for all communication taking place between the Primary radio and the DMO repeater.

The term “secondary link” is used for all communication taking place between secondary radio and the DMO repeater. The primary is your radio initiating and transmitting the voice or data and the secondary is your radio receiving the voice or data.

You can enable Call Monitoring of ongoing call to hear what is being transmitted. You can enable Interactive Repeater to hear and take part in the transmitted call.

Before entering Repeater Mode, your radio enters Repeater Background Mode and monitors the DMO channel for a predefined duration. This duration is configured in the Repeater Background Monitor Timer.

If the signal from other repeaters or gateways is detected, your radio displays `Repeater Detected` or `Gateway Detected` accordingly.

While in Repeater Background Mode, your radio does not send a signal to indicate presence. All operations are blocked except for the following:

- Entering Emergency Mode.
- Switching to another DMO channel.
- Switching to Trunked Mode Operation (TMO) by toggling the One-Touch Button (OTB).

You can manually exit Repeater Background Mode by pressing the **Cancel** softkey. Your radio returns to the previous selected DMO mode.

Your radio exits Repeater Background Mode and starts operating in Repeater Mode if the DMO channel is free when the Repeater Background Monitor Timer expires.

For more information, refer to DMO Gateway and Repeater Communication on page 78.

11.4.1
Encryption in the Repeater Mode

While in the Repeater Mode, your radio supports Air Encryption and is able to repeat encrypted calls and messages.

If Static Cipher Keys (SCK) keys installed on your radio are invalid:

- Your radio transfers calls and messages without deciphering them (provided that the encryption level is not the highest).
- The LED indicator turns orange.
- You cannot make any calls.

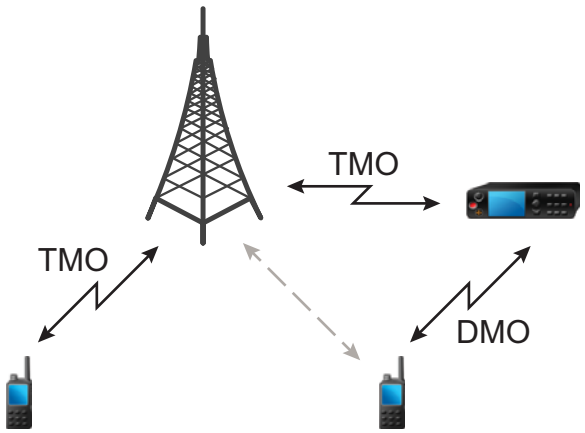
11.5
Gateway Mode

NOTE: This is a Software Selling Feature.

The Gateway Mode allows your radio to work as a gateway and thus provide connectivity among radios operating in DMO and TMO Modes.

NOTE: Only one gateway can be used in one setup. A gateway and a repeater cannot exist in the same setup.

Figure 12: Gateway Mode Operation



A DMO/TMO gateway is used to provide gateway connectivity between radio operation in the DMO and the TETRA TMO network. In other words, the gateway mode provides the interface between TETRA DMO and TMO modes.

The gateway has two air interfaces:

- On the connection to the TMO network, the gateway operates as normal TMO radio. It registers and authenticates to the SwMI using its own ITSI and its own security keys when applicable. Similarly the gateway uses its own identity in all signaling exchanges with the SwMI in the same way as for a normal TMO radio.
- On the DMO side, the gateway uses the air interface specified in the ETSI DMO Gateway Air Interface. On the DMO side, the gateway uses the frequency specified for the currently selected DMO talkgroup. The gateway generates a Gateway Presence Signal after it has successfully registered and authenticated

to the SwMI. This signal informs any DMO radio monitoring the RF carrier that the gateway is now present and available for service, and provides frame and slot numbering.

While in the gateway mode, individual and group calls are supported. When the gateway receives an individual or group call addressed to its current selected TMO talkgroup, it forwards the call on to the respective mapped DMO talkgroup. If the DMO channel is not free, and the incoming call has Emergency priority, then a preemption request is sent.

When the gateway receives an individual or group call addressed to its current selected DMO talkgroup, it forwards the call on to the respective mapped TMO talkgroup. The DMO radio that initiated the call requires correct setup for gateway calls (otherwise the call is rejected).

The gateway enters Background Mode if it receives TETRA signaling that is not addressed to the gateway and that is stronger than the Gateway RSSI Threshold. While in Background Mode, the gateway does not send a presence signal to the DMO channel or transfer traffic between channels.

To re-enter Gateway Mode, the gateway surveys the DMO channel for TETRA signals. If the gateway does not detect any signal that is stronger than the Gateway RSSI Threshold, it surveys the channel again for a period determined by the Gateway Background Survey Time before entering Gateway Mode.

At the same time, the gateway monitors TETRA transmissions on the DMO channel. If the gateway detects that a DMO transmission has ended, it monitors the channel again for a period determined by the Gateway Background Monitor Time before entering Gateway Mode.

Gateways roam between TMO sites. To prevent disconnecting an ongoing call due to roaming, the site switch is delayed until it is no longer in range of the given site.

For more information, refer to DMO Gateway and Repeater Communication on page 78.

NOTE: While in the gateway mode, individual and group calls cannot be initiated, also any active TMO scanning is suspended, including the scanning of supergroups.

11.5.1
Standby Mode

Your radio enters Standby mode if there is another Gateway on the same Direct Mode Operation (DMO) frequency.

The Gateway icon flashes and no transmission is forwarded through the gateway. You can exit Standby Mode by choosing another DMO talkgroup, or waiting until the other gateway is out of coverage and is no longer present on the DMO talkgroup.

11.5.2
Forwarding Group Calls

Your radio shows the source and destination talkgroup of the Group call.

11.5.3
Emergency Calls in Gateway Mode

When you press the EMERGENCY button, your radio enters TMO Emergency mode and starts an Emergency Group call. Check with your service provider whether the Emergency Group call starts on a tactical or nontactical talkgroup. If your radio in Gateway mode receives an Emergency Group call, it forwards the call to the respective TMO or DMO talkgroup that is currently switched on.

11.5.4
Encryption in Gateway Mode

While in the Gateway Mode, your radio supports Air Encryption and is able to transmit encrypted calls among radios operating in TMO and DMO.

If SCK keys installed on your radio are invalid, the radio cannot function as a gateway and transmit calls.

11.6
DMO Gateway and Repeater Communication

Your radio allows communicating in Direct Mode Operation (DMO) with a Trunked Mode Operation (TMO) group. This communication occurs through Interoperability (IOP) certified gateways.

A DMO repeater retransmits information received from one DMO radio to other DMO radios. Retransmission occurs over the DMO air interface.

For each DMO talkgroup, your radio allows operating in one of the following modes:

Radio to radio only
Your radio initiates communication only on a talkgroup directly and not through a gateway or repeater.

Specific gateway
Your radio can initiate communication on a talkgroup directly or through a specific gateway address that is specified for a talkgroup. The gateway address can be edited through your radio HMI.

Auto gateway
Your radio can initiate communication on the selected talkgroup directly with another radio. Your radio can also initiate communication through any available gateway that is detected as present.

Repeater
The talkgroup links to a DMO repeater.

Specific gateway and repeater
Your radio uses only the gateway with the specified gateway address for the talkgroup and/or a DMO repeater.

Automatic gateway and repeater
Your radio uses the first available gateway for a talkgroup and/or a DMO repeater.

All outgoing communication is placed through the gateway if the following conditions occur:

- Either a specific gateway or auto gateway mode is chosen.
- A suitable gateway is found.

Your radio attempts to set up communication directly if the following conditions occur:

- Communication setup through the gateway fails.
- A suitable gateway is not found.

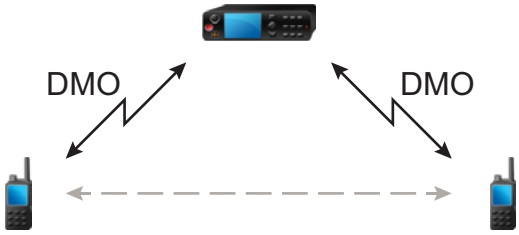
When operating on a gateway and/or repeater, your radio indicates the communication mode.

11.6.1

Communication Through Repeaters

Radios that are out of range and cannot communicate directly with each other in Direct Mode Operation (DMO) can do it through the repeater. The repeater is a radio that repeats all communication on a chosen channel, and as a result increases radios DMO range.

Figure 13: Communication Through Repeaters



When the radio connects to a repeater, it plays a tone, displays the `Repeater available` message, and shows an appropriate icon. When the radio loses connection with the repeater, it plays a tone, displays the `Repeater not available` message, and the repeater icon is blinking.

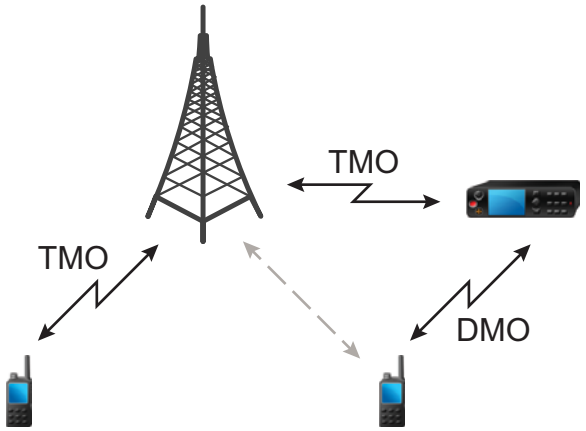
When your radio is on a Gateway mode, it switches to Gateway mode from TMO if your radio enters an emergency.

Turning off your radio or exiting the Gateway mode is restricted when the gateway is forwarding an emergency call.

11.6.2
Communication Through Gateways

Gateway provides connectivity between radios operating in Direct Mode Operation (DMO) and the TETRA network, so that the DMO radios can communicate with radios operating in Trunked Mode Operation (TMO).

Figure 14: Communication Through Gateways



Radio behavior when radio detects a potential repeater signal or connects to a gateway:

- A tone sounds.
- The display shows `Gateway available`.
- The display shows an appropriate icon.

Radio behavior when radio loses connection with the gateway:

- A tone sounds.
- The display shows `Gateway available`.
- The display shows an appropriate icon.

Radio behavior when group call is in queue:

- The display shows `Please Wait`.

Radio behavior when entering Local Site Trunking:

- A tone sounds.
- The display shows `Local Area Service`.

11.6.3
SDS Through DMO Gateways or Repeaters

Radios operating in Direct Mode Operation (DMO) can send the following message types to other radios through DMO Gateways or Repeaters:

- Short Data Service (SDS) Status
- SDS User-Defined Data Types 1, 2, 3
- SDS User-Defined Data Type 4 with or without SDS Transport Layer (SDS - TL)

- Global Navigation Satellite System (GNSS)/Global Positioning System (GPS) Local Information Protocol (LIP) messages

NOTE: The emergency trigger LIP report is sent to the currently selected talkgroup or to the configured destination. Applicable only for Direct Mode Operation (DMO) to Trunked Mode Operation (TMO) forwarding.

Both DMO Gateways and Repeaters can forward messages in Reservation and Idle mode. The supported forwarding directions are:

- DMO group address to TMO group address.
- TMO group address to DMO group address.
- DMO individual address to TMO group address.
- TMO individual address to DMO individual address.

11.7 Gateway and Repeater Synchronization

To communicate using gateways or repeaters, your radio requires synchronization with a gateway or a repeater.

A gateway or a repeater sends presence signals to radios. If a radio receives presence signals, it stays synchronized with the gateway or the repeater, which sends the signals. If a radio fails to receive a presence signal it does not immediately lose synchronization. Your radio waits for another successful presence for a time defined by your service provider. This function ensures that communications are not dropped due to temporary reception issues.

If a gateway or a repeater is unavailable or your radio is not synchronized with a gateway or a repeater, depending on the setup configured by your service provider, the following scenarios apply:

- Your radio falls back to Direct Mode Operation (DMO).
- After pressing the **PTT** button, a prompt appears warning that the second press overrides the gateway or repeater operation mode.
- No direct DMO communications are permitted.

In the second scenario, while your radio receives individual calls and group calls, and replying to individual calls is possible, replying to group calls is not possible.

11.7.1 Selecting DMO Communication Options

In Direct Mode Operation (DMO), you have different options to communicate with other radios in the same talkgroup through the gateway or repeater.

Procedure:

1. From the home screen, press **Options**.
2. Select **Config.**.
3. Select a DMO communication by using one of the following options:

Option	Actions
To communicate in your radio range only	Select **MS-MS**.
To communicate with the infrastructure using the first available gateway for that talkgroup	Select **Gateway** → **Automatic**.

Option	Actions
To communicate with the infrastructure using the specified gateway address for that talk-group	**a.** Select **Gateway** → **Specific**. **b.** If your radio displays `Selected Gateway: None`, press **Edit** to enter the current gateway address.
To use the first available repeater for that talk-group	Select **Repeater**.
To use the first available gateway or repeater for that talkgroup	Select **GW + Rep**.
To use the first available gateway for that talk-group	Select **Automatic**.
To use a gateway with the specified gateway address for that talkgroup	**a.** Select **Specific**. **b.** If your radio displays `Selected Gateway: None`, press **Edit** to enter the current gateway address.

NOTE: When your radio cannot communicate with the gateway and repeater even if a talkgroup to use them is configured, your radio attempts MS-MS communication.

Result:
When your radio detects the gateway, repeater, or both, the respective icon appears solid.

11.7.2
Entering Gateway Mode

Procedure:

1. From the home screen, press **Options**.
2. Select **Gateway Mode**.

   NOTE: When Gateway Mode is enabled, you cannot make any calls.

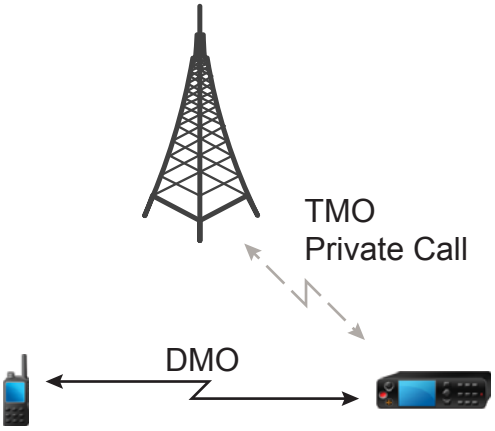
11.8
Network Monitor

NOTE: This is a Software Selling Feature.

This feature allows your radio to monitor for Trunked Mode Operation (TMO) individual calls while maintaining Direct Mode Operation (DMO) services.

When Network Monitor is active, your radio receives direct calls addressed to the selected DMO talkgroup, private DMO calls, Short Data Service (SDS) messages, and also private TMO calls.

The group calls, private calls, and SDS messages initiated are configured in DMO. Only responses to private TMO calls are sent in TMO.



11.8.1
Enabling Network Monitor

Procedure:

1. From the home screen, press **Options**.
2. Select **Network Monitor**.

11.9
Setting Monitor Option

11.9.1
Setting Monitor Option for Repeater Mode

Procedure:

1. From the home screen, press **Options**.
2. Select **Monitor**.
3. Select one of the following options:

Table 28: Monitor Options for Repeater Mode

Option	Description
Off	Your radio works as a repeater only without operation.
Receive Only	To listen only.
Receive&Transmit	To listen and transmit by pressing the **PTT** button.

11.9.2
Setting Monitor Option for Gateway Mode

Procedure:

1. From the home screen, press **Options**.
2. Select **Config**.
3. Select one of the following options:

Table 29: Monitor Options for Gateway Mode

Option	Description
Off	Audio of the calls is not routed to the speakers of the gateway.
Receive Only	Audio of the calls is routed to the speakers of the gateway.

11.10
Transmit Inhibit Mode

The Transmit Inhibit (TXI) Mode is a mode in which your radio sends no radio transmissions. Activate this mode in RF sensitive areas, such as hospitals, airplanes, and situations that can jeopardize safety due to transmission of radiation.

In this mode, your radio does not transmit under any circumstances except for the Emergency Calls. The following are keys and functions that are disabled due to transmission:

- Registration to the network
- Changing talkgroup or folder
- Sending Short Data Services (SDS) messages
- Pressing **PTT** button

While in TXI mode, trying to trigger a transmission causes your radio to display `Not Allowed In TXI Mode` notification and sound a tone.

Your radio still receives:

- Group calls
- Messages - stored in the **Inbox**
- Private call attempts - stored in the **Missed Calls** list, without the option to respond

When danger to safety no longer exists, such as when you leave a RF sensitive area, you can deactivate the TXI Mode and your radio returns to standard operation.

NOTE: RF Transmissions from your radio are prevented under the following conditions:

- TXI Mode is activated.
- Your radio is turned off.

If your radio is registered on a call, when entering or exiting the TXI mode, it sends a designated Short Data Service (SDS) status message. This SDS message indicates to the Switching and Management Infrastructure (SwMI) that your radio is entering or exiting TXI mode.

Mobility procedures that do not require your radio to send an uplink transmission are performed except for cell reselection.

In TXI mode, your radio joins group calls for any group that your radio is monitoring. Transmitting on that call is still prohibited.

Your radio also displays any incoming SDS messages to the user. The missed call feature is active in the TXI mode and allows checking calls that were missed. Your radio attempts to prevent call setup retransmission from being recorded as separate calls.

If you initiate an emergency call, your radio immediately exits TXI mode and attempts to start emergency call when your radio is in service.

If your radio is turned off in the TXI mode, and turned back on, your radio prompts to exit the TXI mode. Choosing **No**, turns off your radio.

11.10.1
Enabling or Disabling TXI

You can enable or disable Transmit Inhibit (TXI) Mode using your radio menu.

Procedure:

Perform one of the following actions:

- To enable TXI, select **Menu** → **Networks** → **TXI Mode** → **Activate**.
- To disable TXI, **Menu** → **Networks** → **TXI Mode** → **Deactivate**.

NOTE: You can disable TXI by pressing the One-Touch Button when initiating an Emergency Call.

Chapter 12

Talkgroups

This section lists the features and functions available for talkgroups.

12.1 Programmable Talkgroups

Your radio offers a talkgroup list facility. Each talkgroup entry contains a TETRA group address and may be associated with a name tag. The talkgroups can be defined in the codeplug as per your radio capabilities.

Talkgroups are configured separately for Trunked Mode Operation (TMO) and Direct Mode Operation (DMO) modes. To program a talkgroup in TMO define its name and Group Short Subscriber Identity (GSSI). To program a talkgroup in DMO define its name, Group TETRA Subscriber Identity (GTSI) and frequency. Your radio operator can select a talkgroup, which has an associated TMO or DMO frequency depending on the mode selected. When switching between the TMO and DMO modes the last active talkgroup is selected. However the required talkgroup can be mapped in the configuration tool. In such a case a corresponding talkgroup is automatically selected during mode switching, regardless of the previously selected talkgroup.

NOTE: Neither the group name nor the corresponding group address can be edited using your radio HMI.

A talkgroup linked to several networks produces as many new unique talkgroups as the networks it associates with. For example, if the talkgroup has the same GSSI and network in several talkgroup folders, one unique talkgroup is created. Alternatively, if the talkgroup has the same GSSI but with different networks in several talkgroup folders, several unique talkgroups are created for each network.

The GTSI indicates the talkgroup uniqueness. It is a combination of the GSSI and the network associated to the talkgroup in the given talkgroup folder. The talkgroup folders do not determine the uniqueness of the new talkgroups.

12.2 Talkgroup Folders

The talkgroups are organized in folders. You can select a talkgroup by first choosing a folder and then the talkgroup in the folder. The size of each folder is flexible and can be defined through provisioning.

The talkgroup folders are organized in a tree-structure:

Level 1 Folders

Can contain any number of level 2 folders.

Placed at the root of the folder structure.

Can contain both level 2 folders and talkgroups at the same time.

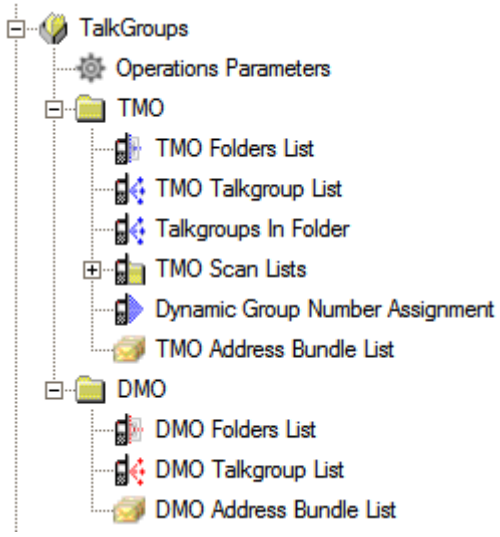
Level 2 Folders

Placed in level 1 folders.

Any given level 2 folder can only be sub-folder to one level 1 folder.

NOTE: Your radio supports up to three levels of folders.

Figure 15: Talkgroup Tree



You are allowed to create up to a maximum of 500 call group folders (in TMO only).

NOTE: The folder definitions cannot be changed using your radio HMI. Any talkgroup folder or sub-folder which is either empty or does not contain any programmed talkgroups is hidden in the HMI.

12.3 Talkgroup Selection

Talkgroup selection from the stored talkgroups list in the idle mode can be performed by scrolling through the list using the scroll keys.

You can also scroll using the **rotary knob**. Talkgroup scrolling can be provisioned to scroll in a folder only, or continuously through the folders acting as one continuous list of groups. Your radio does not allow directly dialing a group Short Subscriber Identity (SSI).

12.4 Talkgroup Blind Operation

Your radio can be provisioned with a virtual scrolling end-stop option for use in blind operation.

When you scroll to the beginning or the end of the list, the first or the last talkgroup displays even if you continue scrolling. A tone emits when you reach the upper or lower virtual end-stop. You can change the scrolling setting for **Rotary Knob** or **Talkgroup Selector** button to **Wrap around Rotary Knob Group Scrolling** using the configuration tool.

12.5
Receive-Only Talkgroups

Talkgroups can be provisioned as receive-only talkgroups, depending on the settings of the folder containing the talkgroup. You can select any talkgroups from the receive-only folder. Your radio allows you to receive calls, but no call can be initiated to this group.

12.6
Non-Selectable Talkgroups

A talkgroup can be provisioned as a non-selectable talkgroup. Such talkgroups are not visible when scrolling through the talkgroup list, and thus cannot be selected.

The group name is displayed only upon receiving a call for the group, for instance, if it is an announcement talkgroup associated with the selected group, or if it is a scanned one. You are not allowed to edit the scan list.

12.7
Transmission Timeout Timer

Your radio limits the time that you can continuously talk in a group call without interruption, according to a provisioned value. You are warned a short time before the talk time expires. The timer is provisioned per talkgroup folder.

12.8
Temporary Group Address

Your radio supports the temporary group address assigned by the Switching and Management Infrastructure (SwMI). The address is valid only for the lifetime of the call.

Your radio monitors signaling addressed to the temporary group, when your radio initiates a group call on the selected group, and the SwMI assigns the call to a temporary group.

Your radio supports the assignment of an incoming group call to a temporary group address.

12.9
User Initiated Group Attachment

You must attach your radio to a talkgroup to participate in a group call.

Your radio initiates a group attachment request to the Switching and Management Infrastructure (SwMI) during the following conditions:

- Radio turns on.
- Radio registers on a new site.
- User initiates a group change.
- User activates a scan list.

When a group change is requested, your radio initiates an attachment to the SwMI, detaching the old group and attaching to the new one.

All group attachments sent by your radio are sent with attachment mode of **Amendment** or **Detach all...** depending on which form causes sending fewer bits over the air interface.

When you turn on scanning and then select the scan list, your radio sends a group attachment request to attach the scan groups in addition to the selected group. Similarly, when you select an Announcement Talkgroup (ATG), your radio sends an attachment of the ATG as the selected group along with the attachment of the associated groups as scan groups. If a group associated with an ATG is selected, your radio sends an attachment of the ATG as the selected group and as a scan group.

The TETRA TIP provides a facility by which your radio can send a status message to the SwMI to turn scanning off and on to save air interface signaling.

If your radio is provisioned with this option, when you turn scanning off, your radio sends an appropriate TETRA signaling. In this state, your radio does not monitor any groups other than the selected group. If you then turn scanning on, your radio sends an appropriate TETRA signaling and begins monitoring all scanned groups again.

If your radio is not provisioned with this option, you can only deselect the active scan list. However, you cannot turn off the scanning. Deselection of the user scan list causes a group detachment of the scan list groups sent to the SwMI. However, your radio continues to scan all other groups, such as ATG associations.

12.10
Announcement Talkgroups

Your radio supports a group hierarchy concept. An Announcement Talkgroup (ATG) is a talkgroup consisting of up to 20 talkgroups. One of the talkgroups is a primary group. Only the primary group can monitor the traffic of the ATG. Users of a subgroup cannot monitor the traffic of other subgroups.

When you select an ATG, your radio monitors signals addressed to the ATG in addition to signals addressed to its selected talkgroup. Your radio does not support active scan list while attached to an ATG.

Depending on the codeplug settings, your radio can be provisioned to initiate an announcement call. If it is not provisioned to do so, your radio can still initiate an emergency call to the ATG.

A talkgroup can be associated to only one ATG. An ATG cannot be associated to another ATG. An ATG has a higher priority than other group calls within the same call priority.

Chapter 13

Dynamic Group Number Assignment

Dynamic Group Number Assignment (DGNA) allows the network operator to dynamically manage talkgroups on your radio over the air interface. Your radio responds to DGNA directed to it or to DGNA directed to a group your radio is attached to even if the talkgroup is not programmed in the codeplug.

Using DGNA, the network operator can:

- Assignment – An assignment of a new talkgroup in the talkgroup list.
- Reassignment – An assignment of a talkgroup that already exists in the talkgroup list.
- Deassignment – Removal of a talkgroup from the talkgroup list.
- Selection – Attach or select newly added talkgroups.

All the above operations are performed by transmitting data to your radio.

When a DGNA message is received, your radio plays a tone and displays a message Talkgroup list updated. If enabled by your service provider, your radio displays all added and deleted talkgroup list.

Your radio also supports supergroups of scanned groups, such that a group addressed DGNA assignment received on one of the user scan group addresses causes your radio to monitor all signaling addressed to that supergroup as long as the scan group is being monitored, and as long as the supergroup lifetime lasts.

DGNA Operation

There are three DGNA Group Type:-

- Static – only selection is allowed.
- Semi-Static – selection and reassignment are allowed.
- Dynamic – selection, deassignment, and reassignment are allowed.

The group type configured will determine which DGNA Operation is applicable.

Table 30: DGNA Operations

DGNA Operations	Talkgroup Selection	Talkgroup Reassignment	Talkgroup Deassignment
Static	Applicable	Not Applicable	Not Applicable
Semi-Static	Applicable	Applicable	Not Applicable
Dynamic	Applicable	Applicable	Applicable

Assignment

When your service provider adds (assigns) a new talkgroup, depending on the settings, your radio can perform one of the following actions:

- Attached as scanned – If the group is assigned with attached as scanned, if it is not already in the currently active scan list, your radio adds this group to a Switching and Management Infrastructure (SwMI) Controlled scan list and begins monitoring downlink signaling addressed to this group. The SwMI controlled list holds up to ten groups, and your radio monitors these groups as well as groups in the user scan list.

- Attached as selected – Assignment of the group through DGNA with attached as selected makes it the selected group of your radio. If the DGNA Auto Select is configured, your radio will automatically attach to and automatically select the assigned talkgroup. DGNA Auto Reselect allows your radio to return to the previously selected talkgroup. Your network operator assigns a talkgroup to your radio through DGNA. When the assigned talkgroup is deassigned, your radio automatically returns to the previous talkgroup.

If the talkgroup list is full when adding a group, your radio rejects the assignment operation. If the SwMI controlled list is full and the assignment is with attached as scanned, the attachment is rejected.

Deassigment

When your service provider deletes (deassigns) the currently selected talkgroup, depending on the settings, your radio can perform one of the following actions:

- Enter the `No Group` state – your radio does not attach to any talkgroup automatically.
- Attach to the last selected TMO talkgroup - If the last selected TMO talkgroup is not available (it was deleted), your radio enters the `No Group` state.
- Attach to a default talkgroup configured by your service provider - If the default talkgroup is not available (it was deleted), your radio enters the `No Group` state.
- At each talkgroup change, an appropriate notification is shown on the display.
- If the DGNA message is received to delete all talkgroups, your radio displays `All Talkgroups Deleted`.

13.1 DGNA Reception

When a Dynamic Group Number Assignment (DGNA) message is received, your radio plays a tone and displays a message `Talkgroup list updated`. If enabled by your service provider, your radio displays all added and deleted talkgroup list.

When your service provider deletes (deassigns) the currently selected talkgroup, depending on the settings, your radio can perform one of the following actions:

- Enters the “No Group” state – your radio does not attach to any talkgroup automatically.
- Attaches to the last selected TMO talkgroup. If the last selected TMO talkgroup is not available (it was deleted), your radio enters the “No Group” state.
- Attaches to a default talkgroup configured by your service provider. If the default talkgroup is not available (it was deleted), your radio enters the “No Group” state.

At each talkgroup change, an appropriate notification is shown on the display.

If the DGNA message is received to delete all talkgroups, your radio displays `All Talkgroups Deleted`. To exit the DGNA display, you can use the **Back** Soft key or the **End** key.

13.2 DGNA Auto Select Group

If the Dynamic Group Number Assignment (DGNA) Auto Select is configured, whenever your radio receives a DGNA, it switches to the added talkgroup.

13.3
DGNA Auto Reselect Group

Dynamic Group Number Assignment (DGNA) Auto Reselect allows your radio to return to the previously selected talkgroup. Your network operator assigns a talkgroup to your radio through DGNA. When the assigned talkgroup is deassigned, your radio automatically returns to the previous talkgroup.

13.3.1
Viewing DGNA Talkgroups

Prerequisites: Your radio receives the Dynamic Group Number Assignment (DGNA) message.

Procedure:

1. To view the added talkgroups details, press **View**.
2. Scroll to select the required talkgroup.
3. To select a DGNA group, press **Attach**.

Chapter 14

Types of Radio Calls

Your radio can make Group, Private, Phone and Private Automatic Branch Exchange (PABX), and Broadcast calls in Trunked Mode Operation (TMO), Direct Mode Operation (DMO), or both.

Table 31: Types of Radio Calls

Call Type	Description	DMO	TMO
Group Calls	Group Calls are point-to-multipoint call operations. Your radio must be configured as a member of the talkgroup for you to communicate within the group.	✓	✓
D-PTT Preempt Group Calls	D-PTT Preempt Group Calls are preemptive priority calls that allow superiors to temporarily interrupt and speak in an ongoing group call.	✓	✓
Private Calls	Private Calls are calls from one individual radio to another. If configured, your radio can block outgoing private calls. The following are private calls that need to be blocked in TMO: • Half Duplex • Full Duplex • PSTN (Telephony) • PABX The following are private calls that need to be blocked in DMO: • Calls between Motorola Solutions radios • Calls using Repeater • Calls using Gateway	✓ Simplex Calls only	✓ Simplex and Duplex Calls
Phone or PABX Calls	Phone Calls allow you to call a landline telephone number or a cellular mobile phone number. PABX Calls allow you to call local (office) extension numbers.	✗	✓
Broadcast Calls	Broadcast Group Calls are high-priority group calls from the console operator to all radios at one or more sites. Your radio can monitor a Broadcast Call but you cannot talk back. **NOTE:** In TMO mode, broadcast call can be forwarded from the Gateway to a DMO open talkgroup or Attached DMO Talkgroup if configured.	✗	✓

14.1

Group Call

The group call service enables your radio to communicate with a group of other TETRA radios using point to multi-point operation.

This service is available in both Trunked Mode Operation (TMO) and Direct Mode Operation (DMO). You can initiate a new group call to the selected talkgroup or talk back to the existing group call by pressing the **PTT** button.

Functions available in a group call service are listed as:

Group Call Reception

In most situations, your radio receives group calls without any intervention. When your radio receives an incoming group call, you are alerted with a short alert tone. Depending on the configuration, the tone can be disabled. Then the speech follows.

To clear a call ended by the call owner, normally by the Switching and Management Infrastructure (SwMI), you do not need to do anything. However, you can leave a group call. Then the call continues for other radios, even though your radio does not participate in the call anymore.

PTT Queue

PTT Queue allows you to configure the response to releasing **PTT** of the call originating radio. This feature also determines how to cancel waiting for the call when the infrastructure is busy and your call is queued.

Talking Party Identification

Radios engaged in a group call receive an ID of the transmitting party. You can find the identification in the call setup message.

Call Ownership

Your radio can be given the call ownership of a talkgroup call. When your radio is the call owner, it sends an appropriate TETRA signaling to end the call.

NOTE: The SwMI decides the ownership of a call.

Transmission During Group Call

While receiving a group call, and the **PTT during received Group Call** is enabled, you can request to transmit by pressing and holding the **PTT** button. The system registers this action and informs you that the request has been queued.

If you release the **PTT** button, your radio sends a message to the system withdrawing the request.

Late Entry

A radio can join a group call even if it does not participate in it from the beginning.

For example, if you turn on your TETRA terminal and select a talkgroup with an ongoing group call, your radio automatically joins the call. Similarly, if your radio has been outside of the radio coverage, for example in a tunnel, the control channel continues to divert the terminal to a talkgroup call, assuming a call is already in progress.

NOTE: For TMO, this feature must be configured on SwMI. Acknowledged late entry and late entry paging are not supported.

D-PTT Tones

This menu item contains the settings for the Double PTT (D-PTT) feature. The D-PTT feature enables your radio to generate a specific tone sent to other radios in the talkgroup.

NOTE: Your radio can support either D-PTT Tone feature, or D-PTT Preempt Group Call feature at a time only.

To send the tone, you can press the preconfigured One-Touch Button once or **PTT** button twice in a period defined in the configuration tool. The D-PTT is triggered only when your radio is in idle or Group Call mode. The D-PTT tone is not played on the sending radio.

After the D-PTT tone is played, you can press and hold the **PTT** button again for the permission to talk. If you press the **PTT** button while the D-PTT tone is played, the permission is ignored. The D-PTT tone is sent over the air but is not audible on the sending radio.

If you hold the **PTT** after the second press and your radio finishes sending the D-PTT tone, you can start a group call. You are notified of the behavior by the permission to talk tone after D-PTT tone ends. If the **PTT** button is released after the second press, only the D-PTT tone is sent. The D-PTT tone is sent as a voice. Hence, the receiving radio plays the sound no matter whether the feature is enabled on it.

You can adjust the D-PTT tone volume level in the speaker or earpiece of the sourcing radio. Disabling all the tones does not affect the sent tone volume. From the HMI, you can change the D-PTT tone to be single, double, or triple. The tone type can also be changed in the codeplug.

D-PTT Preempt Group Call

The D-PTT Preempt Group Call allows superiors to take over and speak in an ongoing group call by making preemptive priority calls.

NOTE: Your radio can support either the D-PTT Tone feature, or D-PTT Preempt Group Call feature at a time only.

By pressing the PTT (Push-To-Talk) button twice, you make a preemptive request to temporarily interrupt an ongoing group call and gain permission to speak.

If your group call is preempted and you are still pressing the **PTT** button, your radio displays the `PTT Denied` prompt.

If your service provider enables the visual notification, your radio displays the `PTT Interrupted` prompt throughout the group call preemption, even if you no longer hold the **PTT** button.

If your service provider enables the audio notification, your radio plays the PTT Denied Tone until you no longer hold the **PTT** button.

14.2
Private Call

Private call, also called point-to-point call, enables communication between two individuals. No other radio can hear the conversation.

This call type can be carried out in two ways:

Duplex Call
This call type is only allowed in Trunked Mode Operation (TMO). During this call, both parties can speak at the same time.

Simplex Call
Available in TMO or Direct Mode Operation (DMO). Only one party can speak at a time.

In TMO, you can answer a private call in the following methods:

Hook (default)
When this method is selected, you must answer the call to begin transmission.

Direct

When this method is selected, the call is automatically answered without any keypress and transmission begins immediately. Therefore, ensure that the incoming call notification is configured properly to indicate the incoming call.

As Received

When this method is selected, the call is answered according to the call answering setup determined by the transmitting party.

If configured, your radio can block outgoing private calls. The following are private calls that need to be blocked in TMO:

- Half Duplex
- Full Duplex
- PSTN (Telephony)
- PABX

The following are private calls that need to be blocked in DMO:

- Calls between Motorola Solutions radios
- Calls using Repeater
- Calls using Gateway

Table 32: Call Answering Rules

The following table illustrates the dependencies between the call answering setup and the call receiving method. The setup on the receiving radio takes precedence over the setup of the transmitting radio.

Call Answering Setup		Call Answering Method
Transmitting Radio	Receiving Radio	
Hook	Hook	User answer
Hook	Direct	Auto answer
Hook	As Received	User answer
Direct	Hook	User answer
Direct	Direct	Auto answer
Direct	As Received	Auto answer

NOTE: The Direct hook method for duplex calls is supported from Dimetra 9.0.2 onwards.

When a DMO private call takes place, the radios not involved in this call receive the channel busy indication. The radios are identified using their radio numbers.

The following are private calls that need to be blocked in DMO:

- Calls between Motorola Solutions radios
- Calls using Repeater
- Calls using Gateway

Transmission Timeout Timer

In a simplex call, your radio limits the time you can continuously talk in a group call without interruption, according to a provisioned value. You are warned a short time before the talk time expires. The timer is provisioned per talkgroup folder.

Private Calls Through DMO Gateway

NOTE: This is a Software Selling Feature.

The DMO Gateway can relay clear and non-BSI encrypted private calls from a radio in TMO to another radio in DMO, and the other way around.

A DMO radio can directly establish a private call with another TMO radio through Individual Short Subscriber Identity (ISSI).

A TMO radio initiating a private call with another DMO radio first establishes a private call with a DMO Gateway. Then the DMO Gateway establishes a private call with the target address of the DMO radio, which is predefined in the Gateway. The DMO forwarding address is configurable. For more information, contact your service provider.

Assistance Call

This feature allows you to make private calls to ask for assistance in normal and noncritical situations. To initiate an assistance call, you can select the target address from up to five configured numbers.

NOTE: Your service provider can configure the number, priority, and the type of the call (simplex or duplex).

You can start an Assistance Call using one of the following methods:

- Dial a predefined number and press **Send** key.
- **Menu** → **Services** → **Assistance Call**.

Private Call with Presence Check

This feature allows you to see if the calling party is available in DMO. When this feature is enabled, you can only initiate a Private Call if the called radio is present on the same channel and responds with a presence check acknowledgment.

Otherwise your radio displays `Party Not Available`.

Talkgroup for Individual Calls

Talkgroup for Individual Calls is a talkgroup that operates on a separate frequency allocated for individual (private) calls only. Using this talkgroup optimizes frequency resources and helps not to block other talkgroups. The only supported call types are: private calls and emergency calls (both private and group). Use this talkgroup each time you need to make a private call.

When you select a Talkgroup for Individual Calls, your radio is not able to receive or initiate any group or broadcast calls with priority lower than Emergency.

When you have selected a Talkgroup for Individual Calls and press the **PTT** button to start a Group Call, your radio:

- Rejects the call
- Plays a tone
- Displays the `Individual Calls Only` message

14.3

Phone Call

The phone call service enables a radio in Trunked Mode Operation (TMO) to communicate in a one-on-one simplex or duplex conversation with a phone (for example, a phone call-enabled TETRA radio or landlines number) using a telephone switch. Your radio supports individual call service to an external identity.

Two phone call types are available:

- A full phone number Public Switched Telephone Network (PSTN) call is addressed to the defined PSTN gateway address.
- An internal Private Automatic Branch Exchange (PABX) call is addressed to the defined PABX gateway address.

NOTE: The PSTN phone call is supported when PSTN/PABX feature is enabled in the codeplug and the Switching and Management Infrastructure (SwMI) supports this functionality. The PSTN/PABX gateway must be configured properly.

The Phone/PABX Speed Dial feature allows you to dial a shortened number of up to three digits instead of the full number. The Phone/PABX **Speed #** number is assigned when the dialed number is added in the contact list.

If configured, your radio can block outgoing private calls. The following are private calls that need to be blocked in TMO:

- Half Duplex
- Full Duplex
- PSTN (Telephony)
- PABX

The following are private calls that need to be blocked in DMO:

- Calls between Motorola Solutions radios
- Calls using Repeater
- Calls using Gateway

Only one PSTN/PABX gateway ID, and one PABX/PABX gateway ID are available in your radio.

Functions available in phone call service are as listed:

Phone Call Initiation

Your radio is able to initiate phone calls to a PSTN or PABX with duplex speech capability. This call type uses TETRA individual call signaling using single stage dialing and hook setup for outgoing calls.

Using the hook signaling for phone calls, implies that until a traffic channel is allocated, your radio generates all feedback tones internally. In addition, your radio accepts SwMI modification of the call setup to direct, enabling the infrastructure to generate the progress tones.

Phone calls can also be made between TETRA radios using the Mobile Station International Subscriber Directory Number (MSISDN) number as the called party number. MSISDN calls share the same gateway as phone calls, that is, PSTN gateway configured in the codeplug. If an MSISDN call is placed, two radios can have a simplex or duplex call based on the assigned ISDN number.

NOTE: The Dimetra Infrastructure does not support private calls and Short Data Service (SDS) through MSISDN.

Phone Call Reception

Incoming phone calls, from the land gateway to mobile, use on-off hook signaling. Your radio extracts the gateway ID from the call setup signaling, to determine whether to start a phone or PABX call.

14.4
Preemptive Priority Call

During a call, if a call setup is received from a call with higher priority than the present call, your radio disconnects from the present call and joins the new high priority call.

Your radio behaviors depend on the configured priorities. Available priorities that can be configured are as follows:

- Priority 1 or 2 (12 or 13) – Interrupts (preempts) ongoing calls of lower priority. Depending on the configuration, your radio either accepts or rejects the new call.
- Priority 3 or 4 (14 or 15) – Interrupts (preempts) ongoing non-emergency calls and join Emergency call that is with higher priority.

When the new call is accepted, a special tone is played, and you are notified of the high priority call.

When you initiate a private call and you receive a rejection with the reason `Called party busy`, you have the option to interrupt the existing call or initiate a new call. However, this time the call is initiated with the preemptive priority.

Priority Monitor During Group Call

While your radio is active in a group call, it can receive a group call setup for a different group. Your radio decides whether to ignore the new call or accept it basing on the call priority. If the new call has the higher priority than the current one, the new call is joined and the current call is dropped.

The following priority types are applicable to calls:

- Call priority is indicated in the call setup signaling.
- Priority of the group indicated by the Class of Usage (CoU) negotiated upon attachment.

If the old call and new call have different call priorities, your radio follows the call with the higher call priority. If the calls have the same call priority, the CoU priority of the group decides.

Your radio is in a group call, but is not currently the talking party. Your radio then detects a call setup for a different group with the same priority. If so, your radio joins the call if a CoU priority is higher.

Your radio can be set up not to immediately join the new higher priority call, but to present the new call to the user before joining it. If so provisioned, you are given a choice of following the new higher priority call or staying with the present call.

Your radio can be set up to treat a selected group call as a higher priority than a scan group call. This behavior occurs regardless of the priority of the calls or the groups.

DMO Private Priority Call

The service provider may assign Pre-emptive Priority to outgoing Direct Mode Operation (DMO) Private Calls. If this is the case, DMO Private Calls from this radio preempt any ongoing calls (except emergency calls or ongoing Pre-emptive Priority Private Calls) on the receiving radio, which then displays `Call-preempted`.

14.5
Broadcast Call

Broadcast Group Call (also called Site Wide Call) is a high-priority group call initiated by the console operator (or dispatcher) to all users located at one or more sites. Your radios are configured to monitor a Broadcast Call, but you cannot talk back. The call can be received as a normal Broadcast Call or an Emergency Broadcast Call. The Broadcast Call preempts an ongoing Group Call that has the same or lower call priority.

In TMO mode, broadcast call can be forwarded from the Gateway to a DMO open talkgroup or Attached DMO Talkgroup if configured.

Broadcast Calls Initiated by Users

This feature allows you to make a Broadcast Call from your radio that is initiated on the predefined talkgroup. Your service provider predefines the alias and the priority of the Broadcast Call.

NOTE:
If the type of the encryption is defined by the SIM Card, the Broadcast Call is always clear. Otherwise if your radio uses other encryption service the type of the encryption used for that Call is up to the encryption settings of that service.

This feature is not supported on the Dimetra infrastructure.

14.6
Ambience Listening

The Ambience Listening (AL) feature allows a console operator or dispatcher to monitor audio activity near a specific radio without giving any indication to the affected radio.

When your radio receives a call setup message with an AL call, your radio accepts the call. Then your radio opens the microphone, and begins transmitting without showing any indication of the call. Call acceptance and rejection while active in another call follows the PPC rules.

Your radio imposes no time limit on the transmission. Your radio continues to transmit until the Switching and Management Infrastructure (SwMI) ends the call, or when you perform an action that releases the call. If you attempt to start a service while the AL call is in progress, your radio disconnects the call and initiates the requested service. Your radio allows performing actions that can be performed without releasing the AL call. These actions include accessing most menu items, activating or deactivating scan lists, and changing talkgroups. When changing talkgroups, your radio appears to perform an attachment. The attachment appears successful, but the actual attachment signaling is performed only after the AL call terminates. When performing the attachment after the call, no indication is shown to the user unless the attachment fails. If you attempt to turn off your radio in the active AL call, your radio enters Pseudo Power-Off state.

In the AL mode, your radio opens the microphone on the last active accessory. In case there is no active accessory, your radio behaves in accordance with the configured audio routing.

Pseudo Power-Off

Turning off your radio in an active Ambience Listening (AL) call causes your radio to enter a Pseudo Power-Off state.

In Pseudo Power-Off state, your radio appears to turn off, have a blank screen, and all LEDs are turned off. However, your radio is fully operational.

When the AL call ends in this pseudo power-off state, your radio automatically turns off.

If you attempt to turn on your radio from the pseudo power-off state, your radio acts as if it is really turning on.

14.7
Call Modification

Call Modification is a feature that allows your service provider to modify the call to optimize it and adjust to a current situation.

Modification can cover:

Call priority
Modified during call setup.

Call type
Modified during call setup.

Call encryption
Modified during an ongoing call, but not in the transmission phase.

When the call is modified, your radio displays `Call Modified` message.

When a recently modified call requires the **PTT** button to transmit, your radio displays `Call Modified Use PTT`.

All modifications are made by your service provider and your radio only follows them. You have no influence on ongoing call modifications.

When call priority is changed to emergency:

- The display indicates that an Emergency Group Call has been received.
- Your radio plays a special audio alert.

NOTE: If a Group Call is modified into an Emergency Group Call, no emergency-related features are triggered.

If your radio cannot follow a call modification requested by the service provider, due to its settings, your radio rejects it and displays `Service Not Available` message.

14.8
Dialing Methods

Your radio supports multiple methods of selecting a number for an outgoing call.

Your radio supports the following dialing methods:

- Using predefined One-Touch Buttons
- Dialing from the favorite folders
- Dialing from the address book
- Dialing from the Recent Calls list
- Direct dialing
- Dialing from the embedded numbers in Short Data Service messages
- Speed dialing
- Talkgroup dialing by index

14.9
Short Number Dial

This feature allows you to dial part of the full number of the person you wish to call. Your radio automatically completes the number.

Your radio number is 4282564.

1. Dial 564 (instead of 4282564, the full number).
2. To place the call, press the **PTT** button or the **Send** key.

14.10 Viewing the Talkgroup Speed Number

With Talkgroup Speed Dial, you can join a talkgroup by dialing the index of the talkgroup. You need not choose the talkgroup from talkgroup folders and lists.

Procedure:

1. From the home screen, press **Options**.
2. Search talkgroups by using one of the following options:

Option	Actions
Searching talkgroups from the folder	a. Select **TG by Folder** → ***<required talkgroup folder>***. b. Highlight the required talkgroup.
Searching talkgroups by entering the name	a. Select **TG by abc**. b. To narrow down the name of the talkgroup, enter up to 15 characters. c. Highlight the required talkgroup.

3. Press **Menu** and select **View**.

Example:

Your radio displays `SpeedNum1*`, which means that the speed number of this talkgroup is 1.

14.11

Making Calls on Your Radio

Procedure:

Make calls by using one of the following options:

Option	Actions
Group Calls	**a.** Press and hold the **PTT** button. **b.** Wait for the Talk Permit Tone tone (if configured) and speak into the microphone. Release the **PTT** button to listen. **c.** To listen, release the **PTT** button. To cancel a call, perform one of the following actions before the talk permit is granted (depending on the configuration set by your service provider): ● Release the **PTT** button. ● Press the **END** key (default). **NOTE:** When a call is canceled, your radio displays `Call Cancelled` message (if configured by your service provider).
Preempting Group Calls	**a.** Your radio receives a Group Call. **b.** Press the **PTT** button twice on your radio or the Remote Control Unit (RCU).
Simplex Private Calls	**a.** From the home screen, enter a number. **b.** Press **Ctype** until you see the **Private** call type. **c.** If Private Call Hook Customization is enabled, select **Menu** → **Hook Method** → ***<required hook method>*** → **Done** **d.** Press and hold the **PTT** button. **e.** Wait for the Talk Permit Tone and speak into the microphone. **f.** To listen, release the **PTT** button. **g.** To end the call, press the **End** key.

Option	Actions
Duplex Private Calls	**a.** From the home screen, enter a number. **b.** Press **Ctype** until you see the **Private** call type. **c.** If Private Call Hook Customization is enabled, select **Menu** → **Hook Method** → ***<required hook method>*** → **Done** **d.** To start the call, press the **Send** key. **e.** To end the call, press the **End** key.
Phone or PABX Calls	**a.** From the home screen, perform one of the following actions. • Enter a number and press **Ctype** until you see **Phone** or **PABX** call type. • Enter the predefined Phone or PABX speed dial number and **#** key. **b.** To start the call, press the **PTT** button. **c.** To end the call, press the **End** key.
Broadcast Calls	**a.** From the home screen, press the **Menu** key. **b.** Select **Services** → **Broadcast**. **c.** To start the call, press the **PTT** button.

NOTE: If you are using the fist microphone or the telephone-style handset, replace it on its clip or holder to end the call.

14.12

Making Calls from Messages

You can call a number embedded in the message in the Inbox or Outbox folder or start a group call with the message sender of a talkgroup using the Embedded Number feature. Your service provider enables the Embedded Number feature.

Calling Numbers from Messages

You can return a voice call to the sender of a message, or to any number that is embedded in the message text.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Inbox**.
3. Highlight the required message and select **Read**.
4. Press the **PTT** button.

   Your radio displays a list of numbers, including the number of the sender.
5. To call, select the required number and perform one of the following:
   - Press the **PTT** button.

- Press the **Send** key.

6. Press **Ctype** to select one of the following types of calls:
   - **Private**
   - **Phone**
   - **PABX**
7. To initiate the call, perform one of the following:
   - Press the **PTT** button.
   - Press the **Send** key.

Making Group Calls on the Talkgroup of the Message Sender

You can make a group call with the message sender of a talkgroup.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Inbox**.
3. Select the required message and press the **PTT** button.

14.13
Receiving Calls on Your Radio

Procedure:

Receive calls by using one of the following options:

Option	Actions
Group Call in Idle	To respond, press, and hold the **PTT** button. **NOTE:** When your radio receives an incoming group call, a tone sounds.
Group Call in Ongoing Group Call	When your radio receives a group call with higher priority while in an active group call, one of the following scenarios occurs: **a.** Your radio is forced to end the current group call, and automatically join the incoming one. **b.** To cancel the incoming group call, select **End**.

Option	Actions
Individual Call	**a.** To respond to private, phone, or Private Automatic Branch Exchange (PABX) calls, perform one of the following actions: **i.** Press the **PTT** button. **ii.** Press the **Send** key. **iii.** Remove the fist microphone or the telephone-style handset from its clip or holder. **b.** To end the call, press the **End** key. **NOTE:** Hanging a fist microphone or telephone-style handset into the clip or holder ends a call, or switches the audio to a connected speaker. This call behavior depends on the configuration of your service provider.

NOTE:
For Individual Calls, if the microphone or handset is off-hook, the external speaker of your radio mutes. The earpiece of the microphone or handset activates. Depending on their availability, audio is routed to the audio input devices as follows:

a. A visor microphone.

b. A microphone of the device that is off-hook.

c. A microphone that was last in use (if two devices are off-hook).

If an accessory is connected through the junction box, the active microphone depends on the hook state of the accessory:

- If the accessory is on the hook, the visor microphone is active.
- If the accessory is off-hook, the microphone of the accessory connected to the GCAI Mobile Microphone Port (MMP) connector is active.

Chapter 15

Emergency Operations

Emergency Operations are used in critical situations.

Emergency Operation Services:

- Emergency Alarm
- Emergency Call (Group, Private, or Phone)
- Emergency Status
- Emergency Alert

Emergency Services are initiated in:

- Emergency Mode
- Silent Emergency Mode

Pressing the **Emergency** button triggers Emergency Operation. When you press the **Emergency** button, your radio activates one or more of the emergency services (depending on provisioned settings).

- Entry into Emergency Mode or Silent Emergency Mode.
- Sending of Emergency Alarm or other status message.
- Starting Hot Mic operation.
- Start an Emergency individual call.
- Turning on the terminal.

The following lists the Emergency features available on your radio.

Emergency Alarm

A special status message that is sent when your radio enters Emergency Operations to the Console to alert the operator regarding an emergency condition.

NOTE: Emergency Alarm in Direct Mode Operation (DMO) mode can be configured to send in all DMO modes or when your radio is synced through Gateway.

Emergency Call

Calls initiated in Emergency mode are known as Emergency Calls. Emergency Call is the highest preemptive priority call. Available Emergency Call types:

- Emergency Group Call

Table 33: Types of Emergency Group Calls

Type	Description
Tactical Group Call	Your radio sends an emergency alarm, makes an Emergency Call, or both on the current talkgroup.
Non-tactical Group Call	Your radio reverts to the programmed talkgroup to send an alarm, make an Emergency Call, or both. ○ Trunked Mode Operation (TMO) – Your radio is configurable for making Emergency Non-Tactical Group Calls without sending an attachment. If configured, your radio

Type	Description
	assumes an implicit attachment after receiving a temporary address. ○ Direct Mode Operation (DMO) – The Non-Tactical Emergency proceeds on the same frequency as the previously selected talkgroup. Your service provider can designate any Individual TETRA Subscriber Identity (ITSI) address to be used for Emergency Operations. ITSI can be an Open Group broadcast address.

- Emergency Individual Calls (Private or Mobile Station Integrated Services Digital Network (MSISDN))
  - Emergency Private Call or Integrated Services Digital Network (ISDN)
    - A simplex or duplex call with emergency priority.
    - During an emergency individual call, your radio rejects all incoming individual calls with non-emergency priority. These rejected calls are shown as missed calls after the emergency individual call ends.
    - Emergency Individual Calls supports direct or hook dialing method for simplex and duplex calls.
    - In a full duplex Emergency Individual Calls initiated to an MSISDN address, the default dialing method is configured to hook and cannot be modified.
    - Emergency Full Duplex Private Calls (FDPC) supports high or low audio state.

Emergency Short Data Service (SDS) Status

Enables your radio to send a status message with a programmed value to the destination address set by your service provider. If no status acknowledgment or a negative acknowledgment is received, your radio retries sending the message. If Emergency Alarm or Hot Microphone is configured, status is not sent.

NOTE: This feature is available only for TMO.

HotMic Operation

There are two types of HotMic available:

Hot Mic

Allows you to talk without pressing the **PTT** button during Emergency Operation.

HotMic operation is applicable for:

- Tactical and non-tactical Emergency groups.
- Half-Duplex and Full-Duplex Private Calls.

Alternating Hot Mic

An enhancement of the Hot Mic. Your radio alternates between transmission phase, where your microphone is active, and reception phase, where you only listen. The duration of time for each phase is determined precisely by your service provider.

The Alternating Hot Microphone terminates when one of the following conditions is met:

- Your radio exits the Emergency Mode.
- The Alternating Hot Microphone timer expires.
- If configured, and the **PTT** button is pressed.
- The **Upper** soft key is pressed during the transmission phase.

When your radio goes out of the service, it enters the reception phase and the Alternating Hot Microphone is on hold. When your radio is back to the service, the Hot Microphone transmission and the Alternating Hot Microphone resume.

When you are in the Emergency Mode, pressing the **Emergency** button restarts the Alternating Hot Microphone.

Silent Emergency Mode

Enables your radio to enter Emergency Operations with no audible indications or keypad tones. All the display indications are as in the home mode.

When Silent Emergency Mode is enabled, your radio cannot use any services except for:

- Receiving Ambience Listening
- Sending Silent Emergency Alarms
- Sending Global Positioning System (GPS) location reports

Your radio will remain, or switch to TMO when Silent Emergency Mode is activated.

NOTE:
If your radio is in a private or group call, your radio waits until the call ends. Your radio then enters the Silent Emergency Mode.

If you turn off your radio in the Silent Emergency Mode, your radio switches to a pseudo power off state. On turning your radio on during the pseudo power off state, your radio acts as during turning on and remains in the Silent Emergency Mode.

Invisible Emergency

Your service provider can disable visual and audible indications on your radio in Emergency Operation. Invisible Emergency provides an extra layer of safety when using Emergency Operation in critical situations, such as a direct attack on you.

Emergency Alert

This is a Software Selling Feature.

Allows your radio to send emergency alerts to other radios within DMO and TMO without TMO coverage by pressing the **Emergency** button. Your radio monitors a special DMO emergency frequency for possible emergency alerts and responds to them by automatically joining the emergency call.

To initiate the emergency alert, your radio must be in MS-MS DMO mode, or out of coverage in TMO mode. The alert is not sent to the dispatch console.

To receive the emergency alert, your radio must be in DMO or TMO, within RF range of the initiating radio, and must not be in a call. When your radio receives the emergency alert, it joins the call automatically.

The following table illustrates the dependencies between the current radio mode and the type of emergency operation:

Table 34: Emergency Operation Dependencies

Radio Mode	Initiate Emergency	Emergency Alert Received
DMO, MS-MS, idle	Emergency Alert	✓
DMO, Repeater, idle	Standard DMO Emergency	✓
DMO, Gateway, idle	Standard DMO Emergency	✓
DMO, in call	Per communication mode	✗
TMO, no coverage	Emergency Alert	✓
TMO, in coverage, idle	Standard TMO Emergency	✓
TMO, in coverage, in call	Standard TMO Emergency	✗

Radio Mode	Initiate Emergency	Emergency Alert Received
Network Monitor, MS-MS	Emergency Alert	✗
Network Monitor, Repeater	Standard DMO Emergency	✗
Gateway operation, in coverage	Standard TMO Emergency	✗
Repeater operation	Standard DMO Emergency	✗

Emergency Destination in Local Site Trunking (LST)

This is a Software Selling Feature.

Allows your radio to send emergency requests to a different destination while in local site trunking mode.

The supported emergency services include:

- Emergency Alarm.
- Emergency Call.
- Emergency Short Data Service (SDS) Status.
- Location Information Protocol reports.

Disaster Alert

A broadcast emergency call initiated by your radio with emergency preemptive priority allowing everyone in a broadcast area to hear. Disaster Alert is designed for catastrophic situations, such as earthquakes, and is the highest priority call. The alert message, duration, and destination talkgroup are configurable using the codeplug.

During Disaster Alert, other functionality is impacted:

- When Disaster Alert begins, all other ongoing services are terminated.
- No other service can interrupt this type of call.
- Hot Mic functionality cannot be used.
- Speech can only be in Clear Mode, even if any of the encryption services are enabled. The only exception is E2E Encryption.

NOTE: Not all infrastructures support this feature. Consult your service provider before enabling this feature.

NOTE: If configured, your radio prohibits talkgroup and operation mode changes in Emergency Mode for TMO and DMO.

15.1

Entering and Exiting Emergency Mode

Entering Emergency Mode

Procedure:

Enter emergency mode by using one of the following options:

Option	Actions
Emergency Mode with Alarm	**To enter:** • Press and hold the **Emergency** button. • Dial a predefined number. **To exit:** Press the **End** key.
Silent Emergency Mode	**To enter:** Press and hold the **Emergency** button. **To exit:** • Press the **Menu** key and then the **#** key for 3 seconds. • When sending of Silent Emergency Alarm failed. • When the maximum number of retries for sending Silent Emergency Alarm is reached. • When the control room terminates the Silent Ambience Listening. • When Ambience Listening disconnects.
Emergency Destination in Local Site Trunking (LST)	**To enter:** Press and hold the **Emergency** button. **To exit:** Press and hold the **End** key. **NOTE:** This is a Software Selling Feature.

Making Emergency Calls

Procedure:

Make emergency calls by using one of the following options:

Option	Actions
Group Call	**To enter:** Press and hold the **Emergency** button. **To talk:** Press and hold the **PTT** button to talk and wait for the *Talk Permit* tone. **To listen:** Release the **PTT** button. **To exit:** • Release the **PTT** button. • Press the **End** key (default). **NOTE:** Perform one of the steps before the *Talk Permit* tone.
Emergency Private Call/ISDN	**To enter:** Press the **Emergency** button. **To exit:** • Release the **PTT** button. • Press the **End** key (default). **NOTE:** Available only when Emergency Private Call is enabled on your radio and the predefined IS-SI is configured.
Emergency Hot Mic	**To enter:** Press and hold the **Emergency** button. To restart transmission, press **Emergency** button. **To talk:** Speaks clearly into the microphone. **To exit:** • If configured, press the **PTT** button. If the PTT button is held, your radio will continue PTT operation in Emergency Group Call mode. • Press the **End** key. • Press the **End** soft key.

Option	Actions
Emergency Alternating Hot Mic	**To enter:** Press the **Emergency** button. **To talk:** Speaks clearly into the microphone. Press the **End** key to end transmission early, or skip the transmission phase. **To exit:** • If configured, press the **PTT** button. • Press the **Upper** soft key (only during the transmission phase). • Exit Emergency Operations. • Wait for the Emergency Alternating Hot Mic timer to expire.

Sending Emergency SDS Status

Prerequisites: Predefined SSI and status number is configurable.

Procedure:

Press and hold the **Emergency** button.

Initiating Disaster Alert

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Services** → **Disaster Alert**.
3. To start the call press **PTT** button.

Result: Your radio displays `Disaster Alert In Use`.

Chapter 16

Short Data Services

Short Data Service (SDS) features supports transfer of short data messages and precoded status transfer called Status Transfer Service (STS).

Table 35: SDS Message Types

Short Data Service (SDS) message types	Functionality	DATA Type	
SDS Status	You can send a predefined Status message that can be associated with text string. The Status messages can be used by the system to send to your radio user Status information.	—	—
SDS User Defined Data Types 1, 2, 3	You can send or receive SDS fixed-length messages.	SDS Type 1	16-bit value
		SDS Type 2	32-bit value
		SDS Type 3	64-bit value
SDS User Defined Data Type 4 with or without SDS Transport Layer (SDS - TL)	• You can send or receive SDS variable-length message. • Message can be sent directly to the end user or using Service Center if provided by the infrastructure. • Message can be sent with or without acknowledgment request. There will be end-to-end acknowledgments, delivery report, and message numbering for messages that are sent with acknowledgment request.	SDS Type 4	
Predefined Templates (ATS Entry Prompt)	You can select a predefined entry prompt to send formatted SDS messages using a predefined destination address.	—	—

The feature supports the following addressing modes:

- Radio to radio
- Radio to talkgroup
- Radio to external subscriber number (gateway address)
- Internal/External Application or Service Center to radio

16.1
Text Messages

The messages feature allows you to send, receive, and store and forward text messages. Messages can be protected from being deleted or being overwritten.

You can manage messages with the following messaging features. Collaborative Messaging and Radio Messaging System (RMS) are additional features. For configuration, check with your service provider.

16.1.1
Type of Short Data Service and Functionality

Table 36: Short Data Service Types

Type of Short Data Service	Description	Typical Maximum Character
Short Text Message	Your radio is able to send, receive, and store and forward text messages.	140 char
Long Text Message	Your radio is able to send and receive Long Text Message with Switching and Management Infrastructure (SwMi), Individual Short Subscriber Identities (ISSI), or Mobile Station Integrated Services Digital Network (MSISDN). Sending long text messages to groups is not possible. This feature allows sending long text messages up to 1000 characters. Messages that are longer than 140 characters are divided and sent separately one after another. Your radio can reconstruct a long text message consisting of up to ten short messages. The maximum length of the message is 141–1000, which is the length defined in the codeplug. Your radio recombines the text segments independently of the order that they have been received to the correct order of the original message. The messages can be combined only if all their message reference numbers are correct, and the segmented receiver timer is still valid. When a recipient receives all the parts of the message, it displays as one on the screen.	1000 char

The following are the actions that you are able to perform with Messages:

Option	Action
Send	You can compose, edit, and send a message up to 1000 characters, depending on the setting.
	Messages can be sent to Group, Individual, and to External Subscriber Number.

Option	Action
	Messages can be sent with a request for a received delivery report.
Receive	Incoming messages are identified with notification and quick access to read the message is provided.
	The incoming message can contain up to 1000 characters, depending on the setting.
Store and Forward	Save incoming and outgoing messages for editing later. Stored out-going messages are sent to the receiver when connection is restored.
Collaborative Messaging	External devices connected through Bluetooth or cable can send and receive messages when your radio application is enabled.
Radio Messaging System (RMS)	Receive and send messages through the TETRA network. The RMS Box is available in the Messages menu if RMS is enabled. **NOTE:** This is a Software Selling Feature.

16.1.2
Buffer Full Overwrite Policy

Buffer Full Overwrite Policy allows you to define how your radio handles received messages when the inbox is full.

When you receive a new Short Data Services (SDS) message and the buffer of the received messages is full, your radio acts according to the Buffer full overwrite policy. The options are:

None
Your radio does not overwrite messages in the buffer. Your radio puts a message in the buffer only in free place. Free place is the case when no message is written or a message is deleted.

Overwrite Old + New
Your radio tries to overwrite old messages. If all the messages are new and unread, overwrite the oldest unread message with the new one.

Overwrite Only Old
If the buffer contains at least one old message, the new SDS message overwrites the oldest read message in the buffer.

NOTE: Messages that are protected will not be overwritten.

16.2
Status Messages

You can select from a list of up to 4000 programmed alphanumeric aliases each of which corresponds to a status value. The valid range of uplink status values is a set of provisioned parameters. If your radio is not enabled with targeted status, the status value is sent over the air interface to the address of the selected group. Your radio recognizes the general status acknowledgment sent from the Switching and Management Infrastructure (SwMI) and the negative acknowledgment. In Trunked Mode Operation (TMO), if no status acknowledgment or negative acknowledgment is received, your radio retries sending the message. The number of retries and time to wait before retrying are provisioned parameters. You are notified of the delivery

status. As there is no acknowledgment for Direct Mode Operation (DMO) status messages, you are notified only of sending the status message. Your radio does not initiate sending of status messages on a traffic channel.

If your radio is provisioned with the targeted status, the status value is sent over the air interface by default to the last sent target. You also have an option to specify a different individual or group to send the message to. In other words, you can send a Short Data Service (SDS) status message to a directly entered ID (for example, ISSI, GSSI, MSISDN). If your radio is not provisioned with the targeted status and you want to send an SDS status message, the following possible actions apply:

- When the default address type of the targeted SDS status is set to **Private** or **Phone**, the default address is used as ISSI, ITSI, GSSI, or ISDN, depending on the configuration.
- When the default address type of the targeted SDS status is set to group, the selected talkgroup address is used.
- When the targeted SDS status is set to **Dynamic**, the status message is sent to the address configured for the Dynamic statuses, or defined by a dispatcher (by SDS Remote Control).

Your radio accepts status messages from addresses that it is monitoring. Your radio can be programmed with an appropriate text associated with each status value. Your radio notifies when a new status message has been received. On receiving an incoming status message, the stored text corresponding to the status value is extracted and placed in the text message buffer as a text message. Receiving a status causes your radio to display the message mail screen, which allows you quick access to read the message. A received status can be stored in your radio text message buffer.

The PEI provides access for external applications to send and receive status messages.

NOTE: The Dimetra Infrastructure does not support the targeted status feature.

16.3 Home Mode Display Text Message

Your radio is provided with a feature that allows your service provider to send special text messages to the display.

The message is limited to 24 characters. The message stays on the home screen until a new home mode display message is received. Power cycle your radio to replace the Home Display message to the predefined one.

16.4 SDS Air Interface Aspects

Delivery report types are available as standard report and short form report. Your radio can be provisioned to send a short-form SDS - TL receive report when the originator of the message allows short-form report.

The short-form report uses a specially designated 16-bit SDS status value instead of SDS-REPORT. Your radio can respond to a delivery response request automatically or manually although a selection of report types through radio HMI is available only in manual response.

Your radio supports SwMIs that employ store and forward service as indicated in the cell broadcast information. Your radio supports the use of a service center, which address is set in your radio. The store and forward operation is supported. However, your radio notifies you only on the successful sending of the message. Your radio does not wait for the report from the service center.

Downlink SDS messages types 1, 2, and 3 are always routed to the PEI when an AT application is registered. If no external application is registered, the message is discarded.

NOTE: The DMO SDS does not support type 1, 2, and 3 user-defined short messages.

16.5
SDS Encryption

Short data messages stored in a radio are protected against any unauthorized access. The stored data includes messages in the Inbox, Outbox, and stored call out messages.

The required protection against any unauthorized access through the HMI, PEI, or unintentional access by other means is carried out through the special mechanisms. The encryption of stored messages preventing from accessing the memory directly and the user authentication protect SDS messages. Protected messages cannot be read on your radio HMI unless valid authentication occurs. For the user authentication, the existing radio PIN is used.

SDS messages received by your radio are encrypted before being stored in the Inbox. Store and Forward messages are encrypted before being saved in the Outbox.

Received call-out messages are encrypted before being stored in the Call-Out (CO) Box.

If the feature is enabled, your radio prompts you to enter the PIN when any of the following menu items are selected from the HMI.

- **Messages → Inbox**.
- **Messages → Outbox**.
- **Messages → CO Box**.

Following successful PIN entry and access to the required messages, your radio does not require further PIN entries to access messages unless one of the following conditions has been met.

- Exiting from your radio menu.
- Turning off your radio.
- Changing the PIN from the HMI.

If you disable the PIN lock through the HMI or change the PIN, the protected messages are deleted. Before deleting the messages, you are prompted to ensure that the operation proceeds. If the PIN lock is changed through the PEI, all the protected messages stored in the Inbox, Outbox, and CO Box are deleted. On enabling your radio permanent disable, the access to the protected messages is lost.

16.5.1
SDS End-to-End Encryption

NOTE: This is a Software Selling Feature.

End-to-end Encryption (E2EE) provides customers with a higher degree of confidentiality than existing TETRA air interface data encryption.

The TETRA standard supports the air interface security that provides protection of the air interface. The information flow inside the infrastructure is not secured. When you require data protection for your data going through the infrastructure, you need your entire transport path to be encrypted.

This entire path encryption is called E2EE. The source and the destinations are supplied with the mechanism for encrypting and decrypting.

NOTE: The 260–275 MHz radios do not support the Short Data Services (SDS) end-to-end encryption.

In air interface encryption, the receiving Base Station decrypts data, which travels clear within the system domain. For E2EE, the transmitting radio encrypts the data, and the receiving radio or an E2EE terminator located in the infrastructure decrypts the data.

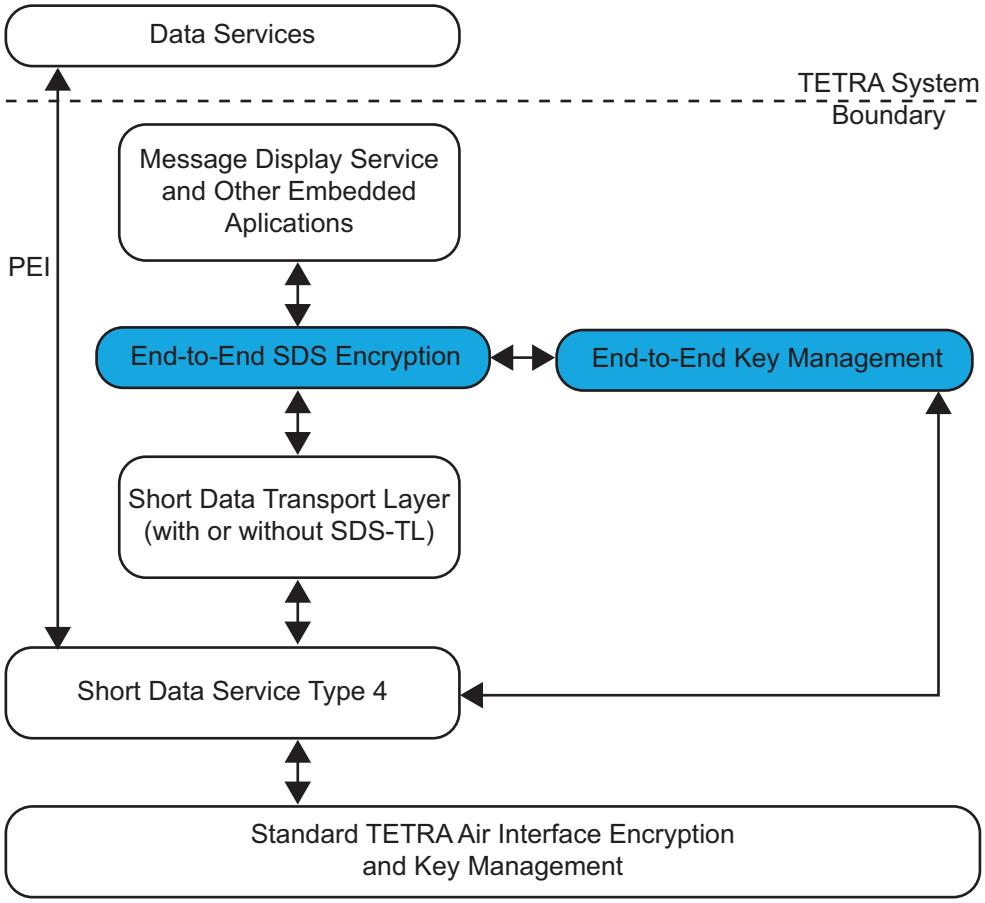
E2EE protects the SDS or SDS-TL data services both in Trunk Mode Operation (TMO) and Direct Mode Operation (DMO). The following TETRA data types are protected.

- SDS type 4 with SDS-TL, with or without acknowledgment request
- SDS type 4 without TL, with or without acknowledgment request

For short data applications, the source data can come from an external application or from a task internal to your radio, such as text messages or Global Positioning System (GPS). Your radio passes only the internal text messages and GPS data for encryption by its crypto-engine.

The encrypted short data service is established between two end points. One end point is terminated in your radio, and the other end point is terminated in a Short Data Encryption Gateway (SDEG) or another radio. The destination address specifies the encryption type, that is, whether the packets are transmitted as encrypted, clear, or dropped.

Figure 16: SDS End-to-End Encryption



NOTE: Key Management Facility (KMF) can manage and support only one short data association and a key at the same time.

Your radio selects the E2EE mode for the outgoing text message according to the address association and requirements for the E2EE High Security Mode. Depending on codeplug settings, you can override the address association and select using the HMI menu whether an SDS is sent to a clear or encrypted contact (Group or Private Number).

Your radio supports the high security mode configurable using the configuration tool. In this mode, the association that binds the address to a given cryptogroup is always mandatory.

If no cryptogroup associations exist, this condition means that the keys are not loaded. In such situation, your radio discards any outgoing or incoming message that is encrypted. You are alerted when this situation occurs.

This feature can only be disabled using the Key Variable Loader (KVL).

SDS Receive Failure Notification

When a radio fails to decrypt a received SDS message, it displays a notification including the Individual Short Subscriber Identities (ISSI) of the sender, and the reason for failure.

16.5.2 DMO SDS Transmit Traffic Stealing

The Traffic Stealing feature enables your radio to send status or Short Data Services (SDS) in a voice call transmission. Your radio replaces the audio frame with the status or SDS payload.

Audio is impacted when traffic is stolen for sending status or SDS. The receiving radio can decode the status or SDS from the traffic and indicate it to the user.

16.5.3 Shadow Groups (Address Bundles)

NOTE: This is a Software Selling Feature.

The Shadow Groups feature offers a way of sending statuses to multiple destinations or recipients simultaneously. Each radio can store up to 500 Address Bundles (in TMO only).

Four types of Address Bundles are supported:

- Status Addressing (including emergency alarm).
- GNSS/GPS Local Information Protocol (LIP) Addressing.
- RMS/FMS Addressing.
- Bluetooth Sensor Addressing.

Shadow Groups in Trunk Mode Operation (TMO)

Each Address Bundle can contain up to four target addresses (ISSI or GSSI). Each talkgroup can be configured to send statuses, GNSS/GPS LIP reports or RMS/FMS messages to a specific Address Bundle.

Additional Address

The Additional Address feature allows your radio to send RMS messages, and LIP reports to additionally defined recipients.

Your service provider defines the default addresses where your radio sends RMS messages and LIP reports. If an Additional Address is selected and enabled, RMS messages and LIP reports are also sent to the recipient defined in the Additional Address.

You can create, edit, and delete Additional Addresses using your radio menu. If your service provider configures an Additional Address, the service provider can disable edition and deletion of the address using your radio menu.

You can define up to 30 Additional Addresses.

Shadow Groups in DMO

In DMO, the Shadow Group contains one target address. Each talkgroup may be configured to send status messages or GPS LIP reports to a specific Shadow Group.

The Shadow Groups feature may affect Emergency Calls setup time to be slightly elongated.

Shadow Groups (Address Bundle) is not supported via gateway.

16.6
Messages

This section contains information on viewing, accessing, and managing messages through the Messages Menu.

16.6.1
New Messages

The New Message menu allows you to create and send new messages. You can also request for Delivery Reports upon sending a message to a recipient.

16.6.1.1
Sending New Messages

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **New Message**.
3. Send messages by using one of the following options:

Option	Actions
Sending Messages to Private or Phone	**a.** Create a message and press **Send**. **b.** Select **Private** or **Phone**. **c.** Enter the recipient number or choose from contacts by pressing **abc**. **NOTE:** For Private target selection, you can enter either Individual Short Subscriber Identity (ISSI), Individual TETRA Subscriber Identity (ITSI), or Group Short Subscriber Identity (GSSI) of the recipient. ISSI or ITSI is a unique and individual ID assigned to each radio. GSSI in Dimetra is called Group ID or Talkgroup ID.
Sending Messages to Groups	**a.** Create a message and press **Send**. **b.** Select **Group** **c.** Select a group that you want to send the message to.
Sending Store and Forward Messages	**a.** Press the **Menu** key and select **Message Setup** → **On/Offline users**. **b.** Create a message and press **Send**. **c.** Select **Private** or **Phone**. **d.** Enter the recipient number or choose from contacts by pressing **abc**.

4. Perform one of the following actions:
   - Select **Send**.
   - Press the **Send** key.
   - Press the **PTT** button.

16.6.1.2
Configuring Delivery Reports

Prerequisites: Contact your service provider to enable Delivery Reports.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **New Message**.
3. Press **Menu** key and select **Delivery Report**.
4. Select one of the following options:

Option	Description
None	No delivery reports are required.
Received	Delivery reports are required when the recipient receives your messages.
Consumed	Delivery reports are required when the recipient reads your messages.
Both	Delivery reports are required when the recipient receives and reads your messages.

16.6.1.3
Viewing Delivery Reports

Procedure:

1. From the home screen, press the **Menu** key.
2. Navigate to the required message by selecting **Messages** → **Inbox** or **Outbox**.
3. Select **Read**.
4. Press **Menu** → **Delivery Status**.

Result: Your radio shows the following behavior depending on the timing in which your message is delivered:

Table 37: Delivery Report Timing

Delivery Report Received Timing	Radio Behavior
Shortly after the message is sent	• Displays one of the following notifications: `Message Sent` A Delivery Report is not requested and a Store and Forward message is received in the Store and Forward server.

Delivery Report Received Timing	Radio Behavior
	Message Delivered A Delivery Report is requested and the recipient receives the message. **Message Read** The **Consumed** Delivery Report is requested and the recipient opens the message. **Message Failed** The Delivery Report is requested and the recipient does not receive the message within the stipulated time. • Saves the Delivery Report and a copy of the message in the **Outbox**.
After a longer period	Saves the Delivery Report and a copy of the message in the **Outbox**.
After a longer period and functionality of the Delivery Report Notifications is configured by your service provider	• Saves the Delivery Report and a copy of the message in the **Outbox**. • Temporarily saves the Delivery Report message in the **Inbox**. The notification disappears after it is read. • Displays the New Message icon. • Displays the New Delivery Status notification screen (if possible).

16.6.2
Entering the Inbox

The inbox folder contains up to 100 new or old incoming messages, depending on the length of the messages. The **Messages** sub-menu indicates the number of the messages.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Inbox**.

16.6.3
Receiving New Messages

When you receive a new message, your radio shows the following indications:

- Plays a tone.
- Displays the New Message icon and animation.

Procedure:

Receive new messages by selecting one of the following options:

Option	Description
Read	To read the whole message.

Option	Description
Back	To dismiss the message. **NOTE:** If you dismiss the message, you can access the message later from the Inbox.

16.6.4
Immediate Text Messages

NOTE: This is a Software Selling Feature.

The Immediate Text Messaging feature enables your radio to receive and display text messages immediately. This feature is used for sending information of high importance from the console to radios.

When your radio receives an immediate text message, the following occurs:

- The immediate text message is stored in the **Inbox**.
- The content of the immediate text message is displayed.
- The relevant audio tone is played.
- If the periodic alert feature is enabled, the periodic alerting is active until you press the **Soft** key.

NOTE: If this feature is disabled, the immediate text messages are processed as normal text messages.

When you reply or forward an immediate text message, the message is sent as a normal text message.

When your radio receives more than one immediate text message, the latest received immediate text message is displayed. All previous immediate text messages in the **Inbox** are not prompted.

If your radio is in the PIN Lock state, an immediate text message is displayed after you enter the correct PIN. The message remains on the screen until you press the **End**/**Home** key.

16.6.5
Storing Numbers from Messages

The Embedded Number feature allows you to call a number embedded in the message in the Inbox or Outbox folder. You can also start a group call with the message sender of a talkgroup. You can save the number of the sender or embedded number from the message to a new or existing contact.

Prerequisites: Contact your service provider to enable the Embedded Number feature.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Inbox**.
3. Highlight the required message and select **Read**.
4. Press the **PTT** button.
5. Your radio displays a list of the numbers including the senders number.
6. Highlight the required number and press **Store**.
7. Highlight the required contact and press **View**.

8. To store a number, use one of the following options:

Option	Actions
Saving as a new contact	a. Select **[New Contact]** and fill out the required fields. b. Press **Done**.
Saving as an existing contact	a. Select **Edit**. b. Choose the **Type** of the new number and press **Done**.

16.6.6
Entering the Outbox

The outbox stores up to 100 sent messages arranged chronologically.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Outbox**.

16.6.7
Using Submenus in the Inbox and Outbox

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Inbox** or **Outbox**.
3. Highlight the required message and press the **Menu** key.
4. Apply submenu features by using one of the following options:

Option	Actions
Saving the message as a template	a. Select **Store**. b. Change the default name of the template and press **OK**.
Deleting the message	a. Select **Delete**. b. To confirm, select **Yes**.
Deleting all messages in the Inbox or Outbox	a. Select **Delete All**. b. To confirm, select **Yes**.
Invoking the edit screen with the original message as default text, and the message originator as the recipient	a. Select **Reply** and edit the text. b. To send, perform one of the following options: • Select **Send**. • Press the **PTT** button. • Press the **Send** key. **NOTE:** Applicable only for Inbox.

Option	Actions
Invoking the edit screen with previously entered text to the same recipient	**a.** Select **Resend** and edit the text. **b.** To send, perform one of the following options: • Select **Send**. • Press the **PTT** button. • Press the **Send** key.
Invoking the edit screen with an old message and send it to a different recipient	**a.** Select **Forward** and edit the text. **b.** To send, perform one of the following options: • Select **Send**. • Press the **PTT** button. • Press the **Send** key.
Refreshing the list of messages to display new messages	Select **Refresh**.
Displaying the date and time of the message when it is in one of the following statuses: • Sent • Delivered • Read • Expired and undelivered • Expired and unread • Failed due to an unknown error	Select **Delivery Status**. **NOTE:** Applicable only for Outbox.
Protecting the message and avoid deleting or overwriting it	Select **Protect**.
Removing protection from the message	Select **Unprotect**. **NOTE:** Message protection is enabled in the Inbox and Call Out Inbox. You can only delete unprotected messages.

16.6.8

Entering the Call-Out Box

NOTE: This is a Software Selling Feature.

The Call-Out (CO) Box contains incoming and outgoing Call-Out messages. Your radio plays a Call-Out tone according to the configured indication profile. The indication profile is configured based on the severity level of a matching Group Short Subscriber Identity (GSSI) and Sub-Address Group Call-Out.

Clicking **Select** on a Call-Out message headline displays more detailed information on the item.

When your radio is in normal mode, you are able to browse through all messages in the CO Box. If your radio is in Call-Out mode, you can only browse through the information regarding the currently ongoing Call-Out message.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **CO Box**.

16.6.9
Radio Messaging System

The Radio Messaging System (RMS) feature allows your radio to receive and send RMS messages. RMS Box stores all incoming and outgoing RMS messages, both Status messages and Free Text messages.

NOTE:
This is a Software Selling Feature.

This feature is only available when enabled by your service provider.

16.6.9.1
Entering the RMS Box

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **RMS Box**.

16.6.9.2
Sending RMS Statuses

Prerequisites: Contact your service provider to enable the **Send RMS/FMS** menu item.

NOTE: If the **Send RMS/FMS** menu is disabled, your radio can only receive Radio Messaging System (RMS) messages.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Send RMS/FMS**.
3. Perform one of the following actions:
   - Press and hold a required key (for RMS status 0–9).
   - Press the required two keys combination (for RMS status 10–99).
   - Scroll to the required RMS status.
   - Type out a message using RMS Free Text (available in SDS-TL only).

16.6.10
Entering the WAP Box

Each Wireless Application Protocol (WAP) Push message can be loaded immediately or stored as a message in **WAP Box**.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **WAP Box**.

16.6.10.1
Viewing WAP Messages

The Wireless Application Protocol (WAP) is used to access the mobile web from a radio through a WAP browser. The WAP Push feature allows WAP content to be sent to a radio. WAP Push messages are encoded messages that include links to WAP addresses.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **WAP Box**.
3. Select the required message.
4. View the message in the browser by selecting **Go to**.

16.6.11
User-Defined Templates

A template box stores user-defined message templates.

16.6.11.1
Managing User-Defined Templates

This feature allows you to manage your saved templates.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Templates**.
3. Highlight the required template and press **Menu**.
4. Manage templates by using one of the following options:

Option	Actions
Viewing the template	Select **View**.
Deleting the template	Select **Delete**.

Option	Actions
Editing the template	**a.** Select **Edit Text**. **b.** Edit the text. **c.** Press the **Menu** key and select: • **Save Changes** – To save the edited template. • **Store** – To save the edited template as a new template.
Editing the name of the template	**a.** Select **Edit Name**. **b.** Edit the template name and press **OK**.

16.6.11.2

Sending User-Defined Templates

This feature allows you to send your saved templates.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Templates**.
3. Highlight the required template name and press **Send**.
4. Send the message by using one of the following options:

Option	Actions
Sending the message to a talkgroup	Select the required talkgroup from the **TalkGroup List**.
Sending the message to an address in your contact list	**a.** Press **abc**. **b.** Select the name of the recipient.
Sending the message to a contact or talkgroup that is not configured in your radio	**a.** Enter the contact number. **b.** Press **Send**.

16.6.12

Predefined Templates

Predefined message templates are programmed into your radio. You are allowed to perform limited edit operations on the predefined template. You can send it, but you cannot store the edited template or erase it from the predefined template list.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Predefined**.
3. Highlight the required template.

4. View, edit, or send templates by using one of the following options:

Option	Actions
Viewing the template	**a.** Press the **Menu** key. **b.** Select **View**.
Editing the template	**a.** Press the **Menu** key. **b.** Select **Edit**. **NOTE:** You are only allowed to replace the existing text.
Sending the template	• Select **Send**. • Press the **PTT** button. • Press the **Send** key.

16.6.13

Managing Status Messages

There are two types of status messages: statuses and targeted statuses. Your service provider determines which type is enabled on your radio.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Send Status**.
3. View or send status messages by using one of the following options:

Option	Actions
Viewing a status message number	**a.** Press the **Menu** key. **b.** Select **View**.
Sending existing status messages in your radio	**a.** Select the required status message. **b.** Perform one of the following actions: • Press **Select**. • Press the **PTT** button. • Press the **Send** key.
Sending status messages using a status number or if the status list is empty	**a.** Enter a 5-digit status message number. **b.** Press **Send** key.

4. Select a recipient by using one of the following options:

Option	Actions
Sending to a private number	**a.** Enter the number or press **abc** to select the name from your contact list. **b.** Press the **Send** key.

Option	Actions
Sending to a talkgroup	Select the required talkgroup from the **TalkGroup List**

Result: Your radio displays one of the following delivery reports:

- `Status Sent`
- `Status Failed`

16.6.14

Managing Additional Address

The Additional Address feature allows your radio to send Radio Messaging System (RMS) messages and Local Information Protocol (LIP) reports to additionally defined recipients.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Additional Address**.
3. Manage additional addresses by using one of the following options:

Option	Actions
Enabling or disabling Additional Address	**a.** Select **Enable**. **b.** Select one of the following options: • **On** – To activate. • **Off** – To deactivate.
Selecting additional addresses	**a.** Select **Select Address**. **b.** Scroll to select the alias of the Additional Address and press **Select**.
Viewing additional addresses	**a.** Select **Select Address**. **b.** Scroll to select the alias of the Additional Address you wish to view. **c.** Press the **Menu** key. **d.** Select one of the following options: • **Edit** – For User Defined Additional Address alias. • **View** – For Predefined Additional Address alias. The display shows the Alias, the ISSI/ITSI/GSSI, and the Status of the address (Pre-Defined or User Defined).

Option	Actions
Entering new additional addresses	**a.** Select **Select Address**. **b.** Select **[New Address]**. **c.** Press **Change** key. **d.** Enter new values of the Alias and ISSI/ITSI/GSSI fields, press **Done** key. The new alias appears in the list of available aliases. There is no possibility to have two Additional Address items with the same Additional Address Alias.
Editing additional addresses	**NOTE:** Applicable only for User-Defined positions. **a.** Select **Select Address**. **b.** Scroll to select the alias of the Additional Address you wish to edit. **c.** Press **Menu** key. **d.** Select **Edit**. **e.** Press **Change** key. **f.** Enter new values of the Alias and ISSI/ITSI/GSSI fields, press **Done** key. The changed alias appears in the list of available aliases. There is no possibility to have two Additional Address items with the same Additional Address Alias.
Deleting additional addresses	**NOTE:** Applicable only for User-Defined positions. **a.** Select **Select Address**. **b.** Scroll to select the alias of the Additional Address you wish to delete. **c.** Press **Menu** key. **d.** Select **Delete** and confirm deletion by the **OK** key.

Chapter 17

Calling Line Identification Presentation

If your radio is provisioned with the Calling Line Identification Presentation (CLIP), the calling party number is transported as part of the incoming call setup signaling.

Also the calling party number is shown on your radio display. If the calling party ID is programmed in your radio with a corresponding name, the name is displayed in addition to the number.

NOTE: The number sent by the Switching and Management Infrastructure (SwMI) is expected to be in a form that can be used to call back the calling party at any other time. Thus, for instance, the number can be stored in the address book.

If the calling party number is not present in the incoming call setup signaling, a blank line is displayed.

Chapter 18

DTMF Overdial

This supplementary service allows your radio to send Dual-Tone Multi-Frequency (DTMF) tones to both the internal and the external network during the call (conversation). It is only possible to send DTMFs when in a full duplex call.

This feature allows you to communicate with an automated answering device (for example, the voice mail or answering machine) during an on-going private, phone or Private Automatic Branch Exchange (PABX) call.

While in an on-going private, phone, or PABX call, press the DTMF keys (0-9, *, #). When pressed, the DTMF key sounds a tone and the entered digit is displayed on the screen.

This feature is enabled by default. You can disable this feature in the codeplug.

Chapter 19

Call-Out

NOTE: This is a Software Selling Feature.
If you are using Direct Mode Operation (DMO), you are recommended to apply DMO SCK for data confidentiality.

A Call-Out is an alert sent to one or many recipients when an incident requires immediate attention. The Call-Out message can include an instruction to use a different talkgroup during the Call-Out or remain on the attached talkgroup. You can select from a list of up to 1120 programmed alphanumeric aliases each of which corresponds to a status value.

The types of Call-Out alerts are:

Normal
An alert message sent by a dispatcher to a single radio, or a group of radios.

Storm Plan
An alert message sent by a dispatcher to a group of radios. To raise its reliability, it is sent several times. You are not able to respond to the Call-Out alert. Any key press takes you to the information phase.

The Call-Out mode is ended when the acknowledgment timer runs out, or when you press any key or softkeys (**Messages** and **Exit**), except for the **Emergency** button, or the rotary knob.

Simple Call-Out
An alert with the functionality similar to full Call-Out but without the information phase. There are two types of Simple Call-Out:
With user receipt
The Call-Out mode is ended when the acknowledgment timer runs out, or when you select **Accept**, **Reject**, **Standby**, or reply with a text message.

Without user receipt
The Call-Out mode is ended when the acknowledgment timer runs out, or when you press any key or softkeys (**Messages** and **Exit**, except for the **Emergency** button, or the rotary knob.

Fallback Mode
An alert message that is limited only to voice communication. To initiate this type of Call-Out, press a One-Touch Buton predefined by your service provider. This Call-Out type can be manually cleared.

NOTE: Fallback is only possible when your radio is in Local Site Trunking.

Test Call-Out
A special Call-Out alert sent by the dispatcher to test the Call-Out feature. On receiving the Test Call-Out, your radio plays a tone and displays **Test Call-Out**. To respond and clear the alert, select **Test OK**.

Only emergency mode has a higher priority than Call-Out. However, if your service provider configures Emergency Calls to be ignored during Call-Out mode, your radio rejects Emergency Calls with no notification. When you receive an alert, the following responses are available:

- **Accept** – Additional information from the dispatcher is displayed.
- **Reject** – Your display returns to the home display, and the talkgroup is set to the one before the Call-Out.

You can address a Call-Out alert by:

- Individual Short Subscriber Identity (ISSI) – To an individual radio.
- Group Short Subscriber Identity (GSSI) – To a group of recipients.

Your radio plays a Call-Out tone according to the configured indication profile. The indication profile is configured based on the severity level of a matching Group Short Subscriber Identity (GSSI) and Sub-Address Group Call-Out.

All incoming and outgoing Call-Out messages are stored in **CO Box** (Call-Out Box) and can be managed through the Human-Machine Interface (HMI). You can protect Call-Out messages from being deleted or from the overwriting policy of your radio. The overwrite policy deletes the outdated one on the receipt of a new Call-Out message. When a new Call-Out arrives, the new Call-Out overrides the old Call-Out, even if it has not been responded. An ongoing Call-Out overrides the old one in any phase of the Call-Out alert. Also, the overwrite policy deletes unprotected Call-Out messages first before deleting protected ones.

There is a two-level structure for the alerts. The first level is the main alert list, and the second one are all the messages associated with the alerts. Both lists are displayed chronologically with the newest on top. The capacity of the **CO Box** is 100 Call-Out alerts and 100 messages (incoming/outgoing).

In normal mode, you can browse the **CO Box** and read all the Call-Out messages. In the Call-Out mode, you can only read the ongoing Call-Out messages.

The Call-Out service functions in two main phases:

Alert Phase

You are alerted using the LED pattern, vibration pattern, alert tone, and volume level configured for the first matching subaddress containing the indication profile setting. Your radio receives a Call-Out message. A tone sounds to indicate the message. When the text is displayed, you have the following options:

- **Accept**
- **Reject**
- **Menu**

NOTE: If allowed by the service provider, you can stop the alert tone by pressing any key.

These messages provide the important information about an incident. An ongoing alert tone is paused on incoming Call-Out group call. If not stopped before, this alert is resumed once the call ends. The time-stamp on the Call-Out alert indicates the time and date when the Call-Out is received.

Information Phase

You are in the Call-Out mode and you can receive more detailed information about the incident through a subsequent text or voice message. For more information, you can query using a voice group call or Call-Out text function. You will be enabled to send a text message to the dispatcher host application. Depending on the settings configured by your service provider, you are able to respond to a Call-Out in one of the following ways:

- Free text – Type a response.
- Call-Out template – Select from a list of predefined replies.

Call-Out Authorized ISSI

When you enable the Call-Out Authorized ISSI feature, your radio accepts Call-Out from authorized calling party and discards any unauthorized Call-Out. There is no indication displays if your radio discards unauthorized Call-Out. Your radio can accept up to 2000 Authorized ISSI list, which includes Call-Out types such as Alert, Test, Information, Clear, and Availability Request. You can export and import the list in the configuration tool.

19.1 Call-Out Modes Interaction

Call-Out feature operation is different in other modes:

Transmit Inhibit (TXI) Mode

You can receive Call-Out messages. The Call-Out alert message is displayed on the screen. You have the option to exit TXI Mode or exit the Call-Out prompt.

- Exit TXI – Your radio exits TXI mode and prompts you to accept or reject the Call-Out message.
- Exit Call-Out – Your radio exits the Call-Out message and returns to TXI mode.

Trunked Mode Operation (TMO)

Call-Out is supported.

Direct Mode Operation (DMO)

Call-Out is supported.

Gateway

Call-Out is supported.

NOTE: Gateway shall stay in Gateway mode or leave Gateway mode to join Call-out is depending on the configuration.

Emergency Mode

All Call-out alerts are ignored.

19.2 Setting Call-Out Availability

Prerequisites: Contact your service provider to enable the Call-Out Availability feature.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Messages** → **Call-Out Availability**.
3. Select one of the following options:
   - **Available**
   - **Not available**

Chapter 20

Horn and Lights Alarm

The Horn and Lights function allows your vehicle to alert you of an incoming important message.

Pressing the External Alarm Key key toggles the horn and lights feature. When enabled during ignition off, your vehicle horn sounds and the lights flash to announce an incoming private or phone call.

NOTE: The external alarm relay must be installed and the feature must be programmed to work.

Chapter 21

Contacts

The contacts feature offers “address book” capabilities on your radio. Each entry matches the alias (name) and ID (number) that are used to initiate a call.

Each contact entry requires the following information:

Name
If you store more than one number to one contact, this entry is required.

Type
Each contact must be assigned to one of the following types:

- Private (a TETRA Individual Short Subscriber Identity (ISSI) or Individual TETRA Subscriber Identity (ITSI))
- Home (phone number)
- Mobile (phone number)
- Work (phone number)
- PABX (local short number)
- Other (phone number)

Contacts from your radio can be placed into multiple folders inside your address book. You can edit a folder name when creating the folder, or while adding or editing a new contact (if configured).

NOTE: You can enter a maximum of 15 characters when naming a folder.

Contact entries are sorted alphabetically according to entry alias. Each alias are associated with up to five IDs of different call forms.

The Contact List supports a maximum capacity of 2,000 Contacts. The list can store up to 1,000 associated Private, and 1,000 associated either Phone or PABX numbers distributed among the contacts.

Your radio provides editing capabilities to the address book to allow adding or deleting entries. Your radio also provides the possibility to view the number of used and free address book entries.

The address book is also accessible through PEI. Using the PEI enables you to read, write, and modify contact list entries using AT commands.

21.1 Creating Contacts

Procedure:

1. From the home screen, press the **Contacts** key.
2. Select **[New Contact]**.
3. Highlight **Name** and press **Change**.
4. Enter your name and press **OK**.
5. Highlight **Type** and press **Change**.

6. Select the required type of contact.

   NOTE:
   You can also use the **Left** and **Right** Navigation keys to select the type of contact.

   If **Private** is selected, you can set the hook method for **Simplex** and **Duplex** calls (if the respective Private Call Hook Customization is enabled).

7. Highlight **#** (number) and press **Change**.
8. Enter the number of your contact and press **OK**.
9. Highlight **Speed #** and press **Change**, if needed.
10. Enter the speed dial number (1–1000) and press **OK**.

    NOTE: If the entered number exist, your radio displays `Overwrite?`. Press **Yes** to confirm, or **No** to enter the speed dial number again.

11. Press **Done**.

Result: You have created a contact with one number. To add more numbers, repeat steps step 5–step 10.

21.2 Editing Contacts

Procedure:

1. From the home screen, press **Contacts** key.
2. Select the contact that you want to edit.
3. Press the **Menu** key.
4. Press **Edit**.
5. To edit, select one of the following entries and press **Change**:
   - **Name**
   - **Type**
   - **#** (number)
   - **Speed #**
   - **Simplex**
   - **Duplex**

   NOTE: Simplex and **Duplex** options are only available if the contact **Type** is Private and the respective Private Call Hook Customization is enabled.

6. Press **Done**.

21.3 Deleting Contacts and Numbers

Deleting Contacts

Procedure:

1. From the home screen, press **Contacts** key.
2. Highlight a contact you want to delete.

3. Press the **Menu** key.
4. Select **Delete Contact**.
5. Select **Yes**.

Deleting Numbers

Procedure:

1. From the home screen, press **Contacts** key.
2. Select a contact you want to edit.
3. Highlight the required number you want to delete.
4. Press **Menu**.
5. Select **Delete number**.

   NOTE: If an entry contains only one number, deleting the number deletes the entry.
6. Press **Yes**.

21.4
Checking Capacity

Checking Capacity allows you to see how many numbers are stored in your radio.

Procedure:

1. From the home screen, press **Contacts** key.
2. Press the **Menu** key.
3. Select **Capacity**.
4. Select one of the following options:
   - **Private**
   - **Phone/PABX**
   - **Contact**

21.5
Dialing Through the Contact List

Procedure:

1. From the home screen, press **Contacts** key.
2. To highlight the required contact, use **Up** and **Down** Navigation keys, or enter up to 12 characters of the contact name.
3. If the contact has more than one number, use **Left** and **Right** Navigation keys to select the required number.
4. To initiate a simplex call, press the **PTT** button with a **Private** number. Otherwise use the **Send** key to initiate a duplex call.

Chapter 22

Security

Security menu stores all your security settings.

22.1 Terminal Equipment Identity

The Terminal Equipment Identity (TEI) is a unique identification number programmed in your radio at the factory. TEI cannot be later modified.

22.2 Managing PIN Protect

PIN Protect allows you to configure PIN code authentication the next time your radio is turned on. The PIN code protects your radio against unauthorized use.

IMPORTANT: For radios with general PIN authentication, the PIN length is only set to a 4-digit code. For radios with BSI PIN authentication, your service provider can configure the PIN length up to an 8-digit code. To protect the devices from unauthorized access, change the default PIN code.

If you are unable to unlock your radio, you can only send or receive Emergency Calls and adjust the volume level with the Rotary Knob.

IMPORTANT: If your radio uses a BSI PIN code and you are unable to unlock your radio, you cannot take any action.

Protecting Your Radio with a PIN Code

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **PIN Protect**.
3. Select **On**.
4. Enter the PIN code.

Postrequisites: Each time you turn on the terminal, a PIN code is required.

Changing PIN Codes

NOTE: This feature is only available when enabled by your service provider.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **Change Code**.
3. Radio prompts for the `Old Code`.

4. If the entered code matches the outdated code, your radio prompts for the new code twice.

Result: Your radio displays `Code Accepted`.

22.3

Managing Keypad Lock

Keypad Lock lock the keypad on your radio.

NOTE: By default, the **Power** and **Emergency** buttons are always operative when the keypad is locked.

Locking Keypad

Procedure:

Perform one of the following actions:

- Press **Menu** and select **Security** → **Keylock Setup** → **Lock Keypad**.
- Press the predefined menu shortcut.

Unlocking Keypad

Procedure:

Press **Menu** → ***.

Setting Automatic Keylock Delay

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **Keylock Setup** → **Delay**.
3. Use **Up** and **Down** Navigation keys to change the minutes and press **Done**.

Setting Keylock on Startup

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **Keylock Setup** → **Start Locked**.
3. Select one of the following options:

Option	Description
On	Enables a keypad lock on your radio the next time your radio is turned on.
Off	Disables keypad lock on your radio the next time your radio is turned on.

22.4

Authentication

Authentication establishes a level of a trust between a radio and Switching and Management Infrastructure (SwMI). It is a challenge-response result protocol between two parties based on their common knowledge of a secret key (K) to verify the identity of each party.

The SwMI Authentication Center (AuC) provides a single K for authentication, which is shared only with your radio. The SwMI always initiates Authentication. If set by the service provider, your radio can also authenticate the SwMI.

22.5

Air Interface Encryption

NOTE: This is a Software Selling Feature.

Air Encryption is a feature that enables encryption of entire communication between your radio and infrastructure, which results in increased security of calls, messages, and data.

Your radio supports TETRA Air Interface Encryption (AIE) using the standard TETRA public encryption algorithms, as defined in TETRA Security ETS 300 392-7, TEA1, TEA2, and TEA3. The focus of cryptography in TETRA is the encryption key. TETRA AIE provides 12 000^{8} key combinations.

TETRA TMO has three classes of encryption:

- Class 1 – clear (none)
- Class 2 – Static Cipher Key (SCK) encryption
- Class 3 – Derived Cipher Key (DCK) encryption, sometimes called the dynamic key, the Common Cipher Key (CCK), and the Group Cipher Key (GCK)

TETRA Direct Mode Operation (DMO) has two classes of encryption: Class 1 and Class 2.

Enhanced Security consists of Trunked Mode Operation (TMO) Air Interface Encryption class 3G and DMO class 2.

The security features supported in your radio depend on the security mode.

Table 38: Security Features Required Per Security Class

Security Feature	Mode			
	Security Class 1	Security Class 2	Security Class 3	Security Class 3G
Radio Initiated Authentication	Not Allowed	Not Allowed	Not Allowed	Not Allowed
SwMI Initiated Authentication	Optional	Optional	Mandatory	Mandatory
Mutual Authentication	Optional	Optional	Optional	Optional
Over-the-Air-Rekeying (OTAR)	N/A	Optional	Mandatory	Mandatory
SCK AIE	N/A	Mandatory	N/A	N/A
DCK AIE	N/A	N/A	Mandatory	Mandatory

Security Feature	Mode			
	Security Class 1	Security Class 2	Security Class 3	Security Class 3G
GCK AIE	N/A	N/A	N/A	Mandatory

NOTE:
In the current release, your radio does not support the following security features:

- Radio initiated authentication.
- Support for TEA4.
- Explicit authentication during Dynamic Group Number Assignment (DGNA).
- OTAR in foreign network.
- GCK AIE in foreign network.

22.5.1
Viewing Air Encryption State

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **AirEncrypt**.

Result: Your radio displays:

- `Air Encryption Is Off` – The Air Encryption is not activated.
- `Air Encryption Is On` – The Air Encryption is activated.

22.5.2
Clear Radios (Class 1)

Your radio can be configured as a clear radio. In such a case, your radio identifies itself in registration as a Security Class 1 radio and does not support encryption. A Security Class 1 radio does not contain any encryption algorithms in its software.

22.5.3
Static Cipher Key Encryption (Class 2)

Your radio supports static Air Interface Encryption (AIE) using a set of up to 32 Static Cipher Keys (SCK) shared by the Switching and Management Infrastructure (SwMI) and all authorized radios.

Your radio then determines which static keys to use based on the SCK Number (SCKN) and SCK version number (SCK-VN) broadcast by the SwMI. A radio can be configured to support static key encryption. In such a case, it identifies itself in registration as a Security Class 2 radio, and attempts to negotiate Security Class 2 encryption. Each radio then uses either the TEA1 or the TEA2 (TEA 3 for Asia and Pacific) Key Stream Generator (KSG) algorithm. Each radio contains only one of those algorithms in its software.

When Security Class 2 Encryption has been negotiated, encrypted PDUs are encrypted using SCK.

In Direct Mode Operation (DMO), the system manager may choose the SCK and the key may be distributed from the Trunked Mode Operation (TMO) SwMI using the Over-the-Air Rekeying (OTAR) mechanism or provided manually using Key Variable Loader (KVL).

22.5.4

Derived Cipher Key and Common Cipher Keys Encryption (Class 3)

Derived Cipher Key and Common Cipher Keys Encryption (DCK/CCK) are required to prevent overexposure of key material. Existing encryption systems use Static Cipher Keys (SCK), where one key is used for all radios and all communications.

Key material is often exposed and SCK logistics of changing keys consist in programming all radios and Base Stations. DCK is used for individually addressed TM-SDU (Service Data Unit). DCK/CCK encryption provides Derived Cipher Key (DCK) for uplink (from your radio to the BTS) communication and Common Cipher Key (CCK) for downlink (from the BTS to your radio) group communication. The DCK is derived from either the one-way or mutual authentication process and the CCK is received during the registry.

Your radios supporting the dynamic key encryption identify to the system as Class 3 radios during registry and attempt to negotiate Class 3 encryption. A Class 3 radio supports group addressed signaling and group communication traffic encryption using CCKs as well as encryption of uplink and down link individually addressed signaling messages and individual call traffic (private or phone) using its DCKs. Your radios support Over the Air Rekeying (OTAR) of the CCK by the system.

A clear radio can transmit and receive from encrypted radios. The system informs the encrypted radios that the communication is with a clear radio and they switch to clear operation. Class 2 and 3 radios can only act as described if they are allowed to operate in a lower class.

22.5.5

Group Cipher Keys Encryption (Class 3G)

NOTE: This is a Software Selling Feature.

For the Security Class 3G, the system allows grouping addressed signaling and dedicated group call traffic encryption using Group Cipher Keys (GCK) to cryptographically isolate talkgroups.

The downlink signaling is encrypted using Modified Group Cipher Key (MGCK) that is cryptographically derived from the Common Cipher Key (CCK) associated with the serving cell and the GCK associated with a given talkgroup. The Switching and Management Infrastructure (SwMI) does not change GCK and CCK simultaneously. Whenever a GCK change occurs, CCK changes are frozen for this time period.

The Derived Cipher Key (DCK) is derived from either the one-way or mutual authentication process and the CCK is received during registry, whereas the GCK is received through Over-the-Air Rekeying (OTAR) mechanism only.

Your radio supports over-the-air and manual provisioning of key associations that link a GCK to one or more Trunked Mode Operation (TMO) talkgroups, and manual provisioning of Key Association Group (KAG) to one or more Direct Mode Operation (DMO) talkgroups.

The system can provide the ability for the operator to group contiguous ranges of TMO Short Subscriber Identity (SSI). This case occurs where any talkgroup residing within the address range is assigned using the same GCK association. These ranges referred to as Key Association Ranges (KAR), are used to convey the TMO talkgroup and GCK relationships to the relevant SwMI and radios responsible for GCK functions.

22.5.6

Over-the-Air-Rekeying

Over-the-Air-Rekeying (OTAR) is a feature that allows operators to centrally manage and distribute the encryption keys used by the subscriber radios for voice and data encryption. With OTAR, you are able to

plan, generate, store, track, and maintain all encryption keys for the entire radio network using one central system. OTAR also allows you to change encryption keys frequently, which enhances the security.

TETRA systems support Group Cipher Keys (GCK) encryption for specific talkgroups:

- Group OTAR of GCK.

  NOTE: This is a Software Selling Feature.

- Group OTAR of fallback TM-SCK.
- Group OTAR of DM-SCK, including management of the cryptographic schedule of DM-SCKs.

The group OTAR mechanisms require a use of the Group Session Key for OTAR (GSKO). The GSKO is delivered to your radio only by using individual OTAR and the Session Key for OTAR (KSO).

For the systems utilizing group OTAR, the fundamental system operation (regarding Static Cipher Keys (SCK) /GCK OTAR) relies on the sites regular transmission. In other words, the sites are regularly broadcasting information regarding which security class and associated keys are in use. The sites transmit future versions of the respective keys to groups of radios belonging to the same Cryptographic Management Group (CMG). Your radio acquires the keys before the Switching and Management Infrastructure (SwMI) activates them. Then the air interface encryption service uses the keys. The sites also broadcast the current key that is in use, which can be sent using the OTAR mechanism to your radio on request.

NOTE: When a radio has not received a new key before activation by the SwMI, your radio requests the missing keys.

Some systems adopt only individual OTAR methods for delivery of SCK and GCK to your radio. In such cases, GSKO is not used. Some systems employ a mix of individual and group OTAR methods. Your radio supports the complement to functionality required for supporting the superset of different SwMI behaviors, for example:

- Individual OTAR (using KSO) of SCK and GCK.
- Group OTAR (using GSKO) of SCK and GCK.
- Individual OTAR (using KSO) of GSKO.
- Secure DMO Key Management (using SwMI).
- Crypto Management Group.
- Storage of 10 KAG (equivalent to 30 DM-SCK).
- Storage of 16 GCK (includes current/future versions).
- Storage of two TM-SCK.
- Storage of Group Association attribute per Talkgroup.
- GCK Air Interface Encryption.
- Smooth key changes of GCK.
- Smooth security class changes to SC3G.

The SwMI can support the group OTAR feature. Where supported, the SwMI groups radios that share the same set of cryptographic key material into a specific CMG. Any radio belonging to the same CMG is addressed using a CMG GTSI. The primary purpose of the addressing is to transmit group OTAR messages conveying TM-SCK, DM-SCK and/or GCK. Any radio that supports TM-SCK group OTAR, DM-SCK group OTAR, or GCK group OTAR is assigned to a specific CMG.

Each CMG has a designated specific GSKO. The system deploys over-the-air a CMG GSKO (and CMG GTSI) to each radio belonging to the CMG. The GSKO is used as the sealing key for TM-SCK, DM-SCK, and GCK, when sent across the air interface. The SwMI can perform scheduled transmissions of the future TM-SCK addressed to each CMG. Your radio requesting a TM-SCK triggers the site to schedule additional

transmissions of the requested TM-SCKs. These transmissions are addressed to either the CMG GTSI that your radio belongs to or its ITSI.

The SwMI can perform scheduled background transmissions of the future GCKs addressed to each CMG. Your radio requesting for a given GCK triggers the site to schedule additional transmissions of the current and the future versions associated of the requested GCK. These transmissions are addressed to either the CMG GTSI that your radio belongs to or its ITSI.

The SwMI can perform scheduled background transmissions of the current and the future DM-SCK addressed to each CMG. Your radio requesting for a DM-SCK triggers the site to schedule additional transmissions of the requested DM-SCK. These transmissions are addressed to either the CMG GTSI that your radio belongs to or its ITSI.

22.5.7
Encryption Mobility

A Class 2 or Class 3 radio can operate on a lower class Switching and Management Infrastructure (depending on configuration). A radio that is provisioned not to allow operation on a lower class Switching and Management Infrastructure (SwMI), does not register on such a cell.

A Class 2 or Class 3 radio moves to a cell that supports a Static Cipher Keys (SCK), Common Cipher Keys (CCK), or Group Cipher Keys (GCK) that your radio possesses, applies Air Interface Encryption (AIE) to the registration Protocol Data Unit (PDU). If no acknowledgment is received, your radio sends the registration in clear.

22.5.8
Encryption HMI

A Class 2 or Class 3 radio that is involved in a clear communication provides a visual and an audible indication informing that the communication is not encrypted (if enabled by the service provider).

If configured by your service provider, your radio plays a sound and displays `Call & Data Not Encrypted` when encryption is on and you receive a clear call (unencrypted). This feature provides service confidentiality between you and the system.

In the TMO Mode, when Air Encryption is enabled on your radio but cannot be supported due to an infrastructure failure, the following icon appears on the display:  . When encryption is not available in the DMO Mode, your radio displays  .

22.5.9
Air Interface Encryption Key Storage

Your radio stores all the keys, Static Cipher Keys (SCK), Common Cipher Key (CCK), Derived Cipher Key (DCK), or Group Cipher Keys (GCK), in a sealed manner in nonvolatile memory of your radio. However, they are not stored in the codeplug.

Your radio supports loading of the SCK keys manually using the Key Variable Loader (KVL). By using a special key combination, you can delete the cipher keys in your radio. Depending on the configuration, you may erase either all keys or only the short-term keys.

22.5.10
Verify Key Validity

Key (K) is a secret key that the infrastructure uses to authenticate your radio in the system providing service confidentiality between your radio and the system. Static Cipher Key (SCK) is a secret key used for the Air

Interface Encryption Class 2. SCK is used to encrypt calls and data in Trunked Mode Operation (TMO) and Direct Mode Operation (DMO). The SCKs used in TMO are called TMSCKs, and SCKs used in DMO are called DMSCKs.

NOTE: Verifying key validity ensures that the authentications in your radio are valid and can be used for encryption.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security**.
3. Select one of the following options:

Option	Actions
K Validity	Your radio displays: • `K is Valid` – The infrastructure can authenticate your radio. • `K is Invalid` – The infrastructure is unable to authenticate your radio. Contact your service provider to restore the key to your radio.
TMSCK Validity	Your radio displays: • `TMSCK is Valid` – Your radio can work encrypted in TMO. • `TMSCK is Invalid` – Your radio cannot work encrypted in TMO. Contact your service provider to restore SCKs to your radio.
DMSCK Validity	Your radio displays: • `DMSCK is Valid` – Your radio can work encrypted in DMO. • `DMSCK is Invalid` – Your radio cannot work encrypted in DMO. Contact your service provider to restore SCKs to your radio.
DMO SCK	**IMPORTANT:** Changing this setting can cause your radio to operate incorrectly. **a.** Press **Next**. **b.** Select one of the following options: • **Yes** – To change the key. • **No** – To leave the key. **NOTE:** This is a Software Selling Feature.

22.6 Secure DMO

The Secure Direct Mode Operation (DMO) feature guarantees key ciphered transmission in the DMO.

When DM-SCKs are provided by OTAR, you are informed in case your radio does not contain the complete set of SDMO keys. Whenever your radio enters DMO and your radio does not possess past and present

DM-SCKs for all provisioned KAG and/or it has not yet successfully received SCK Subset Grouping Type, SCK Subset Number, and SCK-VN information from the SwMI, then your radio:

- plays a special reject tone.
- prompts a message indicating **OTAR incomplete**.

Your radio provides SDMO status information to the user from the MMI **DMOSCK Validity** submenu inside the **Security** menu (present only when configured in the codeplug):

- **DMO SCK is Valid** if DMO SCK OTAR is disabled and all DM-SCKs are provided using the KVL.
- **DMO SCK is Valid** if DMO SCK OTAR is enabled and your radio knows the current SCK information and has all the corresponding past and present DM-SCKs.
- **DMO SCK is Invalid** in all other cases.

Your radio supports system management of SDMO keys. The SDMO operated device radio includes the configuration of the DM-SCKs used by SDMO, the current active SCK Subset Number, and the Version Number information to organize key schedules. Your radio considers the last received variant of this information PDU as the most accurate indication of SDMO key configuration.

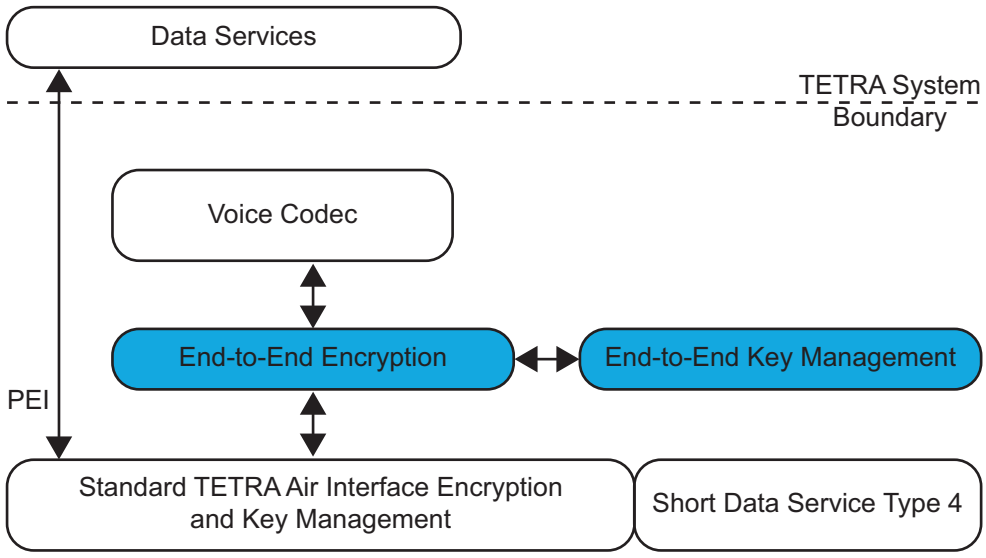
DMO SCK can only be used if Enhanced Security feature is purchased.

22.7 End-to-End Encryption

The TETRA standard supports air encryption.

Your radio creates the PDU (Protocol Data Unit) and the PDU is encrypted before transmission. The Base Station receives this PDU and must decrypt it, to know what to do with it and where to send it. Thus, if a PDU contains voice information, the voice part of the message has been decrypted and is now unprotected, until it is transmitted out to the caller.

Figure 17: Voice and Data End to End Encryption



The End-to-End Encryption (E2EE) feature resolves this issue by encrypting the voice information before it is packed into the PDU. This message is also encrypted according to the over-the-air encryption of the TETRA standard. Thus, when the Base Station decrypts the PDU containing voice information, the voice part remains protected by encryption until the called radio receives the voice and decrypts it.

The Motorola Advanced Crypto Engine (MACE) and BSI encryption carry out voice encryption. The crypto engine takes the voice stream and encrypts this stream using a set of keys. Likewise, the crypto engine takes encrypted voice stream and using the same keys decrypts back into clear voice.

The encryption of voice and data can be carried out using a dedicated SIM card reader.

In the end-to-end encryption feature, your radio notifies and informs whether the call, being made or received, is voice-encrypted. Your radio also provides with means to select a different key, delete keys, request new keys and change the encryption mode of non-defined private calls.

Your radio supports BSI encryption in full duplex calls.

This feature is relevant for group calls and private calls in TMO and DMO.

22.8 SIM Security

The SIM is an integrated circuit card that holds a filing system and an application.

There are two types of SIM security features:

- BSI SIM is only available on the GMOI network
- SECTRA SIM

The security of the SIM card is ensured by the means of the following security functionality groups:

Security Functionality Groups
Voice End-to-End Encryption (E2EE) and related key management
Network access parameters and authentication
Key management for Air Interface Encryption (AIE)
Operational Tactical Address (OPTA), modification, encryption, and transfer
AES for E2EE of SIM Interface and SIM-Terminal Authentication

The application performs the following actions:

Actions
Generation of Key Stream Segments (KSS)
Synchronization for E2EE
TETRA authentication algorithm based on K key on the SIM
Key management for E2EE keys
SIM interface encryption and authentication using the AES

The filing system holds the following items:

Items
Network access parameters as Individual Tetra Subscriber Identity (ITSI)
Security class definition and authentication definition
Integrated circuit card identifier
SIM version number

Items
OPTA

The E2EE keys are also kept on the SIM. However, they are accessible for the SIM application only, thus E2EE key management is transparent to your radio.

The keys for AIE remain on your radio. The SIM application handles AIE key management. SECTRA SIM does not support handling AIE key management.

22.9 Radio Disable or Enable

A dispatcher can disable or enable your radio remotely.

When disabled, your radio does not participate in any voice call, Short Data Service (SDS), or packet data activity and ignores all supplementary services sent on the down link. All visible and audible indications are disabled, and your radio appears to be turned off. All user inputs, such as key presses, are ignored, and the PEI interface is closed.

Your radio continues to perform mobility management functions, such as roaming, to facilitate subsequent enabling or further disabling.

Your radio stores the disabled or enabled state in the codeplug, so the unit remains in that state after turning on.

If your radio is in the disabled state, and receives an appropriate TETRA signaling for subscription enablement with the correct Short Subscriber Identity (SSI) and Mobile Network Identity (MNI), it restores to its normal operative state.

The TEI Query feature provides TEI information to the infrastructure during registration. This allows the dispatcher to disable radio by sending an appropriate TETRA signaling for equipment disable with the correct TEI for this radio. Replacing the SIM card does not activate your radio. TEI Query feature is only available on GMOI network.

If your radio is in the equipment disabled state, and receives an appropriate TETRA signaling with the correct TEI, your radio restores to its normal operative state (if the subscription is also in the enabled state).

22.10 Radio Permanent Disable

NOTE: This is a Software Selling Feature.

Radio Permanent Disable and Radio Permanent Disable v2 are features that are mutually exclusive.

Permanent disabling is intended to protect a network from being attack from a compromised or faulty radio. It can be used when your radio has been compromised, or has been suspected of compromise for a long time. It is a one-way function and no equivalent enable is available. Then your radio should be recovered and reprogrammed before being used again by the service provider.

When your radio is permanently disabled, it becomes inoperable.

- All its MMI interfaces on your radio are disabled.
- All its security key material, that is GCK, GSKO, DMO SCKs, Ks, DCK, CCK, and TMO SCKs are deleted.
- All its codeplug is deleted.
- All its software is deleted.

The permanent disable should be invoked when it has been determined that a radio is unrecoverable. When a radio has been lost or stolen, the first step always is to stun your radio using temporary disable.

The permanent disable should be used with the deletion of the user radio record in the User Configuration Server and the deletion of the K-REF association of the disabled radio in the Provisioning Center and the Authentication Center. This deletion ensures that subscriber information is not downloaded into the Home Location Register if a restore of the UCS is performed.

The system operator has to also ensure that your radio K-REF association is also removed from the other Authentication Centers in the network, in cases where the K-REF pairs are duplicated across the network.

If this association is not removed, your radio could be assigned a new home zone that lies in a cluster where the K-REF association has not been deleted.

22.11 Radio Permanent Disable v2

NOTE: This is a Software Selling Feature.

Radio Permanent Disable and Radio Permanent Disable v2 are features that are mutually exclusive.

Similar to permanent disable, once your radio is disabled using the permanent disable v2, it cannot be recovered over the air. When your radio accepts the permanent disable command, and if the permanent disable v2 flag is enabled in the codeplug, your radio appears to be inoperable.

- All its MMI interfaces on your radio appear to be disabled.
- All its security key material that is GCK, GSKO, DMO SCKs, Ks, DCK, CCK, TMO SCKs, and End-to-End key material are deleted.
- Your radio automatically enters programming mode upon powering attempts.
- The permanent disable flag is set in the codeplug.

Unlike in the permanent disable, a permanent disabled v2 radio can be re-enabled using the software selling dongle. If you have the software selling dongle, you can read the codeplug and clear the permanent disable flag.

NOTE: The configuration tool can restore a radio that is disabled using the permanent disable v2.

22.12 High Assurance Boot

Your radio has a facility that ensures that the code and data flashed in your radio is authentic and has not been altered.

The hardware forces the High Assurance Boot (HAB) module to run at boot time. The module checks if all software comes from a trusted source. Your radio is checking the signature of the code and data segments present in your radio using a public/private key mechanism.

If the HAB authentication of the flashed software fails, it does not allow your radio software to run.

22.13
Covert Mode

This feature enables you to completely shut down all visible and audible alerts and notifications, making your radio unnoticeable even in a silent and dark environment.

All audio activities are suppressed to the built-in speaker and mic, and the audio is routed to and from the accessory only.

When your radio is in the Covert Mode, you cannot enter the following menu items of the Setup menu.

- **Set Volume**
- **Tones**
- **Backlight** (in Display menu item)

When the Covert Mode is turned on:

- All tones are set to **Off** (corresponding to All Tones menu entry).
- The private speaker is set to **Off**.
- The dimmer state is set to covert (this state is not selectable using the **Backlight** key.)
- The wallpaper is disabled.
- The screen saver is disabled.
- The Covert Mode color palette is activated.

Your radio turns on in the mode set before turning off. If Covert Mode is enabled before turning off, your radio turns on in Covert Mode.

When Covert Mode is turned off, all the changed settings are reverted to the previous state.

When using the Covert Mode, a low audio accessory must be connected to your radio. The correct low audio accessory is the GCAI Handset, or the older style handset connected through the junction box.

This feature can be used as a One-Touch Button.

22.13.1
Activating Covert Mode

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **Covert Mode**.
3. Select one of the following options:

Option	Description
On	• All tones are set to off. • Backlight and LED are disabled immediately. • Group audio is routed to the earpiece. • Your radio displays: `Covert Mode On`.
Off	• All settings for tone, backlight, and audio are restored. • Your radio displays: `Covert Mode Off`.

Chapter 23

SDS and Status Remote Control

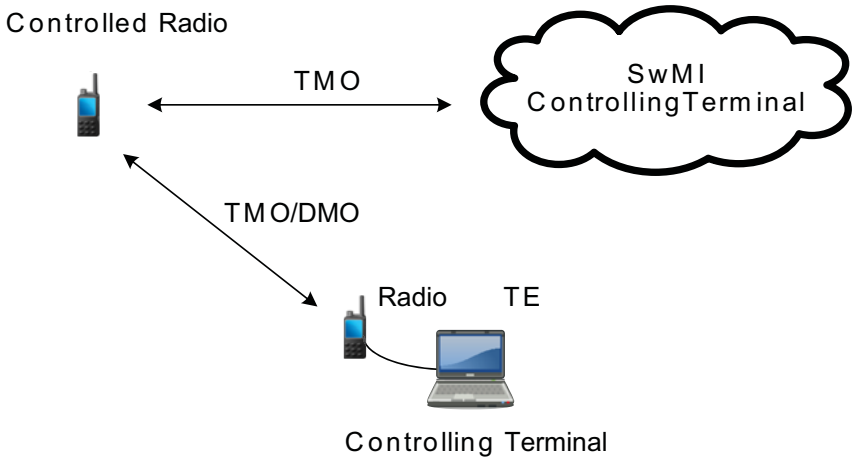
The Short Data Service (SDS) Remote Control is a feature that enables remote control and configuration of your radio using special SDS messages. The Status Remote Control is a feature that provides limited control of your radio. Only one type of remote control can be active on a radio, either the SDS or the Status.

SDS Remote Control

NOTE: This is a Software Selling Feature. You can use the feature only after a successful authorization, which requires entering a valid remote control PIN number.

The SDS remote control feature enables controlling a radio through Air Interface using SDS - TL bearer service. A controlling terminal, for instance, a controlling radio or Switching and Management Infrastructure (SwMI) controlling terminal, sends the SDS remote control messages with AT commands to a radio for execution. The SDS remote control functionality works in both Trunked Mode Operation (TMO) and Direct Mode Operation (DMO), and the remote control PDUs are sent using Terminal Equipment (TE).

Figure 18: SDS Remote Control Overview



The remote control messages can be sent to a group or individual radios. The messages can be sent both in TMO and DMO (including the Repeater Mode) by any radio capable of controlling other radios. A controlled radio receives over the air control information using SDS type 4 with Transport Layer (TL) on the specific PID number defined in the codeplug. If the received control message is originated from one of the Individual Short Subscriber Identities (ISSI) present on your radio authorized ISSI list, your radio executes the received command and sends a response. If configured by service provider, upon the reception of SDS Remote Control Service (AT command) request, your radio gives an audio-visual notification.

Your service provider has two modes, which can be configured for your radio:

- Limited SDS Remote Control
- Full SDS Remote Control

For more information on these modes, check with your service provider.

Status Remote Control

Status Remote Control provides limited control of your radio, unlike SDS Remote Control. The following tasks can be assigned remotely to a radio:

Play loud tone until your interaction

Your radio plays a loud tone as in the Fall Alert feature until you unlock the keypad (if needed) and press the appropriate soft key labeled **Exit**. The tone is played through the speaker even if an accessory is attached.

The tone is not emitted when your radio is in one of the following states:

- In a call
- Temporarily disabled
- Pseudo Off Mode
- Ambience Listening Mode
- Transmit Inhibit Mode (TXI)
- Emergency Mode
- Silent Emergency Mode
- Covert Mode

Send firmware version and TEI

Your radio sends back an SDS message with its firmware version and TEI.

NOTE: If the sending ISSI is not on the Allowed ISSIs list, the receiving radio ignores the task.

23.1 Setting Remote Control

Setting the remote control allows you to toggle the remote control.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Security** → **Remote Control**.
3. Select **On** to enable, or **Off** to disable remote control.

Chapter 24

Setup

The Setup menu allows you to change the general configuration on your radio.

24.1 Setting Ring Style

Procedure:

1. For the home screen, press the **Menu** key.
2. Select **Setup** → **Ring Style**.
3. Select one of the following options:

Option	Description
Duplex	To set a new ring style for all incoming duplex calls.
Simplex	To set a new ring style for all incoming simplex calls.
DMO Simplex	To set a new ring style for all incoming Direct Mode Operation (DMO) simplex calls.

   The display shows the current ring style used.

4. Scroll to the desired style and press **Select**.

   The new ring style is played immediately for a few seconds. If necessary, adjust the volume level.

24.2 Setting Volume

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Set Volume**.
3. Select **Speaker** or **Earpiece**.
4. Select one of the following options:

Option	Description
Voice	Sets the volume level for voice.
Duplex	Sets the volume level for duplex ringtones.
Simplex	Sets the volume level for simplex ringtones.
Keypad	Sets the volume level for keypad tones.

Option	Description
Tones	Sets the volume level for alert tones.

NOTE: If the display shows only one option **Volume**, you can adjust all the above settings at once. You have the option to change the settings individually when the **Volume Adj. Mode** is set to **Individual**.

5. Press **Right** or **Left** Navigation key to change the value.

24.3 Setting Language

Prerequisites: Your service provider sets the available list of languages.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Language**.
3. Select the desired language.

24.4 Setting Data Function

You can set up your radio to transmit and receive data from the external device.

Prerequisites:
Connect your radio accessory connector to an external device using the PMKN4104 cable.

The external device must run an application complying with TETRA standards.

Enter Trunked Mode Operation (TMO) only and not Transmit Inhibit Mode (TXI).

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Data Setup**.
3. Select one of the following options:

Option	Description
Voice Only	Your radio receives and transmits voice calls only.
Data Only	Your radio acts as a modem. Your radio rejects incoming and outgoing voice calls (except for Emergency Calls), status, and text messages.
Voice & Data	Your radio acts as a modem but voice calls have priority over data calls and can interrupt them.

24.5
Setting Audio

This menu item allows you to adjust your radio audio settings.

You can adjust the audio quality and audio parameters of your radio according to your working environment. For example, an airport worker may experience different audio quality when working outside the airport with loud noise and inside the airport with less noise at the same time.

24.5.1
Artificial Intelligence (AI) Noise Suppression

Your radio can use Artificial Intelligence (AI) to remove background noises from your radio when transmitting. This ensures that your voice is heard clearly even in loud environments.

When talking through the microphone, your radio suppresses external noises to significantly improve voice call clarity. Loud background noises that are suppressed includes:

- Sirens
- Crowd noises
- Fire truck water pump
- Boat noises

You can select the level of noise suppression

High AI-Noise Suppression (Default)
Removes most background noise for maximum clarity.

Low AI-Noise Suppression
Allows some background noise for situational awareness.

Basic
Uses a traditional noise suppressing mode.

Disable
Turns off noise suppression entirely.

NOTE: MXM600 noise suppression works with existing MTM5000 series audio accessories and Bluetooth accessories.

Echo Cancellation

The Artificial Intelligence (AI) Noise Suppression uses enhanced echo cancellation technology to reduce the need to adjust the loudspeaker volume.

If a visor mic and a loudspeaker of a mobile radio are used on a full duplex call in a vehicle, an echo that affects call quality is produced.

If AI-Noise Suppression is enabled, enhanced echo cancellation is also activated. Your radio not only eliminates background noise, but also cancels out echo in a full duplex call in a vehicle.

Howling (Acoustic Feedback) Suppression

When Artificial Intelligence (AI) Noise Suppression is enabled, howling suppression is also enabled. This allows the radio automatically eliminates howling without any additional input.

A howling noise can occur when two radios using the same talkgroup are close together. This happens when a portable radio user enters a vehicle with a mobile radio and both are in the same talkgroup. This howling disrupts communication and can be distracting in critical situations.

When AI-Noise Suppression is enabled, howling suppression is also enabled.

NOTE: If **Basic** or **Disable** noise suppression options are selected, howling suppression is disabled.

24.5.1.1
Enabling Artificial Intelligence (AI) Noise Suppression

Procedure:

1. From the home screen, press the **Menu** → **Setup** → **Audio**.
2. Select **Noise Suppr.**.
3. Select the level of noise suppression required.

24.5.1.2
Disabling Artificial Intelligence (AI) Noise Suppression

Procedure:

1. From the home screen, press the **Menu** → **Setup** → **Audio**.
2. Select **Noise Suppr.**.
3. Select **Disable**.

24.5.2
Audio Profiles

Audio profiles provide an easy way to adjust audio settings to match existing working conditions, such as high noise environments.

You can adjust the following settings using audio profiles:

- Volume Settings for Voice and Tones
- Mic Gain and Automatic Gain Control (AGC)
- Voice Filters such as noise suppressor
- The type of audio icon to use: No icon (default), Normal or Loud

There are 10 audio profiles which can be enabled and configured using CPS.

Audio profiles can be selected by navigating through your radio menu or by selecting a programmed One-Touch Button.

The name of the active audio profile can optionally be displayed on the idle screen. This is part of the Configurable Idle Screen feature.

24.5.3
Transmit Automatic Gain Control

The Transmit Automatic Gain Control (TX-AGC) provides flexibility in terms of operating environment. The TX-AGC allows you to transmit from a radio both indoor and outdoor without having to change a profile. The TX-AGC provides normalized sound levels to the receiving party.

24.5.4

Audio Routing

Your radio diverts the audio to different connected audio accessories for the incoming and outgoing audio. For example, your radio may divert the audio to the call recorder output.

The audio routing is configured in the codeplug Various events, as for example placing an accessory on-hook, affect the audio routing.

24.5.5

Audio Routing and PTT Hook Interactions

Your radio has the following routing schemes.

Available Audio Route Types

The table lists the types of audio route that are available for your radio.

Table 39: Available Audio Route Types

	Audio Route Types
1a	Handset Front-head
1b	Handset Back-head
1c	Handset Rear Accessory Connector (RAC)[1]
2	External Speaker
3a	Hands-free Microphone Back-head
3b	Hands-free Microphone RAC
4a	Handheld Microphone Front-head
4b	Handheld Microphone Back-head
4c	Handheld Microphone RAC[1]
5	Line-In
6a	Hearer Speaker Microphone (HSM) Front-head
6b	HSM Back-head
6c	HSM RAC[1]
7	Expansion-head Microphone[2]
8a	GCAI Headset or Personal Hands-Free (PHF) Front-head
8b	GCAI Headset or PHF Back-head
8c	GCAI Headset or PHF RAC[1]

[1] Not available with Multi Radio Control feature enabled.
[2] Not available with Multi Radio Control or Dual Control Head feature enabled.

	Audio Route Types
9	Bluetooth Headset

NOTE: Priority handling is as follows unless stated differently:

- Bluetooth Headset
- Front-head
- Back-head
- RAC

Audio Routing Schemes

The table lists the available audio routing schemes.

Table 40: Audio Routing Schemes

Call Type	Answering Method	Audio Routing
Full Duplex Private Call (FDPC) / Phone / PABX	Perform one of the following actions: • Press the **Send** key. • Press any key, if Voice Services Options is enabled by your service provider.	To the hands-free microphone, if configured. Applicable only for: • Hands-free microphone back-head • Hands-free microphone RAC • External speaker
		To the handset taken off-hook. Applicable only for: • Handset front-head • Handset back-head • Handset RAC • External Speaker[3]
		To the HSM/ HSM2 if connected (with or without a secondary accessory). Applicable only for: • HSM Front-head • HSM Back-head • HSM RAC [4]
		To the GCAI headset / PHF. Applicable only for: • GCAI headset / PHF front-head • GCAI headset / PHF back-head • GCAI headset / PHF RAC[4] • External speaker [3]
		To the line-in rear accessory, if configured by your service provider. Applicable only for:

[3] If the external speaker is permanently disabled when there is an incoming call, there is no receive audio in the external speaker. The state of the external speaker can be toggled On or Off at any time by pressing the Speaker **On** / **Off** button.

[4] If the junction box selection is enabled.

Call Type	Answering Method	Audio Routing
		• Line-in • External speaker
		To external speaker.
	Take the handset off-hook.	To handset taken off-hook.
Half Duplex Phone Call (HDPC)	Press the **Earpce** softkey. OR FDPC had been initiated and modified to HDPC by the SwMI.	The routing is as follows: • To the external speaker on the transceiver of the control head that the call is answered from. • To the handset taken off-hook on the transceiver of the control head that the call is answered from. • To one of the following routes, by priority: ○ To the IMPRES handset earpiece if the IMPRES handset is taken off-hook. ○ To the HSM / HSM2 earpiece if the HSM / HSM2 is connected to the control head. ○ To the HSM earpiece if the HSM is connected to RAC through a junction box.[4] ○ To the GCAI headset / PHF earpiece if the GCAI headset / PHF is connected to the control head. ○ To the GCAI headset / PHF earpiece if the GCAI headset / PHF is connected to RAC through a junction box.[4] ○ To the external speaker.[5]
FDPC / Phone / PABX and HDPC	Press **PTT** on the handset (On-hook).	To the external speaker.
	Press **PTT** on the handset (Off-hook).	To the handset **PTT** is pressed.
	Press **PTT** on the handheld microphone (On / Off hook).	To the handheld microphone **PTT** is pressed.
	Press **PTT** on the hands-free microphone.	To the hands-free microphone associated with the pressed **PTT**.
	Press external **PTT**, when Line-in rear accessory is configured by your service provider.	To the line-in and to the external speaker.
	Press **PTT** on the HSM.	To the HSM **PTT** is pressed. **NOTE:** For HSM RAC, only applicable if junction box selection is enabled.

[5] Available only for radios with Dual Control Head feature enabled. There is only one receiving audio path on the control head (front-head GCAI **or** back-head GCAI **or** external speaker). In case both the handset and external speaker are connected to the control head, the handset have the priority for receiving audio if it is taken off-hook.

Call Type	Answering Method	Audio Routing
	Press **PTT** on the GCAI headset / PHF.	To the GCAI headset / PHF **PTT** is pressed. **NOTE:** For GCAI headset / PHF RAC, only applicable if junction box selection is enabled.
	HDPC auto-answer.	The routing is as follows: ● To the external speaker on the transceiver. ● To the handset of the transceiver, if taken off-hook. ● To one of the following routes, by priority: ○ To the IMPRES handset earpiece if the IMPRES handset is taken off-hook. ○ To the HSM / HSM2 earpiece if the HSM / HSM2 is connected to the control head. ○ To the HSM earpiece if the HSM is connected to RAC.[4] ○ To the GCAI headset / PHF earpiece if the GCAI headset / PHF is connected to the control head. ○ To the GCAI headset / PHF earpiece if the GCAI headset / PHF is connected to RAC.[4] ○ To the external speaker. [5]
	Press expansion-head **PTT**.	To the expansion-head microphone, and to the external speaker.
	Using AT commands (virtual PTT).	To one of the following routes, by priority: ● To the handset RAC if taken off-hook. ● To the handheld microphone RAC if taken off-hook. ● To the hands-free microphone RAC. ● To the HSM RAC.[4] ● To the headset / PHF.[4] ● To the line-in. ● To the handset front-head if taken off-hook. ● To the handset back-head if taken off-hook. ● To the HSM front-head. ● To the HSM back-head. ● To the handheld microphone front-head. ● To the handheld microphone back-head. ● To the headset / PHF front-head. ● To the headset / PHF back-head. ● To the hands-free microphone back-head.[56]

Call Type	Answering Method	Audio Routing
Group Call	Not applicable.	The routing is as follows: ● To the external speaker on the transceiver. ● To the handset of the transceiver, if taken off-hook. ● To one of the following routes, by priority: ○ To the IMPRES handset earpiece if the IMPRES handset is taken off-hook. ○ To the HSM / HSM2 earpiece if the HSM / HSM2 is connected to the control head. ○ To the HSM earpiece if the HSM is connected to RAC.[4] ○ To the GCAI headset / PHF earpiece if the GCAI headset / PHF is connected to the control head. ○ To the GCAI headset / PHF earpiece if the GCAI headset / PHF is connected to RAC.[4] ○ To the external speaker.[5]

PTT and Hook Interactions for Group Calls

The table lists the available PTT and Hook interactions for Group calls.

Table 41: PTT and Hook Interactions for Group Calls

Active Audio Routing	Event	Next Audio Routing
Any accessory with hook signal	GCAI active accessory is placed on-hook.	If Accessories Options is enabled by your service provider, audio routing follows 'Group Call' in Table 40: Audio Routing Schemes on page 162.[7] [8]
	GCAI active accessory connected to GMLN7825_ Junction Box is placed on-hook.	If Accessories Options is enabled by your service provider, audio routing is routed through the hands-free microphone on the RAC and the associated external speaker.
	An inactive handset is placed on-hook.	The audio routing follows Table 40: Audio Routing Schemes on page 162.
Any	PTT from any handset placed on-hook.	Receiving audio is routed to the external speaker associated with the same control

[6] Available only for radios with Multi Radio Control feature enabled. There is only one receiving audio path on the control head (front-head GCAI **or** back-head GCAI). In case both the handset and external speaker are connected to the control head, the handset have the priority for receiving audio if it is taken off-hook.

[7] Press **PTT** to transmit.

[8] For radios with Dual Control Head feature enabled only. The Key Press Token rules apply when **PTT** pressed is associated with the other control head than the current active accessory is associated with.

Active Audio Routing	Event	Next Audio Routing
		head as the handset. This action does not activate any microphone.[789]
	PTT from any handset taken off-hook or from any other accessory (independent of hook state).	Audio routing follows 'Group Call' in Table 40: Audio Routing Schemes on page 162.
	PTT through AT commands.	Audio routing follows 'Using AT commands (virtual PTT)' in Table 40: Audio Routing Schemes on page 162.

	Any handset is taken off-hook.	• Radios with Dual Control Head or Multi Radio Control features enabled:
		  ○ Audio routing follows 'Group Call' in Table 40: Audio Routing Schemes on page 162.
		• Others:
		  ○ To another handset, if the other handset is a GCAI (receiver or receiver-transceiver) handset.
		  ○ Audio routing follows 'Group Call' in Table 40: Audio Routing Schemes on page 162.

	GCAI handset connected to GMLN7825_ Junction Box is taken off-hook.	If the previous active accessory is a hands-free microphone on RAC, audio is routed through a GCAI handset. Otherwise the routing remains unchanged, unless **PTT** is pressed.

24.5.6

Setting Audio Profiles

This feature allows you to adjust the audio parameters of your radio in its current operating environment.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Audio** → **Audio Profile**.
3. Select a required profile.

[9] The associated external speaker state (On / Off) does not change. If the speaker is disabled, receiving audio will not be heard. The state of the external speaker can be toggled On or Off at any time by pressing the Speaker **On** / **Off** button.

24.5.7
Setting Volume Adjustment Mode

You can set the volume of your radio to Individual or Common.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Audio** → **Volume Adj. Mode**.
3. Select one of the following options:

Option	Actions
Individual	Select **Menu** → **Setup** → **Set Volume**. **NOTE:** You can use the steps above to set volume to Voice, Duplex, Simplex, Earpiece, Speaker, and Keypad per your preferences.
Common	You can set one value for all the items in **Menu** → **Setup** → **Set Volume**.

NOTE: You can configure the Volume Control Mode using the configuration tool.

24.6
Setting Tones

Your radio has two tone packs that are Classic Tones (default) and New Tones.

Prerequisites: Contact your service provider to enable a tone pack.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Tones**.
3. Set tones by using one of the following options:

Option	Actions
Keypad Tone	**a.** Select **Keypad Tone**. **b.** Select **On** or **Off**.
All Tones	**a.** Select **All Tones**. **b.** Select **On** or **Off**.

Option	Actions
Tone indication when pressing the **PTT** button	**a.** Select **Talk Permit**. **b.** Select one of the following options: • **No Tone** – No tone heard on pressing the PTT button. • **Short Tone** – Short tone heard on pressing the PTT button. • **Normal Tone** – Normal tone heard on pressing the PTT button.
Tone indication when a recipient is ready to receive transmission	**a.** Select **Clear to send**. **b.** Select **Tone On** or **Tone Off**.
Tone indication for missed calls, unread messages, and low battery level	**a.** Select **Periodic Alert**. **b.** To activate or deactivate periodic tones, select **Alert**. **c.** To indicate the time between each periodic tone, select **Period**.

24.7

Setting Display

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Display**.
3. Set the display by using one of the following options:

Option	Actions
Adjusting the font level	**a.** Select **Font Level**. **b.** Perform one of the following actions: • For default size font, select **1** • For large-size font, select **2**. **NOTE:** Less text is displayed. In some languages, the number of available font levels is decreased.
Enabling or disabling large idle font on the home screen	**a.** Select **Large Idle Font**. **b.** Select **On** or **Off**. **NOTE:** Large Idle Font is not available in some languages.

Option	Actions
Setting the extended status icons	**a.** Select **Extended Status Icons**. **b.** Perform one of the following actions: • To always display icons in normal size, select **Disabled**. • To display enlarged icons only on the home screen, select **Idle Only**. • To display enlarged icons on the home screen, and when browsing your radio menu, select **Always**.
Setting the screen saver	**a.** Select **Screen Saver**. **b.** Perform one of the following actions: • To activate or deactivate the screen saver, select **Activate**. • To set the text on the screen saver, select **Text**.
Setting the backlight	**a.** Select **Backlight**. **b.** Perform one of the following actions: • To illuminate backlight when your radio is turning on, receiving signals, and when pressing keys on your radio or connected accessory, select **Auto**. • To illuminate backlight when your radio is turning on, or when the backlight One-Touch button is pressed, select **Semi Auto**. • To toggle the backlight on or off by pressing the **Backlight** key, select **Manual**.
Enabling or disabling the wallpaper	**a.** Select **Wallpaper**. **b.** Select **On** or **Off**.

24.8

Setting Time and Date

NOTE: If the Home Display Text Message feature is enabled, Home Mode Display Text can cover time and date, depending on the Configurable Idle Screen settings. The infrastructure synchronizes the time and date. When not within the infrastructure signal range you can set the values manually.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Time & Date**.

3. Set the time and date by using the following options:

Option	Actions
Displaying the time and date on your home screen	**a.** Select **Display**. **b.** Perform one of the following actions: • To display time and date, select **Time & Date**. • To display time only, select **Time Only**. • To display date only, select **Date Only**. • To disable time and date display, select **Off**.
Formatting the time	**a.** Select **Format** → **Format Time**. **b.** Perform one of the following actions: • To display time with **am** or **pm** indication, select **12-Hour**. • To display time in a 24-hour format, select **24-Hour**. **NOTE:** This feature is only applicable if the time and date on your home screen is set to **Time & Date** or **Time Only**.
Formatting the date	**a.** Select **Format** → **Format Date**. **b.** Select one of the following options: • **DD/MM/YY** • **MM/DD/YY** • **DD-MON-YY** • **YY/MM/DD** **NOTE:** This feature is only applicable if the time and date on your home screen is set to **Time & Date** or **Date Only**.
Setting the time and date manually	**a.** Select **Set**. **b.** Select one of the following options and adjust the value with the Navigation keys or keypad. • **Set Time** • **Set Date** • **Time Offset** **c.** Press **Done**. **NOTE:** The offset value is adjusted with 15 minute steps, up to 14 hours ahead or behind.

Option	Actions
Setting automatic updates for the time and date	**a.** Select **System Update**. **b.** Perform one of the following actions: • To use internal time and offset, ignoring all information from the infrastructure, select **Off**. • To update time from the offset programmed by your service provider from the infrastructure time, select **Time Only**. • To update time and offset received from the infrastructure, select **Time & Offset**.

24.9
Active Accessory (Accry) Type

Use this menu item to determine which microphone has priority during Alternating Hot Microphone or Ambience Listening.

24.9.1
Accessory (Accry) Setup

You can connect IMPRES, CORE, Other third-party authenticated, or Secondary Accessories to your radio side connector, or use Bluetooth.

If you connect an IMPRES accessory, your radio detects and recognizes the accessory automatically. If you connect a CORE, Other (for example, a third-party accessory), or Secondary accessory (for example, an earpiece connected to a Remote Speaker Microphone (RSM)), your radio can detect the connection but manual selection is required at the **Accry Setup** menu.

The **Accry Setup** menu contains the supported accessories, represented by their Model Number as defined by the related Audio Device Descriptor (ADD). The ADD is a set of parameters in your radio that defines the audio settings, such as gains and filters settings, for each accessory.

IMPORTANT: Do not connect RSMs to both connectors at the same time. To ensure a correct connection, do not press any RSM buttons when connecting the RSM to your radio.

24.9.2
Selecting the Active Accessory (Accry) Type

Active Accessory (Accry) Type Setup allows you to manually configure audio accessories that do not install automatically after plugging them in. Accessories intended for the control head and the transceiver differ and are configured separately. The Accry Setup menu contains the supported accessories, represented by their Model Number as defined by the related Audio Device Descriptor (ADD). ADD is a set of parameters in your radio that defines the audio settings, such as gains and filters settings, for each accessory.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Active Accessory Type**.
3. Select one of the following options:

Option	Description
Control Head Accry	Higher priority is given to the microphone connected to the control head.
Transceiver Accry	Higher priority is given to the microphone connected to the transceiver.
Control Head Accry	Higher priority is given to the microphone connected to the control head. Applicable to RECH.
Transceiver Accry	Higher priority is given to the microphone connected to the transceiver. Applicable to RECH.
Front Accry	Higher priority is given to the microphone connected to the front accessory connector. Applicable to TSCH.
Rear Accry	Higher priority is given to the microphone connected to the rear accessory connector. Applicable to TSCH.

NOTE: In case the **PTT** on any connected accessory is pressed, the highest priority is assigned to that accessory.

24.10
Setting Volume Control (Cntrl)

Volume Control (Cntrl) allows you to determine which audio output device, speaker, or earpiece to adjust when you turn the Rotary Knob.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Volume Cntrl**.
3. Select one of the following options:
   - **Earpiece** – By turning the **Rotary Knob** you control earpiece volume.
   - **Speaker** – By turning the **Rotary Knob** you control the speaker volume.

24.11
Selecting Accessory (Accry) Setup

This menu item allows you to manually configure audio accessories that do not install automatically after plugging them in. Accessories intended for the control head and the transceiver differ and are configured separately.

NOTE: When Bluetooth Headset is connected, the control head and transceiver accessories setup are not affected.

Procedure:

1. From the home screen, press the **Menu** key.
2. Perform one of the following options:

Option	Actions
Configuring Bluetooth Headset Accessories	Select **Setup** → **Accry Setup** → **Bluetooth Headset**.

Option	Actions
Configuring Control Head Accessories	**a.** Select **Setup** → **Accry Setup** → **CH Accry**. **b.** Select one of the following options: • **GCAI Fronthead** – Contains a list of preconfigured accessories that can be connected to the front connector on the RECH. • **Secondary Accry** – Contains a list of preconfigured accessories that can be connected to Hearer Speaker Microphone (HSM). • **GCAI Backhead** – Contains a list of preconfigured accessories that can be connected to the back connector on the RECH. • **Visor Mic Backhead** – Contains a list of preconfigured visor microphones that can be connected to the back connector on the RECH. • **Ext Speaker Backhead** – Contains a list of preconfigured external speakers that can be connected to the back connector on the RECH. • **Second Mic Cradle** – Contains a list of preconfigured microphones that can be connected to the TSCH cradle. • **Ext Speaker Cradle** – Contains a list of preconfigured speakers that can be connected to the TSCH cradle. **NOTE:** Lists of accessories are configured by your service provider.

Option	Actions
Configuring Transceiver Accessories	**a.** Select **Setup** → **Accry Setup** → **Transceiver Accry**. **b.** Select one of the following options: • **Visor Mic Rear Accry** – Contains a list of preconfigured visor microphones. • **GCAI Rear Accry** – Contains a list of preconfigured GCAI accessories. • **Rear Secondary Accry** – Contains a list of preconfigured secondary accessories. • **Ext Spkr Rear Accry** – Contains a list of preconfigured external speakers. • **Line-In Rear Accry** – Contains a list of preconfigured line-in accessories. • **Line-Out Type** – Contains a list of preconfigured line-out type connections. **NOTE:** All accessories must be connected to the connector at the rear of the transceiver. The list of accessories are configured by your service provider.

NOTE: One control head can support only one external speaker at the same time, either a speaker connected to the control head, or to the transceiver. When you select one external speaker, the other becomes unselectable from the menu.

24.12

Editing Book On Settings

This menu item allows you to edit RUA/RUI feature settings to automatically accept or reject book on requests.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Book on Setup**.
3. Select one of the following options:

Option	Description
Book on Accept	Your radio accepts all book on requests.
Book on Reject	Your radio rejects all book on requests without any notification.

24.13

Setting Rotary Knob

This menu item allows you to set all the related functionality of the **Rotary Knob**.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Rotary Knob**.
3. Set the rotary knob by using the following options:

Option	Actions
Setting the mode for the Rotary Knob	**a.** Select **Rotary Mode**. **b.** Perform one of the following actions: • To enable both volume and scroll modes, select **Dual**. • To control volume, select **Volume**. • To change talkgroups or scroll through menus, select **Scroll**.
Setting the lock function for the Rotary Knob	**a.** Select **Rotary Lock**. **b.** Perform one of the following actions: • To lock the Rotary Knob, select **Locked**. • To unlock the Rotary Knob, select **Unlocked**. • To disable the lock function, select **Disabled**.
Setting the Rotary Knob function when the keypad is locked	**a.** Select **In Keypad Lock**. **b.** Perform one of the following actions: • For volume setting and scrolling, select **Lock None**. • For scrolling only, select **Lock Volume**. • For volume setting only, select **Lock Scroll**. • To disable both volume setting and scrolling, select **Lock Both**.
Enabling or disabling continuous scrolling in a talkgroup list	**a.** Select **Wrap Around**. **b.** Select **On** or **Off**. **NOTE:** Only when **Wrap Around** is set to **On** and the **Scroll Range** is set to **Scroll To Next**, you are able to scroll through all the talkgroups and folders.

Option	Actions
Setting the scrolling range in a talkgroup list	**a.** Select **Scroll Range**. **b.** Perform one of the following actions: • For scrolling through talkgroups in the current folder only, select **Stay In Range**. • For scrolling through all talkgroups and folders, select **Scroll To Next**. **NOTE:** Only when **Wrap Around** is set to **On** and the **Scroll Range** is set to **Scroll To Next**, you are able to scroll through all the talkgroups and folders.
Enabling or disabling a confirmation prompt before selecting a talkgroup	**a.** Select **Confirm TG Sel.**. **b.** Select **On** or **Off**. **NOTE:** If confirmation prompt is enabled, confirm talkgroup selection by pressing **Select** or **PTT** button.
Setting the Side Button function	**a.** Select **Function Keys**. **b.** Perform one of the following actions: • To set the function according to the Rotary Mode, select **Side**. • To set the function for volume setting, select **Volume Adjust.**. • To set the function to predefined One-Touch Button features, select **OTB Feature**.

24.14 Selecting Default Setting

The menu item resets your radio back to default settings.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Def. Settings**.
3. To confirm, press **Yes**.

Chapter 25

Group Setup

This menu item allows you to set the operation parameters, scanning, and my groups folder.

25.1 Operation Parameters

Operation Parameter is used to define your radio mode and the talkgroup at your radio startup, and when changing modes TMO to DMO and TMO to Repeater.

25.1.1 Determining Radio Mode at Radio Startup

This feature allows you to set radio mode at startup.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Operations Parameters** → **Startup**.
3. Select one of the following options:

Option	Description
TMO	Your radio turns on in Trunked Mode Operation (TMO).
DMO	Your radio turns on in Direct Mode Operation (DMO).
Last Selected	Your radio turns on in the previously selected mode when last turned off.

25.1.2 Determining Talkgroup at Radio Startup

This feature allows you to determine the talkgroup of your radio at radio startup.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Operations Parameters** → **Home Group Startup**.
3. Select one of the following options:

Option	Description
Last Selected	Your radio enters the last selected TMO or DMO talk-group before being turned off.
Home Group	Your radio enters the Home Group (TMO or DMO) when turn on, depending on your radio mode selected.

25.1.3

Determining Talkgroup When Switching Mode

This feature allows you to determine the talkgroup of your radio when switching from Trunked Mode Operation (TMO) to Direct Mode Operation (DMO), or Repeater mode.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Operations Parameters** → **Home Group TMO to DMO/Repeater**.
3. Select one of the following options:

Option	Description
Last Selected	Your radio enters the last selected DMO talkgroup when in DMO. If Group Mappings are configured, they take precedence. The DMO Talkgroup mapped to the current TMO Talkgroup is used.
Group Mappings	Your radio enters the DMO Home Group unless a Group Mapping is configured. If Group Mappings are configured, they take precedence. The DMO Talkgroup mapped to the current TMO Talkgroup is used.
Home Group	Your radio enters the DMO Home Group, ignoring possible group mappings.

25.1.4

Configuring the Home Group

This feature allows you to configure the home groups on your radio.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Operations Parameters**.
3. Perform one of the following actions:

Option	Actions
To configure the TMO Home Group or Home Folder	Select **TMO Home Group**.
To configure the DMO Home Group	Select **DMO Home Group**.

25.2
Talkgroup Scanning

Talkgroup scanning allows your radio to monitor the signaling of a few talkgroups at the same time. In addition to monitoring signaling addressed to the selected talkgroup, your radio can monitor signaling addressed to multiple talkgroups.

NOTE: This feature is only available when your radio is in Trunked Mode Operations (TMO).

To use the multiple group monitoring, define a scan list, which is a user-activated scan list. Your radio can allow creating and editing the scan list using HMI. This list holds up to 20 talkgroups, which you monitor in addition to the selected group.

You can choose only one user-activated scan list at a time. When this list is activated, your radio begins to monitor traffic for these groups in addition to the traffic for the selected group. Up to 40 scan lists can be defined.

If the Switching and Management Infrastructure (SwMI) instructs a radio to detach one of the scanned groups, your radio stops monitoring the group. The group remains in the scan list. Subsequent attachment of a group by the SwMI causes your radio to begin monitoring the group again.

The SwMI can also instruct a radio to attach groups from out of the scan list. If the group attachment is accepted, your radio monitors the group.

If talkgroups have been attached or are always attached, your radio can passively monitor the following talkgroups:

- Selected talkgroup.
- Announcement Talkgroup (ATG) associated with the selected talkgroup (if this talkgroup is not set as **Permanently detach**).
- Talkgroups associated with the selected ATG (if this talkgroup is not set as **Permanently detach**).
- Talkgroups in the user-activated scan list (if scanning is enabled and the SwMI-initiated detachment has not been performed on these groups).
- Talkgroups in the SwMI-controlled scan list (if scanning is enabled).
- Talkgroups with the class of usage set to **Always Scanned** (if supported).

25.2.1
Activating Talkgroup Scanning

This feature allows you to monitor any Trunked Mode Operation (TMO) Group Call in the defined talkgroup list.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Scan** → **Scanning**.
3. Select **Select List** and then, a list name.

   Your radio displays list name selected.
4. Select **Scanning** → **On**.

Result: Your radio is scanning on the predefined scan list.

25.2.2

Setting Talkgroups in the Active Scan List

This feature allows you to edit talkgroups in the active scan list.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Scan** → **Active List**.

   NOTE: If your radio displays `Scanning is Off`, go to **Group Setup** → **Scan** → **Scanning** → **On** to enable scanning.
3. Select **View** and highlight the required talkgroup.
4. Press **Menu**.
5. Select one of the following options:

Option	Description
Delete	Erases a group from the active scan list.
Priority	Sets the priority status of the talkgroup: • **Low** • **Medium** • **High**

25.2.3

Setting Scan Lists

This feature allows you to set up any scan list.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Scan** → **Scan Lists**.
3. Highlight the required scan list and press **Menu** to see additional settings:

Option	Description
Rename	Enters new name for a scan list.
Capacity	Displays the number of assigned, and unassigned talkgroups for a scan list.
Clear	Deletes all the talkgroup assigned to a scan list.
Add Group	Adds a talkgroup to a scan list. Select one talkgroup from your talkgroup folders and assign the appropriate priority.
Edit	Changes the priority of the required talkgroup or deletes it.

25.2.4
Deleting Talkgroups from Scan Lists

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **Scan** → **Scan Lists**.
3. Highlight the required scan list and press **Menu** → **Edit**.
4. Highlight the required talkgroup and press **Menu** → **Delete**.

25.3
My Groups

My Groups is equivalent to **Favorites**. Both menu items contain shortcuts to favorite talkgroups and contact numbers, and allow the same operations.

For more information on the feature, see Favorites on page 186.

25.3.1
Adding Favorite Folders

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **My Groups**.
3. Select **[New Folder]**.
4. Enter the name and select **OK**.

25.3.2
Adding Talkgroups to Favorite Folders

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **My Groups**.
3. Select **<FolderName>**.
4. Select **[New Group]**.
5. Select the required talkgroup by Folder or by alphabetical search.

25.3.3
Editing My Folder List

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **My Groups**.
3. Highlight required favorite folder.
4. Press **Menu**.

5. Edit the folder by using the following options:

Option	Actions
Renaming the folder	a. Select **Rename Folder**. b. Enter the new name of the folder and press **OK**.
Deleting the folder	a. Select **Delete Folder**. b. Press **Yes**. **NOTE:** You cannot delete the last favorite folder.

25.3.4

Deleting Talkgroups from Favorite Folders

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Group Setup** → **My Groups**.
3. Select the required favorite folder.
4. Delete talkgroups by using one of the following options:

Option	Actions
Deleting a talkgroup	Highlight the talkgroup and select **Delete**.
Deleting all talkgroups	Press **Menu** and select **Delete All**.

Chapter 26

Individual Call Supplementary Services

The Individual Call supplementary services feature in Trunked Mode Operation (TMO) provides similar functions that are available in the telephony network. The subfeatures available are Call Hold, Call Transfer, Call Waiting, and Call Forwarding.

Table 42: Individual Call Supplementary Service Subfeatures

Subfeatures	Description
Call Hold	A console operator can interrupt an individual call by putting it on hold. When a call is on hold, the console operator can perform other actions such as searching for information. During this time, voice communication stops instead of being terminated. Voice communication resumes when the call is no longer on hold.
Call Transfer	Call Transfer allows a console operator to transfer an active individual call to another new party. Call transfer is required, for example when the caller cannot directly dial or does not have the number to do so. The caller is put on hold while the console operator initiates an individual call with the new party. Then, the console operator transfers the call, connecting both parties in a new individual call.
Call Waiting	Call Waiting allows your radio engaged in a call to acknowledge an incoming individual call. Your radio can choose to **Accept**, **Reject**, or **Ignore** the waiting call. **Accept** The ongoing call ends immediately, and your radio connects to the new call. **Reject** Your radio rejects the waiting call and the ongoing call resumes. **Ignore** The **Waiting Call Ignoring Duration** timer starts and your radio must end the ongoing call before this timer expires to connect to the new call. If the timer expires, your radio rejects the call.
Call Forwarding	Call Forwarding allows the Switching and Management Infrastructure (SwMI) to redirect an individual call to another destination. The redirection is according to one or more combinations of the following preconfigurations: **Call Forwarding Unconditional (CFU)** The call is forwarded to the specified destination regardless of the state of the recipient. **Call Forwarding on Busy (CFB)** The call is forwarded to the specified destination if the recipient is busy in another call.

Subfeatures	Description
	Call Forwarding on No Reply (CFNRy) The call is forwarded to the specified destination if the recipient does not answer the call. **Call Forwarding on Not Reachable (CFNRc)** The call is forwarded to the specified destination if your radio is not reachable, for example, if it is switched off or out of range.

26.1 Enabling or Disabling Call Waiting

This feature allows you to enable or disable Call Waiting for your radio.

Prerequisites:
Enter Trunked Mode Operation (TMO).

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Individual Setup** → **Trunked Mode** → **Call Waiting**.
3. Perform one of the following actions:
   - To enable Call Waiting, select **On**.
   - To disable Call Waiting, select **Off**.

26.2 Setting Call Forwarding

This feature allows you to enable or disable Call Forwarding for your radio. If radio is not in TMO mode, selecting call forwarding will results in an *Invalid Keypress* tone and `Service Restricted` message.

Prerequisites:
Enter Trunked Mode Operation (TMO).

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Individual Setup** → **Trunked Mode** → **Call Forwarding**.
3. Set Call Forwarding by using the following options:

Option	Actions
Enabling Call Forwarding	Select **Config Sending** → **On**.
Disabling Call Forwarding	Select **Config Sending** → **Off**.

Option	Actions
Setting predefine condition messages	**a.** Select **Config**. **b.** Select one of the following options: • **Always** • **Busy** • **No Answer** • **Not Reachable** **NOTE:** The settings in the Config sub-menu is only enabled when **On** is selected in Enable Config.
Displaying last forward call	Select **Last Result**.

26.3

Setting Forwarding Address

Prerequisites:
Enter Gateway Mode.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Individual Setup** → **Gateway Mode** → **Forwarding Address**.
3. Enter the number where the call is to be forwarded to and press **OK**.

Chapter 27

Favorites

You can add frequently used talkgroups and phone book contacts to the Favorite folder. You can add items from Favorites or Talkgroups, and Contacts menu levels respectively.

This feature allows quick access to frequently used talkgroups by including the groups in up to three favorite talkgroups ranges. These ranges are separately stored in the data storage. The feature operates in both Trunked Mode Operation (TMO) and Direct Mode Operation (DMO) modes. The favorite talkgroups ranges are shared for TMO and DMO talkgroups.

A favorite talkgroup range name replaces a talkgroup range name on your radio display whenever a favorite talkgroup is selected, or is in use for appropriate operation. The ranges of favorite talkgroups with their talkgroup assignments are kept when your radio is turned on.

You can quickly access favorite folders from the home screen using the following steps:

1. Press the **Up** Navigation key to access the folders.
2. Use the Navigation keys or **Rotary** knob to scroll through items inside the folders.

27.1 Adding Folders to Favorites

Favorites contain less than three favorite folders.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Favorites** → **[New Folder]**
3. Enter a name and select **OK**.

27.2 Adding Contact Numbers to Favorites

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Contacts**.
3. Highlight the required contact, and select **Favorites**.
4. Press the **Left** or **Right** Navigation key to select the required number.
5. Press the **Menu** key, and select **Add to Favorites**.
6. Select the required folder, and press **Select**.

27.3 Making Private Calls to Favorite Contacts

Procedure:

1. To select a contact number you want to call from the home screen, perform one of the following:

- Press the **Up** Navigation key.
- Go to **Options** → **TG by Folder**, select the required favorite folder, and highlight the contact number.

2. Depending on the mode, make private calls by using one of the following options:

Option	Actions
Making simplex calls in TMO or DMO	**a.** Press and hold the **PTT** button. **b.** To talk, wait for the Talk Permit tone. **c.** To listen, release the **PTT** button.
Making duplex calls in TMO	**a.** To initiate the call, press the **Send** key. **b.** A tone sounds until the called party answers the call.

3. To end the call, press the **End** key.

NOTE: If you are using the fist microphone or the telephone-style handset, replace firmly on the clip or holder when done.

27.4 Adding Talkgroups to Favorites

Prerequisites:

To add a Direct Mode Operation (DMO) talkgroup, ensure that your radio is in DMO.
To add a Trunked Mode Operation (TMO) talkgroup, ensure that your radio is in TMO.

Procedure:

1. From the home screen, press **Options**.
2. Select one of the following options:
   - **TG by Folder** – contains talkgroups arranged by folders.
   - **TG by abc** – contains talkgroups arranged alphabetically.
3. Highlight the required talkgroup.
4. Press the **Menu** key, and select **Add to Favorites**.
5. Select the required folder, and press **Select**.

27.5 Managing Folders in Favorites

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Favorites**.
3. Highlight a required folder.
4. Press the **Menu** key.

5. Select one of the following options:

Option	Actions
Renaming the folder	a. To change the folder name, press **Rename Folder**. b. To confirm, press **OK**.
Deleting the folder	a. To remove the selected folder, press **Delete Folder**. b. To confirm, press **Yes**.

27.6

Deleting Items from Favorites Folder

Deleting Single Items

You can choose to delete an individual item, or delete all items from the favorite folder.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Favorites**.
3. Select a folder containing the item that you want to remove.
4. Highlight the item, and select **Delete**.

Deleting All Items

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Favorites**.
3. Select a required folder.
4. Press the **Menu** key, and select **Delete All**.

Chapter 28

Radio Info

Depending on the codeplug configuration the manufacturer, type, and serial number information is available. The information is available through the service page accessible from the HMI.

The Radio Info provides the following data:

- Manufacturer
- Model Number

  NOTE: The manufacturer and model number information is displayed only on radios distributed under Motorola Solutions trademark.
- Release Name – the version of radio software.
- Individual Short Subscriber Identity (ISSI) – the ISSI that is in use.
- TETRA Equipment Identity (TEI) – the TEI is displayed as a hexadecimal number.
- Serial number – Motorola Solutions serial number is displayed only on radios distributed under the Motorola Solutions trademark.
- OPTA – if the BSI SIM support is disabled, no OPTA information is displayed.
- Minimum Software Version – the initial release of radio hardware with the corresponding first software release.

28.1 Viewing and Modifying Personal Information

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **My Info**.
3. Select one of the following options:

Option	Description
My Private Num	To view the private number of your radio.
My Phone Num	To view the phone number of your radio. **NOTE:** To modify the displayed phone number, select **Edit**. Type the number and press **OK**.
Radio Info	To view other information such as manufacturer, product type, ISSI, TEI, Serial Number, OPTA, and minimum software version. **NOTE:** OPTA information is optional.

28.2

Viewing Talkgroup Subaddresses

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **My Info** → **Talkgroup Info**.
3. To view a subaddress, select the talkgroup from the talkgroup list.

Chapter 29

Recent Calls

You can view the history of all calls:

- **Dialed** – Calls you initiated.
- **Received** – Calls you answered.
- **Missed** – Calls you received but not answered or rejected.

Your radio allows you to view recent calls in the call history lists. Each list holds up to 50 entries with the latest calls at the top. If the number of a recent call is stored in the contact list, the name associated with the number appears in the recent calls list. A number dialed more than once, appears only once in the list.

The Call History stack holds private TETRA IDs for:

- Private Call
- Phone Call
- PABX Call

Numbers from the Call History stack are available for the following actions:

- View
- Select and Call
- Store (new or existing entry)
- Delete

NOTE: Outgoing duplex calls from the Recent Calls list in Direct Mode Operations (DMO) are not allowed.

When scrolling through the lists, the display entries are in reverse order with the most recent call at the top. If you call a number from the history, the number does not duplicate, but instead is moved to the top for easy access. However, missed calls and received entries are displayed twice in their respective lists. All call history lists are preserved even after turning your radio on or off. You can always save any number from the stack to your address book for future convenience.

NOTE: Calls missed in TXI mode are stored and can be viewed.

29.1 Viewing Recent Calls

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Recent Calls**.
3. View recent calls by using the following options:

Option	Actions
Viewing dialed calls	**a.** Select **Dialed**. **b.** Press **Menu** key and select **View** to view your dialed number.

Option	Actions
Viewing received calls	**a.** Select **Received**. **b.** Press **Menu** key and select **View** to view your received call.
Viewing missed calls	**a.** Select **Missed**. **b.** Press **Menu** key and select **View** to view your missed call.

Call time information is only available if the time and date are set in your radio. Call duration is not available in the missed calls list.

29.2

Calling from Recent Calls

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Recent Calls**.
3. Select one of the following options:
   - **Dialed**
   - **Received**
   - **Missed**
4. Highlight the required call.
5. Perform one of the following actions:

Option	Actions
Making private calls	**a.** Press **PTT** button to make the call.
Making phone calls	**a.** Press **Send** key to make the call.

Phone calls are only supported in Trunked Mode Operation (TMO).

29.3

Storing Recent Calls into the Contact List

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Recent Calls**.
3. Select on of the following options:
   - **Dialed**
   - **Received**
   - **Missed**
4. Press **Store**.

   If **Store** is not assigned to the **Left** soft key, the number is already stored in your contact list.

5. Store the number by using one of the following options:

Option	Actions
Storing the number as a new entry	Select **[New Contact]**.
Storing the number as an existing entry	**a.** Select the entry. **b.** Press **View**. **c.** Select **Edit**.

6. Highlight the contact type field.
7. Display the required contact type for the number by scrolling to the left or right.
8. Select **Done**.

29.4 Deleting Recent Calls

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Recent Calls**.
3. Select on of the following options:
   - **Dialed**
   - **Received**
   - **Missed**
4. Highlight the required call and press **Menu**.
5. Delete calls by using one of the following topions:

Option	Actions
Deleting a call	**a.** Select **Delete**.
Deleting all calls	**a.** Press **Delete All**.

Chapter 30

Shortcuts

Shortcuts menu allows you to set up shortcuts to access frequently used menu items.

30.1 Creating Menu Shortcuts

Procedure:

1. From the home screen, press the **Menu** key.
2. Scroll to the item that you want to create a shortcut for.
3. Highlight the item.
4. Press and hold **Menu**.

   A confirmation message is displayed.
5. Select **Yes**.

   The key for the shortcut is displayed.
6. Press **Done**.

30.2 Managing Menu Shortcuts

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Shortcuts**.
3. Highlight a required shortcut and press **Menu**.
4. Manage menu shortcuts by using the following options:

Option	Actions
Changing the assigned key	**a.** Select **Edit**. **b.** Enter the required number from 1 to 20. **c.** Press **OK**.
Deleting a shortcut	Select **Delete** → **Yes**.
Deleting all shortcuts	Select **Delete All** → **Yes**.

Chapter 31

Radio User Assignment (RUA) and Radio User Identity (RUI)

NOTE: This is a Software Selling Feature.

Radio User Assignment (RUA) and Radio User Identity (RUI) enables authentication service. Only a successful logon to any temporary radio provides you with a full access and permanent radio functionality, allowing others to reach you with your permanent number. A failed logon results in limited service.

- Blue – You are logged on.
- Gray – You are logged off.

Radio States

- Full Service – You are successfully logged on. Your radio has full functionality.
- Limited Service – You are not logged on. Your service provider specifies this function.
- Pseudo Log On – Only happens in Local Site Trunking (LST). Your radio has full functionality (subject to the service provider settings) except for certain services like call forwarding. The RUI Pseudo Log On icon is displayed.

Book On

Your service provider assigns a particular radio to one person for a predefined period of time. You can only see the screen with your login, and if full service is granted.

Force Off

Your service provider can log you off. Your radio displays `Force Off`.

31.1 RUA/RUI Log On

You can log on yourself or the dispatcher can log you on. The feature must be enabled in the codeplug, by your service provider.

After turning on your radio, the infrastructure verifies a request from your radio and checks if it supports the Radio User Assignment (RUA)/Radio User Identity (RUI). When the infrastructure accepts RUA request, you are asked for RUI and RU-PIN. After providing correct information, a successful log on occurs and full access is granted for specified time.

When a RUI and/or RU-PIN are incorrect, a log on failure occurs. The infrastructure sends the RUA reject signal to your radio. If enabled in the codeplug, limited service access is granted.

When the dispatcher is sending the RUA accept signal to your radio with the time period that the full service is granted, then the successful book on occurs.

31.2
RUA/RUI Radio Behavior

When your radio is logged off and receives Radio User Assignment (RUA) accept from the infrastructure without sending log on information, it indicates book on with an assigned log on period timer.

Your radio sends automatically book on response according to the terminal settings:

Book on Reject
Your radio rejects all the book on.

Book on Accept
Your radio accepts all the book on.

To log off, use your radio menu. The dispatcher has also the option to log you off using **Force Off** setting.

The pseudo log on is a state which occurs when the RUA/Radio User Identify (RUI) authenticated radio goes to Local Site Trunking (LST), or infrastructure accepts the log on with the empty granted assignment period. In this state, your radio has the full functionality available except some services as forwarding calls. This state is signalized with a specific icon.

The RUA/RUI feature is specified with the following timers:

Log On Process Timer
Defines the amount of time during which your radio awaits log on response from infrastructure.

Time Out Warning Timer
Defines the amount of time after which your radio displays the warning.

Log On Period Timer
Defines the amount of time during which your radio is logged on.

31.3
RUA/RUI Interactions

When you switch from Trunked Mode Operations (TMO) to Direct Mode Operations (DMO), the terminal logs off (depending on the codeplug settings). When you switch from DMO to TMO, your radio initiates the log on process.

You may be Radio User Identity (RUI)-authenticated when out of coverage. In this situation, your radio is in pseudo logged on status. All the timers are the same as for the logged on user with the coverage. You may also be logged off when out of coverage. In this situation, your radio is provided with the limited service access. In both cases, if your radio is back in the coverage area and receives Radio User Assignment (RUA) request from Switching and Management Infrastructure (SwMI), it prompts you to log on.

If during the emergency operations you receive the force-off, it logs you off without exiting the emergency operations. As long as your radio is in the emergency operations, your radio display does not indicate any change.

When your radio turns on in the Local Site Trunking (LST), it prompts for the PIN. If the correct PIN is entered, your radio switches to the pseudo logged on state. When you move to the LST, your radio switches to pseudo logged on state. However, no prompt for the PIN occurs.

When you change to a different physical terminal, the store and forward report is routed to your radio where you are currently logged on. When your radio receives store and forward report, it does not display the report, as the reports have to match the sent Short Data Services (SDS). If an SDS consumer report is requested, it is recommended that the receiver sends an explicit separate SDS message to confirm that the message has been received and read. The report is stored together with the sent SDS in the **Outbox**, because of that when you log off, delete the messages from the **Outbox**. When you change to different physical radio, the previous permanent radio does not receive the report. The status of store and forward message in the **Outbox** cannot be updated.

31.4

Logging On or Off Radio User Identity

Logging On Radio User Identity

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **RUI** → **Log on**.
3. Perform one of the following actions:

Option	Action
Selecting an existing user ID	**a.** Select **User ID**. **b.** Select your user ID from the list.
Creating a user ID	**a.** Select **[New User ID]**. **b.** Enter your user ID.

4. Select **User PIN**.
5. Enter your credentials and press **OK**.

Logging Off Radio User Identity

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **RUI** → **Log off**.
3. Press **Accept**.

Chapter 32

Mobility Services

Terminal mobility indicates the ability of your radio to acquire, register, and operate on an appropriate TETRA network and also to change cells when the conditions require it with a minimum interruption of services.

Main Mobility requirements include:

Initial Cell Selection
The procedure which your radio applies in order to find a suitable cell on which to register and obtain service when no neighbors are known or available. For this procedure, your radio uses a set of provisioned or known frequencies.

Registration
A signaling exchange that your radio employs to notify the Switching and Management Infrastructure (SwMI) that it has arrived at a cell. The registration exchange may include secure key authentication. The SwMI may also request your radio to register to verify your radio location or to force authentication.

Migration and Multi-Network Operation
The terminal will have a set of provisioned parameters which will indicate on which Mobile Network Identity (MNI) the terminal can operate

Control Channel Selection
In TETRA, each TDMA frame on a given carrier is comprised of 4 time slots, each of which can be used as a “physical” channel

Surveillance, Monitoring, and Scanning

Surveillance
A procedure that your radio continuously performs to evaluate the continued suitability of the serving cell based on the broadcast cell parameters and the measured signal strength.

Monitoring
A procedure that your radio employs to evaluate the suitability of a neighbor cell based on signal strength measurements of the cell, and parameters of that cell provided by the serving cell.

Scanning
A procedure that your radio employs to evaluate the suitability of a neighbor cell based on signal strength measurements of the cell and parameters received directly from that cell.

Cell Ranking
The procedure your radio performs to sort the neighbor cells in order of most desirable for cell reselection to least desirable for cell reselection.

Cell Reselection
The procedure used by your radio to move from the serving cell to a cell that the serving cell has identified as a neighbor cell, and whose conditions are sufficiently better that the serving cell.

Cell Restoration
A procedure initiated by your radio following cell reselection to resume an ongoing circuit mode call upon arriving at a new cell.

32.1
Networks

Your radio holds a list of 101 allowed network identities (including 1 home network and 100 foreign networks) with a combination of Mobile Country Code (MCC) and Mobile Network Code (MNC).

The first network in this list must be your radio home network. Each network can have an associated name that can indicate to the user which network it is. Your radio can perform initial cell selection and registration on these networks. The same ISSI is used on all networks. You can limit registration to the home network only, or to a selected network only, and to ignore the other allowed networks.

Registration on any of these networks is performed using your radio Individual Short Subscriber Identity (ISSI) and without migration signaling.

Your radio selects the network registration method based on the following configurations in the configuration tool:

Migration Signaling
If the network supports migration, your radio registers to the network using migration signaling.

ITSI Attach
Your radio registers to the network using regular Individual TETRA Subscriber Identity (ITSI) attachment.

Automatic
Your radio uses migration signaling or ITSI attachment to register to the network, depending on the capabilities of the network.

Your radio operates in all networks similar to its operation in the home network, with some behavior configurable using the configuration tool. All group calls are placed using Short Subscriber Identity (SSI) addresses. It is the responsibility of the Switching and Management Infrastructure (SwMI) to reject calls for groups that the local system cannot reach, or connect the calls to another foreign system. Individual calls are placed using SSI addresses for intra-network calls, or TETRA Subscriber Identity (TSI) for inter-network calls.

If the registration method is ITSI Attach or if Migration Encryption (this is a Software Selling Feature) is enabled, the following features are configurable in the configuration tool for the foreign network:

- Authentication
- Air Interface Encryption (AIE)
- Encryption

NOTE: The telephone gateway interprets telephone numbers with the country code of the local country. For example, if you dial the number 01256-48-4566 in the UK, the system treats as if you dial +44-1256-48-4566.

32.1.1
Migration

NOTE: This is a Software Selling Feature.

The Migration feature enables your radio to migrate and register to a foreign network using migration signaling. This condition allows your radio to attach to talkgroups in the foreign network.

This feature consists of the following key functions:

- If you change talkgroup to one on a different network, your radio automatically migrates to this network or to one of the available networks. If the talkgroup is an Inter-System Interface (ISI) talkgroup, the talkgroup supports multiple networks connected through the ISI interface. Your radio can automatically migrate to an available network in the region. It is useful if the signal is lost as your radio attempts to establish communication with any available network. Your service provider must preconfigure the codeplug with the network before assigning it to talkgroups.

- The service provider can set the registration method to individual networks. Also, the service provider can set an automatic registration method, depending on the network broadcast.

The Migration feature supports individual call, group call, and individually addressed Short Data Service (SDS) or Status messages. To receive group calls or group-addressed Short Data Service (SDS) or Status messages from a group of the current network, your radio has to attach to the nominated group. To receive group calls or group-addressed SDS or Status messages from other networks, the attached talkgroup must be configured in the Switching and Management Infrastructure (SwMI) as an ISI talkgroup.

Your radio cannot migrate to a foreign network while it is in an active call.

32.1.2
Network Selection

In case the Migration is not supported, you can select one or multiple programmed networks to register your radio to.

The following network options are only available when your radio is in Trunked Mode Operation (TMO) or Gateway mode:

Network Sel
In this option, you can select the network to which your radio is allowed to register.

Home Only
Your radio registers only to its home network, even if it finds a foreign network that is in range first.

Select Net
This option allows you to manually select a preferred network from a list of configured networks. As a result, your radio registers only to this selected network, even if it finds another network that is in range first.

Any Network
In this option, if the home network is not available, your radio selects the network automatically. Your radio registers to any network that is already configured into its codeplug list of networks. This option does not require manual selection. Network selection to another network is only performed at initial cell selection following a link failure and then only if the home network is not available.

TG Net Sel
This option is only available when the selected talkgroup is an Any Net or Inter-System Interface (ISI) talkgroup. You can select one or multiple networks determined by the selected talkgroup of your radio, or define the searching and registration priority of the network.

Home Only
Your radio registers only to its home network, even if it finds a foreign network that is in range first.

Select TG Net
Selecting this option displays the available networks of a selected talkgroup. If your radio is attached to an Any Net talkgroup, it displays the allowed multiple networks of the Any Net talkgroup that you can register to. If your radio is attached to an Inter-System Interface (ISI), it displays multiple linked networks that you can register to.

Prefer TG Net
Selecting this option displays the available networks of a selected talkgroup. If your radio is attached to an Any Net talkgroup, it displays the allowed multiple networks of the Any Net talkgroup that you can register to. If your radio is attached to an Inter-System Interface (ISI), it displays multiple linked networks that you can register to. The selected network has the first priority during network searching and registration.

Any TG Net
This option indicates that your radio can register to any available networks of a selected talkgroup. If your radio is attached to an Any Net talkgroup, it can register to networks allowed by the Any Net talkgroup. If

your radio is attached to an Inter-System Interface (ISI) talkgroup, it can register to any available linked network.

If your radio selects a network different from the current one, your radio may force initial cell selection to find a cell that belongs to the home or the selected network. In the selected network option, your radio displays a list of network names where each network name corresponds to one of the Mobile Network Identities (MNI) in the list. The network names are configured in your radio as part of the configuration of the MNI list.

32.1.3
Multi-System Operation

Your radio holds a list of up to 100 allowed network identities – Mobile Country Code (MCC) and Mobile Network Code (MNC) combinations, that are considered friendly networks. The first network in this list must be your radio home network.

Each network can have an associated name that can indicate to the user which network it is. Your radio can perform initial cell selection and registration on these networks. Registration on any of these networks is performed using your radio Individual Short Subscriber Identity (ISSI) and without migration signaling. The same ISSI is used on all networks. You can limit registration to the home network only, or to a selected network only, and to ignore the other allowed networks.

In case the Base Transceiver Station (BTS) does not support the migration defined by European Telecommunications Standards Institute (ETSI) standard, multi-system operation is only supported as follows:

You can change the network mode using the HMI. A top-level menu item called **Networks Sel** allows choosing between **Home Only**, **Select Net**, and **Any Net**. If your radio chooses a network different from the current one, your radio forces initial cell selection to find a cell that belongs to the home or the selected network. In the selected network option, a list of network names, where each network name corresponds to one of the MNIs in the list, is displayed. The network names are provisioned in your radio as part of provisioning of the MNI list. The network alias or MNI of the current network is displayed on the first line of the idle display.

Home Only
In this mode your radio recognizes only the first system in the allowed list. As a result, your radio registers only on its home network, even if a foreign network is in range and is found first.

Select Network (Select Net)
In this mode your radio recognizes only the system you selected in the list of allowed systems. As the result, your radio registers only on this selected network, even if another network is in range and is found first.

Any Network (Any Net)
In this mode radio selects the network automatically where the home network is not available. Your radio registers to any network that it finds that is already programmed into its codeplug list of networks, whereby no user manual selection is required. Network selection to another network is only performed at initial cell selection following a link fail and then only if the home network is not available. Your radio uses its own ISSI.

Your radio operates in all networks as it does in its home network. All communications are placed using SSI addresses, and it is the Switching and Management Infrastructure (SwMI) responsibility to reject communications for subscribers or groups that cannot be reached in the local system.

NOTE: The telephony gateway interprets telephone numbers with the country code of the local country. For example, if you dial the number 01256-48-4566 in the UK, it is treated as if you dialed +44-1256-48-4566.

For description of other BTS supported migrating modes used, refer to Air Interface Migration and Dynamic Air Interface Migration sections.

32.1.4
Selecting Network Operation Mode

NOTE: This is a Software Selling Feature.

Network is a Software Selling Feature. The **Networks** menu allows you to switch between your radio operation modes.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks**.
3. Select one of the following options:

Option	Description
Network Sel	Selects the network to which your radio is allowed to register.
Trunked Mode	Switches to the mode using infrastructure.
Direct Mode	Switches to the mode without using infrastructure.
Repeater Mode	Switches to the Repeater Mode.
Gateway Mode	Switches to Gateway Mode.
TXI Mode	Activate to stop sending any radio transmission. **NOTE:** If your radio is in **TXI Mode**, you cannot switch from **Direct Mode** to **Trunked Mode** or **Repeater Mode**.
Automatic DMO	Enable or Disable Automatic DMO. **NOTE:** When your radio enters Automatic DMO through a gateway, the radio does not support Private Calls.
TG Net Sel	Selects one or multiple networks determined by the selected talkgroup.

32.1.5
Network Select

The Network Select submenu allows you to select a network to register your radio. **Network Sel** is available only in Trunked Mode Operation (TMO) or Gateway mode, otherwise your radio display `Service Restricted` message.

32.1.5.1
Selecting Your Network

Procedure:

1. From the home screen, press the **Menu** key.

2. Select **Networks** → **Network Sel** → **Home Only**.

   Your radio registers to the home network.

32.1.5.2
Using Select Net Registration

Use this feature to migrate to another predefined network when you are out of the range of your network, and your radio displays the `No Service` message.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **Network Sel** → **Select Net**.
3. Select the required network from the list.

Result: Your radio registers to the selected network.

32.1.5.3
Using Any Network Registration

Use this feature when your radio loses the home network coverage, and you want to increase the number of networks it can scan and register.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **Network Sel** → **Any Network**.

   Your radio selects and registers to the network automatically from the predefined list.

32.1.6
Enabling Automatic DMO

NOTE: This is a Software Selling Feature.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **Network Sel** → **Automatic DMO** → **Enable/Disable**.

   NOTE:
   You can enable or disable Automatic DMO in the options menu using Trunked Mode Operation (TMO), Direct Mode Operation (DMO), and Automatic DMO option keys.

   Private Calls are not supported when your radio enters Automatic DMO through a gateway.

32.1.7
Talkgroup Network Select

The Talkgroup Network Select submenu allows you to select one or multiple networks to register your radio accordingly to the selected talkgroup.

32.1.7.1
Selecting Your Talkgroup Network

NOTE: TG Net Sel is available when the selected talkgroup is an Any Net talkgroup or a InterSystem Interface (ISI) talkgroup, otherwise your radio display `Service Restricted` message.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **TG Net Sel** → **Home Only**.

   Your talkgroup registers to the home network.

32.1.7.2
Using Select TG Net Registration

If the talkgroup selected is an Any Net talkgroup, this menu displays multiple networks allowed for registration. If the talkgroup selected is an InterSystem Interface (ISI) talkgroup, this menu displays multiple talkgroup linked networks. Use this feature to migrate to another predefined network, when you are out of the range of your network and your radio displays the `No Service` message.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **TG Net Sel** → **Select TG Net**.
3. Select the required network from the list.

32.1.7.3
Using Prefer TG Net Registration

If the talkgroup selected is an Any Net talkgroup, this menu displays multiple networks allowed for registration. If the talkgroup selected is an InterSystem Interface (ISI) talkgroup, this menu displays multiple talkgroup linked networks. Use this feature to select a network that is most preferred. The selected network is the first priority for scanning and registration.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **TG Net Sel** → **Prefer TG Net**.
3. Select the required network from the list.

32.1.7.4
Using Any TG Net Registration

The network coverage for your radio is lost. Therefore, your radio intends to increase the number of networks for scanning and registering. If the talkgroup selected is an Any Net talkgroup, this menu displays all

networks allowed for scanning and registration. If the talkgroup selected is an InterSystem Interface (ISI) talkgroup, this menu displays all talkgroup linked networks allowed for scanning and registration.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Networks** → **TG Net Sel** → **Any TG Net**.

   Your radio selects and registers to the network automatically from the predefined list.

32.2 Frequency List Type

Your radio can find a wide range of main control channels. Your radio maintains stored lists of carrier frequencies, which are scanned in an order. The use of these lists is designed in such a way to minimize the time it takes to find a valid cell.

There are four types of frequency list. Your radio can use all four frequency lists to speed up the registration process after turning on, or loss of Trunked Mode Operation (TMO) coverage.

Table 43: Frequency List Types

No.	Type	Description
1	Last Known Frequencies List	A list of discrete entries up to the last 32 frequencies stored in the configuration tool, or in the SIM Card. This is a dynamic list, which is populated and maintained by your radio only. The purpose of this list is to hold the frequencies of the last serving cell and its neighbors. Scanning this list first will allow the terminal to quickly find the last cell it was on, or one of its neighbors. The first frequency from that list is the frequency of the last serving cell.
2	Discrete Frequencies List	A second list of discrete entries up to 32 frequencies specified and programmed by the operator. This list can be used to hold frequencies most likely to be encountered by your radio, or frequencies that are preferred over others. This list is not available on the SIM card, radios that use a SIM card obtain this list from the codeplug.
3 and 4	2 Frequency Ranges	A pair of frequency range specifications, which will each cover one range of frequencies to be scanned. Each range is specified by a start frequency, then your radio scans all frequencies in 25 kHz intervals in the specified range. Having two separate range specifications allows for two non-contiguous blocks of frequencies or two different offsets. This list is not available on the SIM card, radios that use a SIM card obtain this list from the codeplug.

NOTE: The discrete frequencies list and the frequency ranges are programmed in the factory, or by the system or network operator using the configuration tool. They are not modified by your radio software.

32.3
Registration

On camping on a cell, your radio sends a registration request Protocol Data Unit (PDU) to the Switching and Management Infrastructure (SwMI), which includes a request to attach to the selected talkgroup.

If the registration and attachment succeed, your radio begins normal operation on the cell. If the registration attempt times out, or the SwMI rejects the registration for a temporary reason, another registration attempt is made. If both attempts fail, your radio attempts to camp on a different cell.

If the SwMI denies the registration request due to the location area rejection, your radio does not attempt to register again at this cell until you turn your radio on the next time. Your radio supports the modification of its subscriber class on receipt of a new subscriber class from the SwMI in the registration acknowledgment PDU. This subscriber class is used until turning off your radio or next Individual TETRA Subscriber Identity (ITSI) attach.

Your radio does not send registration signaling when one of the following occurs:

- Roaming and registration fail before your radio receives the random access acknowledgment and your radio goes back to the last serving cell.
- Your radio discovers a link failure on the serving cell. The link failure is shorter than the predefined timer, and your radio is not in the transmit inhibit mode.
- Your radio discovers a link failure on the serving cell, and is in the transmit inhibit mode. In this case, your radio always goes back to the serving cell without registration. Your radio stays in the transmit inhibit mode until the mode is turned off.

NOTE: When two or more scenarios occur at the same time, your radio registers with signaling.

If your radio discovers a link failure on the serving cell, a specific timer starts counting. If the link failure remains after the timer expires, then your radio acts as during a normal link failure. If the link failure ends before the timer expires, then your radio goes back to the serving cell without registration. This mechanism ensures that unnecessary registration is avoided.

When a radio is out of the serving cell range for a period shorter than configured in the codeplug, then your radio does not register to go back in the range.

32.4
Cell Roaming

Your radio continually monitors neighbor cells and scans the highest ranked neighbor cell.

When the state of the highest ranked neighbor cell is sufficiently better than the serving cell, or when your radio has lost the serving cell, your radio employs cell reselection procedures using the following methods:

- Undeclared cell reselection – if not in a call.
- Unannounced cell reselection – if in a call and not transmitting or link failure occurs.
- Announced type-3 cell reselection – If transmitting in a call and no neighbor has been scanned or the cells are not synchronized.
- Announced type-2 cell reselection – If transmitting in a call, and a neighbor has been scanned, and the cells are synchronized.
- Announced type-1 cell reselection – It is also known as seamless handover. If a radio is transmitting in a call and asks its serving cell to perform the reselection, the Switching and Management Infrastructure (SwMI) performs all the roaming signaling. Your radio then moves straight to the traffic channel on the new cell and continues the call without call restoration. Seamless handover enables radio to roam faster between cells while transmitting and eliminates voice interruption during calls.

For compatibility with systems that do not support type-1 or type-2 cell reselection, your radio can be provisioned to never perform these types of reselection.

Your radio decides on the need for cell reselection, based on comparison of the signal strength and the service level between the serving cell and neighbor cells. The service level criteria are based on the following criteria listed in priority order:

1. System Wide Services available (Local or Wide Trunking)
2. Valid or Invalid Subscriber Class
3. Relinquishing criteria
4. Preferred MNI criteria
5. Congestion level
6. Security Class
7. Subscriber Class
8. Quadrature Amplitude Modulation (QAM) availability
9. Home Location Area
10. Location Area (LA) Boundary
11. Cell Load
12. Local Site Trunking (LST) Services

Your radio prefers a cell that has a higher service level to one with a lower service level. If your radio is operating on a serving cell that has a lower service level than a neighbor cell, your radio roams to the neighbor, even during a call.

During network reconfiguration, a significant number of radios registered on one cell may roam. This roaming can cause major congestion on specific cells. To avoid the congestion on control channels for the specific cells, the specified radios roaming should be distributed in time.

As the operation cannot be performed immediately for all your radios, some of the radios must wait longer to roam. The time cannot be programmed not to cause any of the radios to have inferior roaming capabilities. Thus the roaming time for the radios is randomized.

The randomization means that after roaming scenario starts, a radio is not sending registration parameters to other cells at once but waits random time before sending registration Protocol Data Unit (PDU) to other cells. To avoid unwanted delays in restoring the link, link failures and other related scenarios are not randomized.

32.4.1
Cell Retention and Cell Attraction Offset

NOTE: This is a Software Selling Feature.

To limit the number of radios roaming between cells where one of the cells has only a slightly higher RSSI level, Cell Retention Offset (CRO) and Cell Attraction Offset (CAO) can be configured.

Setting the CRO parameter causes your radio to stay longer on that cell (considering RSSI parameter only).

Setting the CAO parameter causes your radio to switch over to that cell quicker (considering RSSI parameter only).

32.4.2
Seamless Handover

Seamless handover eliminates voice interruption during calls by enabling your radio to roam faster between cells while transmitting.

Faster roaming is possible because your radio asks its serving cell to perform the reselection and the SwMI performs all the roaming signaling. Your radio then moves straight to the traffic channel on the new cell and continues the call without call restoration.

32.5
Channel Selection

Each TDMA frame on a given carrier comprises four time slots, which any slot can be used as a physical channel.

The following types of physical channels are available:

- Traffic physical (TP) channel - used primarily for circuit call traffic.
- Control physical (CP) channel - dedicated only for signaling.
- Packed Data Control (PDCH) channel - dedicated for Packet Data traffic.
- Unallocated physical (UP) channel.

The following types of control channels are available:

- Main Control Channel (MCCH) - occupies the first slot of the main carrier.
- Secondary Control Channel (SCCH) - can be used to extend Control Channel capacity.

  NOTE: This is a Software Selling Feature.

The following types of SCCH are available:

- Common SCCH
- Assigned SCCH

In addition to the MCCH, a cell can have up to three common SCCHs, which could occupy slots 2, 3, and 4 in the main carrier. This solution allows your radio to distribute its population among up to four channels and so to increase Control Channel capacity at the expense of traffic channel capacity.

Until having received a specific parameter on a cell, your radio uses the MCCH. When the signal is received, each radio maps itself to a particular common SCCH, and that SCCH operates as the MCCH for your radio.

32.6
Call Restoration

Call restoration allows your radio roams to a new cell during a call, to resume the on going call upon arriving at the new cell. Cell reselection and call restoration procedures are employed for this attempt.

If your radio is a transmitting party in the call, the announced cell reselection is employed (if possible). Call restoration procedures are performed in the new cell.

If your radio is a receiving party in the call, your radio employs an unannounced cell reselection, followed by the call restoration procedures.

Call restoration is applicable for:

- Group call
- Private call

- Phone call

32.7
Mobility Service Level

Terminal mobility indicates the ability of a terminal to acquire, register, and operate on an appropriate TETRA network. The terminal is also able to change cells when the conditions require it with a minimum interruption of services.

For each neighbor cell, your radio determines the service level based on the cell's parameters as compared with the serving cell. Neighbors are not compared between each other. Each neighbor cell shall be scored as follows:

- The serving cell is Better than this neighbor cell.
- The serving cell is the Same as the neighbor cell.
- The serving cell is Worse than the neighbor cell.

To validate if serving is better/same/worse than checked neighbor, your radio shall use the service level criteria.

If the serving cell is found to be Better or Worse than the neighbor cell for a given criterion then the service level of the neighbor has been determined, and the subsequent criteria shall not be evaluated.

If all criteria for a neighbor cell are the same as the serving cell, then the serving cell shall be considered the same as the neighbor cell.

32.7.1
Operating Mode

There are two types of operating mode in a cell, Wide Mode and Local Site Trunking.

- Wide Mode - System-Wide services supported
- Local Site Trunking - System-Wide service temporary not supported. If system broadcasts indicate that system-wide services are not available (LST) on a cell, your radio registers on this cell only if there are no system-wide cells available.

Depending on the infrastructure settings, when your radio is operating on an LST cell, your radio may prevent you from invoking the following services:

- Private call
- Phone call
- Private Automatic Branch Exchange (PABX) call
- Packet data
- Short Data Service (SDS) data

Depending on the codeplug configuration, your radio may indicate entering the LST with the following notifications:

- Visible and audible
- Visible
- Audible
- None

To avoid unnecessary roaming and reduce congestion, Local Site Trunking Ignoring feature can be enabled. When Local Site Trunking Ignoring feature is enabled, your radio temporarily ignores the LST/WST parameter

when selecting a site. However, your radio still takes other parameters such as the Radio Signal Strength Indicator (RSSI) level of the cell into consideration when deciding on roaming.

The system wide services evaluation is split in two sub-criteria:

- The System-Wide criteria, which will discourage your radio from going from a wide area service cell to a local service cell, as well as encourage your radio to go from a local service cell to a wide area cell – with the rationale that wide area service is always better than local service.
- The LST criteria, which will discourage your radio from going from one local service cell to another local service cell – with the rationale that such roaming may improve RF conditions, but will destroy any ongoing communication.

The reason for this split is to allow other criteria to be evaluated when on a local service cell. The home location area criteria will thus work also between two LST cells.

32.7.1.1

Entering Local Site Trunking

When your radio receives a Local Site Trunking indication from the system, the following occurs:

- Your radio sounds an *Entering Local Site Trunking* tone.
- Display shows the `Local Area Service` message.

  NOTE: Noticeable only on the color display.

- Any call in progress is dropped upon entering Local Site Trunking Mode.

If configured by your service provider, this message/alert is periodically repeated to remind you that your radio is still operating in Local Site Trunking Mode. The following features are available:

- Registration
- Attachment
- Group Call
- Emergency Operations

NOTE: Your service provider can turn on/off all visual and audio indications, when you enter Local Site Trunking Mode.

32.7.1.2

Exiting Local Site Trunking

When the link with the central network controller is reestablished, your radio exits Local Site Trunking, and the following occurs:

- Your radio plays an *Exiting Local Site Trunking* tone.
- Any call in progress during Local Site Trunking is dropped.
- Display icons and soft keys turn blue.

NOTE: Your service provider can turn on/off all the visual and audio indications, when you exit Local Site Trunking Mode.

32.7.2
Congested Cell Handling

This feature is used only during initial registration and when roaming between sites. It is not used when camped on a site that has become busy or congested due to no free traffic channel to make or receive calls.

When the cell that the terminal is trying to register is congested, a special level-based algorithm is in the place. Depending on the level of congestion, the terminal is waiting for the registration or is rejected on that cell.

The terminal recognizes whether the cell is congested (Control Channel Congestion). The terminal tries to roam to not congested cells first, ranking congested ones as secondary. The cell congestion is one of the service level criteria.

The following cells are never marked as congested.

- Last suitable cell - if there are no other suitable cells during roaming or initial cell selection.
- Serving cell.

The feature is configurable using the configuration tool.

32.7.3
Subscriber Class

When your radio turns on, or whenever it performs registration or roaming, it always uses its provisioned Subscriber Class (SC).

When your radio registers on a cell that does not support any of its SCs, it is active only in services that have the emergency priority.

Whenever your radio SC does not match the cell SC (the feature is configurable using the configuration tool), it either uses normal ranking procedures (see Cell Roaming on page 206), or does not roam to the cell at all.

32.7.4
Subscriber Class by Talkgroup

NOTE: This is a Software Selling Feature.

You can configure up to 16 Subscriber Class by Groups in the configuration tool by assigning talkgroups to Subscriber Classes. The talkgroups can be assigned to more than one Subscriber Class according to the Group Short Subscriber Identity (GSSI) or by the folder of the talkgroup, except for the Favorite folder. If a talkgroup is assigned to more than one Subscriber Class, your radio uses the first assigned Subscriber Class.

A radio Subscriber Class changes when the user changes to a talkgroup with a different Subscriber Class. A Subscriber Class received from the Switching and Management Infrastructure (SwMI), over the air, has a higher priority than Subscriber Class by Groups. If your radio is not already using this Subscriber Class, it automatically changes to it.

The Subscriber Class by Talkgroup feature is useful in the following examples:

Preserving traffic channel capacity.
Two cells with the same coverage are placed together to multiply traffic capacity. Radios attached to Talkgroup 1 are registering on these two cells. As a result, traffic channel capacity is reduced as two channels are being used. The Subscriber Class by Talkgroup feature directs radios registered on the second cell to roam to the first cell, thus increasing traffic channel capacity.

Distributing radios across cells and prohibiting them from roaming to mismatched cells.
When there are many radios in a small area with multiple Base Transceiver Station (BTS), congestion occurs because of high roaming traffic. The Subscriber Class by Talkgroup feature directs radios attached

to the same talkgroup to roam to a matching Subscriber Class cell. Also, it does not allow radios to roam to a mismatched Subscriber Class cell.

The Subscriber Class by Talkgroup feature does not apply to supergroups as they are regarded as scanned groups.

32.7.5
Cell Surveillance and Monitoring Threshold

Your radio constantly calculates a normalized value that represents the signal strength of a cell. This value is used by radios to determine if the cell is usable and when to leave the cell.

In the default case, when your radio is camped on a cell, it initiates link failure procedures, such as leave the cell, if this normalized signal strength value falls below zero. However, it is possible to configure your radio to allow this normalized value to be processed below zero using the configuration tool; the value can be set in 1 db steps up to -5 db. Reducing this value below zero allows your radio to maintain service on a weak cell where the radio is unable to roam to a better cell.

Chapter 33

Packet Data

In Trunked Mode Operation (TMO), your radio provides a TETRA bearer service for applications that use the IP protocol. This service is available to external applications by connecting using the PEI.

Your radio operates on the single-slot packet data channel by default or the multi-slot packet data channel. The multi-slot packet data channel is a Software Selling Feature.

Your radio supports TETRA standard multi-slot packet data using the IP network layer protocol through Point-to-Point Protocol (PPP), and TETRA SNDCP protocol. The IP connection is established between Terminal Equipment and Mobile Terminal, allowing external applications to communicate with Terminal Equipment using predefined IP addresses.

NOTE: This IP connection is referred as the local link. The link between your radio and the Switching and Management Infrastructure (SwMI) is referred as the wide link. When a wide link is established, your radio is in the wide mode.

Packet data applications reside internally, over UDP, or in an externally connected device, connected using a USB cable port in your radio.

Communication to external radio is initialized using AT commands. Once connection is established, the external application requests and operates in Point-to-Point Protocol (PPP) mode until data connection terminates.

The system provides Point-to-Point IP connectivity allowing the following datagram exchanges.

- Radio ←→ External Equipment (Terminal Equipment) (for example PC).
- External Equipment (Terminal Equipment) ←→ Network (through radio).

Your radio supports only IP version 4 packets. Your radio routes datagrams independently of the protocol sitting on top of IP.

Your radio supports an MTU of 1500 bytes.

Your radio provides a best effort delivery service. If the delivery fails due to your radio environment, your radio generates ICMP messages addressed to the Terminal Equipment. Delivery may fail due to the following reasons:

- No radio coverage.
- Failed transmission.
- Service interaction.

The packet data service Packet Data Channel (PDCH) access signaling has the same priority as a circuit mode setup-related signaling. Your radio uses advanced link for packet data transmission and supports advanced link flow control. If the link does not disconnect between cells, advanced link roaming is supported.

NOTE: To transfer data from a standard computer over the air, connect the computer using the data cable PMKN4104 with your radio. Your service provider has to setup additional applications on your computer.

Your radio does not support data compression. Application attempts to negotiate data compression during context activation is rejected. If the SwMI sends a data compressed IP packet, it is silently discarded.
Your radio supports IP header compression negotiation received from Terminal Equipment during Packet Data Protocol (PDP) context activation and transparently transfers IP packets with the header compression between Terminal Equipment and the SwMI.

The packet data service employs the TETRA standard cell selection and re-selection. The packet data service suspends while the re-selection is occurring, and resumes when the cell re-selection procedure completes.

NOTE: The cell re-selection is undeclared in a strict TETRA case. However, the SNDCP protocol defines a procedure for reconnecting the packet data service on the new cell. In this case, the cell re-selection procedure resembles the unannounced cell re-selection procedure.

33.1 Voice and Data Support

Your radio can alternate between voice and packet data service. However, voice and data running in parallel are not supported. This behavior corresponds to Packet Data (PD) Type B - IP dual mode.

If the Switching and Management Infrastructure (SwMI) rejects the context activation due to `PD MS type not supported`, your radio reinitiates context activation indication to support Type C. The process is to accommodate legacy SwMIs that uses an outdated definition of these types.

Your radio supports transmitting and receiving Short Data Services (SDS) on the Packet Data Channel (PDCH). Thus, these services can be conducted in parallel.

Your radio can operate in one of the voice-data interaction modes.

Voice Only Mode

You can select **Voice Only mode**, in which PD service is disabled. If an external application attempts to start up in this mode, PD registration for a wide link is rejected. If the PD service is active when this mode is selected, your radio deactivates PD. The PEI operates in the local mode only (data transfer between Terminal Equipment (TE) and Mobile Terminated (MT)).

Data Only Mode

You can select **Data only mode**, in which normal voice calls are not permitted. Incoming non-emergency voice calls are rejected, and you cannot initiate non-emergency voice calls. Incoming and outgoing emergency calls are allowed.

Voice and Data Mode

In **Voice and Data mode** any voice call activity that occurs during a data session takes priority over the PD. When a voice call interrupts the data session, the PD session is suspended, until the voice activity ends. Then the session is resumed. Voice priority mode is the default mode.

You can choose one of the interaction modes. The choice of interaction mode is stored in non-volatile memory and remembered when turning your radio on.

In **Voice and Data mode**, if your radio moves to the traffic channel due to the voice service, your radio terminates any active packet data transmission or reception. The data service is suspended. The data service resumes when the voice service ends.

Your radio accepts any downlink SDS message received on the PDCH. Your radio can send uplink SDS messages on the PDCH.

Your radio allows PEI, Global Navigation Satellite System (GNSS) or Global Positioning System (GPS), and Wireless Application Protocol (WAP) packet data applications to activate and use the packet data context simultaneously. The first application initiates PD context activation. The next PD context activation from another PD application results in sending a reply indicating that the PD context is active. When WAP, GNSS or GPS, and PEI PD applications are using the active PD context, your radio filters the downlink IP packets based on their Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) port.

- UDP packets addressed to the WAP port (configured in the codeplug) are routed to the WAP internal application.
- UDP packets addressed to the GNSS or GPS port (configured in the codeplug) are routed to the GNSS/GPS internal application.

- UDP packets not addressed to the WAP nor the GNSS or GPS ports are routed to the PEI, using Point-to-Point Protocol (PPP).

NOTE: When activating another PD context on your radio, use the same settings in both PD contexts.

33.2 Packet Data IP Addressing

Table 44: Packet Data IP Addressing

Addressing Mode	Description
Wide IP Address	An IP address may be assigned to the terminal by the SwMI during the Packet Data (PD) context activation. When assigned, both Terminal Equipment and Mobile Terminal applications use this address as the source address in IP packets delivered to the infrastructure.
Local IP Address	By default both Terminal Equipment and your radio have their own IP addresses. Terminal Equipment and Mobile Terminal use these addresses for local datagram transmissions between Terminal Equipment and Mobile Terminal only and are not passed to the SwMI.
Static or Dynamic IP Address Assignment	The terminals support static and dynamic IP address assignment. The dynamic support is requested in the following situations: • **Request a Dynamic IP Address** is set to **Dynamic** and the PD Application Type is your radio internal PD application. • **Request a Dynamic IP Address** is set to **Dynamic** and the PD Application Type is a PEI PD application requesting dynamic IP address.

33.3 Packet Data User Authentication

The Packet Data (PD) user authentication is a method of authenticating the Terminal Equipment (TE) user before allowing the packet data link activation.

A PD Authentication server connected to the Switching and Management Infrastructure (SwMI) authenticates the Terminal Equipment user. The terminal only sends the messages between the Terminal Equipment and the SwMI. In the wide mode, the terminal offers Point-to-Point Protocol (PPP) user authentication between Mobile Terminal and Terminal Equipment using Password Authentication Protocol (PAP) or Challenge Handshake Authentication Protocol (CHAP), before the IP link is established. The terminal always attempts to negotiate usage of the CHAP method. However, your radio agrees to use PAP, when the Terminal Equipment application insists. If the terminal does not require PD user authentication, it operates without any user authentication. However, if the terminal requires the PD user authentication, it rejects the Packet Data Protocol (PDP) context activation.

NOTE: If the SwMI does not agree for the authentication method, for example PAP, the SwMI can reject it.

33.3.1
Viewing Data Statistics

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Packet Data**.

   NOTE: Data services are only available in Trunked Mode Operation (TMO). The data option must be set to **Voice Data** or **Data Only**.
3. Select one of the following options:

Option	Description
Sent Data	Displays the number of kBs sent and throughput since current Packet Data activation.
Received Data	Displays the number of kBs received and throughput since current Packet Data activation.
Bandwidth	Shows the active data session percentage.
Failed Transfer	The percentage of failed sent or received packets.

NOTE: N.A. – Standby packet data session.

33.3.2
Viewing Encryption Status

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Packet Data** → **Encryption**.

Result: The encryption state of the ongoing packet data session is displayed:

- `Packet Data Channel Clear`
- `Packet Data Channel Encrypted`
- `Encryption N/A` (clear)

Chapter 34

TETRA Network Protocol 1

TETRA Network Protocol type 1 (TNP1) is a bridge protocol based on the TETRA layer 3 over the air protocol. The TNP1 supports all TETRA dispatch functionality.

In Trunked Mode Operation (TMO), the TNP1 specifies a protocol for use over the PEI that allows Terminal Equipment (TE) to have control over the following services:

- TETRA services: Mobility management, call control, short data service.
- Supplementary services: Send GNSS or GPS reports, software information, and battery state information.

In addition, commands to access your radio configuration and storage parameters are available.

Your radio supports TETRA standard packet data using the IP network layer protocol.

Your radio can operate on the single-slot packet data channel, and the multislot packet data channel.

Packet data applications reside internally, for example: GNSS or GPS reports, WAP, or in an external device connected to the 8–wire RS232 data port on your radio. Communication to the external device is initialized using AT commands.

The system provides point-to-point IP connectivity allowing the following datagram exchanges:

- Radio ←→ External Equipment (TE) (for example PC).
- External Equipment (TE) ←→ Network (through radio).

Your radio supports IP version 4 packet.

TNP1 services can use one of two Point-to-Point Protocol (PPP) methods to connect from the terminal equipment to your radio, local mode, and wide mode. The TNP1 must be used in wide-mode wherever possible, to allow the parallel operation of TNP1-SDS services and packet data services over a common PPP link.

If transmit inhibit is entered, your radio drops the wide mode connection, thus the PEI goes back to AT mode. Then the TNP1 client detects this change and reinitiates the PPP session in local mode.

Your radio disables the TNP1 session while being in the Direct Mode Operation (DMO).

AT commands are used to initiate the PPP service for TNP1 to operate. Once the PPP session is running, all AT commands are blocked. When the PPP session is closed, AT commands are available.

34.1 TETRA Network Protocol 1 IP Addressing

Table 45: TETRA Network Protocol 1 (TNP1) IP Addressing

Addressing Mode	Description
Wide Mode	All TNP1 services are available including packet data transfer towards the Switching and Management Infrastructure (SwMI). The address used is the dynamic address radio IP, or statically configured address.
Local Mode	All TNP1 services are available except packet data transfer. The addresses used are the two static addresses TE IP: 10.0.0.101 and MT IP: 10.0.0.100.

Addressing Mode	Description
Port Addressing	Your radio uses a fixed port address for reception and transmission of TNP1 packets. The port number is 4024.

Chapter 35

Location Services

The location service feature uses information from Global Navigation Satellite System (GNSS) satellites orbiting the Earth to determine the approximate geographical location of your radio.

Your radio supports the following navigation constellation:

- Global Positioning System (GPS)
- Global Navigation Satellite System (GLONASS)
- Galileo
- BeiDou Navigation Satellite System (BDS)
- Satellite-Based Augmentation System (SBAS)
- **NOTE:** All are Software Selling Features, except SBAS.

Enhance GPS Performance

When the GPS feature is unable to complete a location calculation successfully, you hear an audible tone indicating that your radio cannot see the satellites. To maximize the ability of your radio to determine a location fix, please note the following guidelines:

Stay in the open

The GPS feature works best where there is nothing between your radio and a large amount of open sky. If possible, go outside, away from tall buildings and foliage. While the performance in a building is improved by moving closer to windows, glass with certain sun shielding films may block satellite signals.

This feature works best where there is nothing between your radio and a large amount of open sky. To maximize the ability of your radio to determine a location fix, avoid closed spaces, tall buildings, and foliage. If possible, do not use this feature in underground parking lots, tunnels, under bridges, and close to high buildings.

Your radio supports viewing your radio position and the status of the visible satellites is available. The position may consist of longitude and latitude, UK, or Irish grid coordinates.

Use the following two methods to configure the GPS feature parameters:

Configuration tool

The configuration tool provides a default profile.

Over-the-air

The commands received over the air may overwrite the default profile configuration.

The profile assigned to your radio determines when to send location data, what data to send with what accuracy and to what address.

All data requests and configuration commands received over the air are checked to confirm that they have come from a trusted source.

Location reports are accepted only from authorized Individual Short Subscriber Identities (ISSI) or IPs, depending on the configured transport layer of SDS or Packet Data.

You can enable or disable the GPS Location Service through your radio interface. If this feature is disabled, the Location Service Configuration can be programmed to the following parameters:

- Receiver – GPS Receiver is disabled. Your radio responds to location requests by informing that location reporting is disabled.

- Receiver and Location Protocol – GPS Receiver and Location Protocol are disabled. Your radio does not respond to any location requests.

Once the GPS Location Service is reenabled, your radio restores its location service.

Your radio supports GNSS trigger functions to report GNSS positions when your radio meets a set of criteria. Your service provider can set up the following triggers, together with their specific parameters:

Table 46: GPS Triggers

LIP Triggers can be configured for TMO only, DMO only, or both modes at the same time.

Trigger Type	Trigger Event
Power-up	Radio turns on in TMO.
Power-down	Radio turns off in TMO.
Emergency condition	Radio enters emergency operations.
Periodic	Given time interval after the last location report expires.
Moved	Radio position has changed by at least the distance defined (your radio checks the movement from the last known position at an interval).
TMO ON	Successful registration on entering TMO from DMO.
DMO ON	Before TMO deregistration, and before entering DMO.
Transmit Inhibit Mode (TXI) ON	Radio is about to enter TXI.
Transmit Inhibit Mode (TXI) OFF	Radio has successfully registered after leaving TXI.
Loss of GPS	Radio detects a loss of GPS for a minimum duration defined by the service provider.
Recovery of GPS	Radio detects a recovery of GPS signal for a minimum duration defined by the service provider.
Status entered (Status and RMS Status)	Your radio sends a status defined in the codeplug for location reporting by programming.
GPS ON	The positioning device has been switched ON.
GPS OFF	The positioning device in your radio is switched OFF.
Emergency Periodic Profile (LRRP only)	Your radio is in emergency operation and given a time interval after the last location report expires.

35.1 Different Location Displays

Table 47: Different Location Displays

Latitude/Longitude	UK Coordinates	Irish Coordinates	UTM Coordinates	MGRS Coordinates
Time	Time	Time	Time	Time

Latitude/Longitude	UK Coordinates	Irish Coordinates	UTM Coordinates	MGRS Coordinates
Latitude	2-Letter Code	1-Letter Code	3-Letter Code	3-Letter Code and 2-Letter Code
Longitude	Easting and Northing Coordinate	Easting and Northing Coordinate	Easting and Northing Coordinate	Easting and Northing Coordinate
Altitude	Altitude	Altitude	Altitude	Altitude
Satellites	Satellites	Satellites	Satellites	Satellites

- Time – Indicates when the last time the location was calculated. The time is provided in Universal Time Coordinated.
- Letter Code – Grid zone or square on the map for different coordinate standard.
- Latitude – Expressed in degrees, minutes, and seconds.
- Longitude – Expressed in degrees, minutes, and seconds.
- Number of satellites – Used to calculate the location. In general, more satellites provide better accuracy. The maximum is 12 satellites.
- Easting – Refers to the eastward-measured distance expressed in meters.
- Northing – Refers to the northward-measured distance expressed in meters.

NOTE: Skipping each digit of easting and northing coordinates decreases the accuracy by the factor of 10.

35.2 GNSS Accuracy

The GNSS Location Service accuracy depends on the GNSS coverage.

In good GNSS coverage (at least -130 dBm or in open sky), the location accuracy is < 5 m for 95% of location reports.

35.3 Location Report

Your radio can record location track when it is out of service, when in Direct Mode Operation (DMO), or when in Transmit Inhibit (TXI) mode.

Your radio can be triggered to send Location Reports in various circumstances, for example:

- Upon a request
- Entering Emergency Mode
- At specified time intervals
- At specified distance intervals

The Location Reports can be sent in two ways using:

Short Data Service (SDS)

The Location Reports are sent using SDS with User-Defined Data Type-4 as a Transport Layer (SDS - TL), using one of the methods below:

- European Telecommunications Standards Institute (ETSI) Location Information Protocol (LIP)

- Motorola Solutions Location Request/Response Protocol (LRRP) GPS Location Protocol, which uses either:
  - SDS - TL (for added reliability)
  - Simple GPS with no SDS - TL (for saving air interface resources)

Packet Data (Trunked Mode Operation (TMO) only)

Packet Data must be enabled on the network to send Location Reports using Packet Data. When this feature is enabled, your radio requests for Packet Data context activation. Triggers and location information sent or received are carried out similarly to the SDS. Sending or receiving triggers and location information during Direct Mode Operation (DMO) or Emergency Mode is not possible.

Disabling this feature using your radio interface deactivates the Packet Data service and the ongoing Packet Data session deregisters.

If the Location Reports are sent over the Packet Data, a Packet Data icon is displayed when the message is being sent. If a Packet Data connection cannot be established, your radio is not able to send or receive GPS data.

Location reports are sent in TMO. Your service provider can also provision location reports to be sent in Direct Mode Operation (DMO). If configured, Location Information Protocol (LIP) sends the emergency trigger LIP report in emergency priority when your radio is in emergency mode or emergency call. If your radio is provisioned to provide user indications, the feature operational status is indicated on your radio display. Also, if configured by service provider, your radio gives an audio-visual notification upon reception of LIP command.

Location Report Backlog

Your radio can record location track when it is out of service, when in DMO, or when in TXI mode.

The location reports generated during this time is stored, and all location report backlog recordings are uploaded once your radio is back in service. Your radio can save up to maximum 180 location reports. The location report backlog function differently when in different mode:

Location Backlog Recording in Trunked Mode Operation (TMO)

Your radio starts recording location reports when radio is out of service in TMO Mode.

Your radio resumes latest location reporting when TMO coverage is regained.

Location Backlog Recording in Direct Mode Operation (DMO)

Your radio starts recording location reports in DMO Mode.

Your radio resumes latest location reporting when it switches back to TMO mode.

NOTE: This feature is only available when enabled by your service provider.

Location Backlog Recording in Transmit Inhibit Mode (TXI)

When your radio is in TXI mode, location reports are generated and recorded but not sent out.

Once your radio exits TXI mode and is within TMO coverage, the location reports are uploaded to the server.

35.4
Military Grid Reference System

NOTE: This is a Software Selling Feature.

The Military Grid Reference System (MGRS) is the geo-coordinate standard used by the military for locating points on Earth. The MGRS attempts to represent the entire surface of Earth on a worldwide grid. The grid is

based on the UTM (Universe Transverse Mercator) between 80° S and 84° N latitudes and UPS (Universal Polar Stereographic) systems.

The UTM area is divided into 60 longitudinal strips, each 6° wide. The strips are numbered 1–60 beginning at the 180°–174° W (Zone 1) and increase to the East. Each strip (or Zone) is then divided (horizontally) into 8° latitude bands.

NOTE: An example of an MGRS coordinate would be **19TDJ3858897366**, which consists of:

- **19** is the UTM Zone Number
- **T** is the corresponding UTM latitude band letter
- **DJ** is the MGRS Grid Reference used to define the 100 km square within the UTM/UPS block. The columns A-Z (excluding "I" and "O"), like UTM, start at 180° and increase towards the East. Every three columns, the pattern repeats. Letters designating rows, increase towards the North. The letters cycle backwards through the alphabet in the southern hemisphere (towards the South):
  - **D** is the MGRS column letter
  - **J** is the MGRS row letter
- **38588** is the 5-digit MGRS Easting value. It represents the number of meters East of the origin (that is, southwest corner) of the 100 km square in which it is contained.
- **97366** is the 5-digit MGRS Northing value. It represents the number of meters North of the origin (that is, southwest corner) of the 100 km square in which it is contained.

MGRS Support feature can be programmed in configuration tool. You can choose to display the GNSS/GPS coordinates in MGRS format.

35.5 Enabling GNSS

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Location** → **Interface**.
3. Select **On**.

   NOTE: Your service provider can enable this feature.

35.6 Viewing Your Position

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Location** → **Position**.
3. To refresh your position, select **Position** and press **Refresh**.

35.7 Viewing the Testpage

Procedure:

1. From the home screen, press the **Menu** key.

2. Select **Location** → **Testpage**.
3. Select one of the following options:

Option	Description
Position	To view detailed information of your current position. Your radio displays: • Time • **N** for latitude • **E** for longitude • **H** for height • **Sats Used** for several tracked satellites • **B** for bearing • **HS** for horizontal speed • **LC** for level of confidence
Power	To view detailed information of a satellite. Your radio displays: • **PRN** code • **Status** • **Mode** • **C/N** for carrier-to-noise ratio
Version	To view detailed information of the software version. Your radio displays: • **SW** for software version • **HW** for hardware version • **ASIC** for application-specific integrated circuit • **RC** for release code

35.8
Backlog

The backlog submenu allows you to enable or disable, view, and delete backlog reports.

NOTE: The backlog of location reports is only available when Local Information Protocol (LIP) is enabled.

35.8.1
Enabling or Disabling Backlog

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Location** → **Backlog** → **Enablement**.
3. Select one of the following options:

Option	Description
On	To enable recording the location report backlog.
Off	To disable recording the location report backlog.

35.8.2
Viewing Backlog Reports

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Location** → **Backlog** → **Reports**.

Result: The display shows the number of backlog reports that are stored.

35.8.3
Deleting All Backlog Reports

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Location** → **Backlog** → **Delete All**.

Chapter 36

Wi-Fi

NOTE: Your radio supports MAC Randomization feature. This feature enhances your privacy by using randomized MAC addresses. MAC Randomization prevents others from tracking your location when you connect to a Wi-Fi network.

Wi-Fi features enable your radio to connect to a network wirelessly. You can set up and connect a Wi-Fi network to update your radio firmware and codeplug.

Your radio supports WPA, WPA2-PSK, and 802.1x EAP-TLS.

Frequency Bands

IEEE 802.11n supports both 2.4 GHz and 5 GHz unlicensed frequency bands. These unlicensed bands enforce strict transmission power limits to prevent interference among devices.

Operation Modes

The operation mode supported is Wi-Fi Client.

Network Security, 802.11i

The supported security types include the following items:

Wi-Fi Protected Access (WPA) and WPA2

WPA/WPA2-PSK (Pre-Shared Key) requires a passphrase between 8 to 63 characters. The authentication protocols are the Advanced Encryption Standard (AES).

WPA/WPA2-Enterprise or 802.1x EAP-TLS, provides more security than WPA-PSK. 802.1x EAP-TLS offers individualized and centralized control over access to the Wi-Fi network. When trying to connect to the network, your radio will use the MSI certificate as a credential to authenticate with RADIUS.

36.1

Turning Wi-Fi On or Off

Prerequisites: Contact your service provider to enable the Wi-Fi feature for your radio.

Turning Wi-Fi On

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi** → **Wi-Fi: Off** → **On**.

Result:
The display shows a notification of the Wi-Fi status.

Turning Wi-Fi Off

Procedure:

1. From the home screen, press the **Menu** key.

2. Select **Wi-Fi** → **Wi-Fi: On** → **Off**.

Result:
The display shows a notification of the Wi-Fi status.

36.2
Connecting to Networks Through Scan

NOTE: After connecting your radio to a network, the Certificate Enrollment process automatically begins. See Viewing Certificate Enrollment Status on page 228.

Prerequisites: Turn on Wi-Fi.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi** → **Scan**.

   When the scan is complete, your radio displays a list of Wi-Fi networks within range.
3. Select the required network, and press **Connect**.

   IMPORTANT: When the Wi-Fi function is enabled, and **Active Scanning** is constantly turned on, an attacker can use the Wi-Fi signal to identify and monitor the location of your radio. When a Wi-Fi feature is required for Active Scan, you are recommended to enable the **Wi-Fi Auto Off** feature to minimize your risk.

   NOTE: Your radio can only connect to networks that are predefined in the codeplug. If you attempt to connect to nondefined networks, the display shows a negative notification.

Result: When your radio is connected to the network, the display shows a positive notification.

36.3
Connecting to Networks Through Network List

NOTE: After connecting your radio to a network, the Certificate Enrollment process automatically begins. See Viewing Certificate Enrollment Status on page 228.

Prerequisites: Turn on Wi-Fi.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi** → **Network List**.
3. From the list of predefined networks, highlight the required network.

   NOTE: The Network List lists all predefined networks. However, some of the listed networks are not within the Wi-Fi range of your radio.
4. Press **Connect**.

Result: When your radio is connected to a network, the display shows a positive notification.

36.4
Viewing Network Information

Prerequisites: Connect to a network.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi** → **Network Information**.

Result: The display shows information of the connected network.

36.5 Viewing the MAC Address

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi** → **MAC Address**.

Result: The display shows the MAC address of the Wi-Fi chip.

36.6 Viewing Certificate Enrollment Status

This feature allows you to check the status of the certificate enrollment.

The certificate enrollment validates your radio to be able to use certain radio features such as Wi-Fi OTAP or 802.1x EAP-TLS Network. The certificate enrollment only needs to be performed one time, and automatically starts when you first configure and connect your radio Wi-Fi to an access point with internet connection. Your radio is already preloaded with the required root certificates and settings for the enrollment.

Prerequisites: Turn on Wi-Fi.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi** → **Cert. Management**.

Result:
Your radio displays the following information:

Table 48: Certificate Management Categories

Category	Description
Device Key	Indicates whether the Radio Device Key Pair is present in your radio.
Base	Indicates the enrollment status of the Base Certificate in your radio.
Wi-Fi OTAP	Indicates the enrollment status of the Wi-Fi Over-the-Air Programming (OTAP) Service Certificate. **NOTE:** This is a Software Selling Feature.
Wi-Fi Enterprise	Indicates the enrollment status of the Wi-Fi Enterprise Service Certificate.

If enrollment is successful
Your radio displays `Enrolled` for each respective certificate.

If enrollment failed or enrollment not started

Your radio displays `Not Enrolled` for each respective certificate. You can trigger a reenrollment using the **Retry** button.

NOTE: The **Retry** button will not be visible if the certificate enrollment was rejected by the server.

Chapter 37

Over The Air Programming

NOTE: This is a Software Selling Feature.

Over The Air Programming (OTAP) enables remote radio reconfiguration over Wi-Fi network.

37.1 Wi-Fi OTAP

NOTE: This is a Software Selling Feature..

Wi-Fi Over-the-Air Programming (OTAP) allows your radio to upgrade radio software and configuration wirelessly over a Wi-Fi connection. Your radio pulls updated files from the Integrated Terminal Management (iTM) instead of having those files pushed out by the programmer.

For each update, your radio uploads the device inventory to iTM. Your radio then gets a job descriptor from iTM. The job descriptor indicates pending jobs and files to download or upload.

OTAP over Wi-Fi includes the following jobs:

- Updating firmware.
- Updating configuration.
- Updating languages.
- Reading the codeplug.

If the Wi-Fi Auto-On or Off feature is enabled while your radio Wi-Fi connection is turned off, the Wi-Fi turns on automatically when you turn on your radio. This process allows your radio to check for updates and send programming status updates to the iTM. Your radio Wi-Fi connection reverts back to off mode when one of the following conditions is fulfilled:

- When **Check for Updates** returns a negative result, a 30 s timer starts to turn off the Wi-Fi. The occurrence of a negative result is due to one of the following reasons:
  - No Wi-Fi connection.
  - iTM server is not available.
  - No OTAP updates are available.
- When **Mandatory Update** is available:
  1. Your radio downloads the update, performs the upgrade, and reboots.
  2. After rebooting, your radio sends the programming status update to the iTM.
  3. Starts the 30 s timer to turn off the Wi-Fi.
- When **Non-Mandatory Update** or **Mandatory Update Upon Ignition Sense** is available:
  1. Your radio downloads the update, and starts the 30 s timer to turn off the Wi-Fi when the download completes.
  2. Your radio reboots after installing the update.
  3. After rebooting, your radio sends the programming status update to the iTM.

4. Starts the 30 s timer to turn off the Wi-Fi.

NOTE:

- The 30 s timer is run at the background of your radio. Once the timer expires, the Wi-Fi connection is automatically turned off without any notification statuses.
- The Wi-Fi status changes automatically if Wi-Fi Auto-On or Off feature is enabled.

37.2 Receiving Non-Mandatory Wi-Fi OTAP Update

Prerequisites: Your radio display shows an **Wi-Fi OTAP** prompt with `Restart required. Install update?` text for a new configuration update.

Procedure:

Install updates by using one of the following options:

Option	Actions
Installing updates immediately	Select **Now**.
Installing updates later	**a.** Select **Later**. Your radio shows `New radio settings before upgrade completion will not be preserved.` **b.** Perform one of the following actions: • To return to **Wi-Fi OTAP** prompt, select **Back**. • To postpone the update, select **Confirm**. The *OTAP over Wi-Fi Update Available* icon is indicated at the status bar.

Result:
When the OTAP installation prompt is accepted, your radio updates with the new configuration as received over OTAP. Visible indication guidance and update status are provided during the update.

When the OTAP installation prompt is rejected, your radio returns to idle mode.

NOTE:
If a non-mandatory update prompt is received when your radio is operating in a data box mode, the system automatically installs the update. A 10 s countdown is initiated, similar to a mandatory update.

37.3 Receiving Mandatory Wi-Fi OTAP Update

Prerequisites: Your radio display shows a **Wi-Fi OTAP** prompt with `Auto restart for update: 10` text for a new configuration update.

Procedure:

Your radio restarts to complete installation once the countdown timer expires.

NOTE: All Land Mobile Radio (LMR) services are unavailable during the countdown period.

37.4
Receiving Mandatory Upon Ignition Sense Wi-Fi OTAP Update

Prerequisites:
Your radio display shows a **Wi-Fi OTAP** prompt with `Auto restart for update: 10` text for a new configuration update when Ignition Sense is triggered.

Procedure:

Your radio restarts to complete installation once the countdown timer expires.

If you keep the ignition off after restarting, your radio remains turned off.

NOTE: All Land Mobile Radio (LMR) services are unavailable during the countdown period.

37.5
Managing Wi-Fi OTAP

NOTE: This is a Software Selling Feature. This feature is only available when enabled by your service provider.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Wi-Fi OTAP**.
3. Select one of the following options:

Option	Description
Check for Updates	Checks for new available updates.
Install Update	Installs the postponed update. The **Wi-Fi OTAP** prompt appears.
Last Updated	Shows the last installed Wi-Fi OTAP information and status of the installation.

Chapter 38

Bluetooth

Bluetooth is a wireless technology used to create personal networks operating in the 5.2 GHz unlicensed band with a range of up to 90 m.

Bluetooth feature allows your radio to interact with standard or commercial Motorola Solutions and third-party audio accessories, wireless PTT, and wireless data services.

By default, Bluetooth is activated on your radio. Your radio supports the Headset Profile (HSP).

Secure Connection feature offers encrypted communication between radio and accessory, encrypted with AES encryptions. Your radio support mode 4 level 4 Secure Connection.

Your radio supports Bluetooth 5.3.

The Secure Simple Pairing feature ensures a high level of security while pairing devices, thus protecting you against recording and passive eavesdropping. One radio can be connected with six data connections and one audio connection.

Your radio supports Bluetooth 5.3. The Secure Simple Pairing feature ensures a high level of security while pairing devices, thus protecting you against recording and passive eavesdropping.

The usable range can be reduced when you connect your radio with devices that support more limited ranges, or if physical obstacles such as walls appear between devices. The following Bluetooth features are available:

- Bluetooth Audio – includes Bluetooth Audio and Fast Push-to-Talk (PTT)
- Bluetooth Radio Control – includes Bluetooth Radio Control using AT commands, Bluetooth Generic Attribute Profiles (GATT) Sensors and M-Radio Control Application on Android smartphone and tablets.
- Bluetooth Smart Ready includes:
  - Bluetooth Generic Attribute Profiles (GATT) Sensors

NOTE: Bluetooth Audio, Bluetooth Radio Control, and Bluetooth Smart Ready are Software Selling Features.

You can use Bluetooth to:

- Connect your radio with wireless accessories, for example, a headset, which gives you a greater freedom of movement and increases your work comfort. Also, wireless accessories allow performing the same activities in several ways. For example, you can change the volume level either in the headset or on your radio.
- Increase connectivity with secure packet data services between your radio and a data device or a smartphone running appropriate applications.
- Enable radio control through a data device.

38.1 Bluetooth Interactions

The Bluetooth feature interacts differently with other features and situations of your radio.

The following features and situations limit the use of Bluetooth:

Covert Mode

Your radio cannot enter Discoverable Mode while in the Covert Mode as Covert Mode has a higher priority.

Transmit Inhibit Mode (TXI)

Bluetooth does not work in the Transmit Inhibit Mode. When your radio enters TXI while Bluetooth is enabled, all remote devices are disconnected and Bluetooth is disabled. After leaving the TXI, Bluetooth is enabled again (if it was previously turned on).

38.2 Bluetooth Restrictions

TETRA Radios support simultaneous connection with up to seven remote devices.

The following restrictions on combinations of connected remote devices apply:

- It is only possible to connect one Motorola Solutions Push-to-Talk (PTT) device at a time.
- It is only possible to connect one Bluetooth (BT) audio device at a time.

38.3 Bluetooth Sensor Data

Your service provider can configure the details of the sensor information your radio displays.

Depending on the type of sensor connected to your radio and the setup configured by your service provider, various types of information are displayed. The following sections contain information on the most significant, predetermined data your radio displays.

Sensor Battery Information

Your radio displays the percentage of the remaining battery power of the connected sensors.

Heart Rate Sensor

If a heart rate sensor with the Energy Expended feature is paired and connected to your radio, two values are displayed:

- Heart Rate in bpm
- Energy Expended in kJ

Sensor Alarm

A radio paired with appropriate sensors increases the security of your radio user by making the user more aware of their surroundings. If the collected values exceed limits set by your service provider, your radio plays an alarm tone, light the LED, and display a warning message. The alarm concerns, for example, low battery, high toxicity, or low/high heart rate.

The alarm is active for a predefined time or until you discard it.

38.4 Enabling Discoverable Mode

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Bluetooth** → **Discoverable**.

Result:

Your radio remains discoverable to other Bluetooth-enabled devices for the configured time.

38.5 Adding Bluetooth Devices

Prerequisites:
For sensor devices and radio control devices, contact your service provider to add them into your radio codeplug.

Examples of sensor devices are barcode scanners and heart rate sensors.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Bluetooth** → **Add Device**.

38.6 Configuring Bluetooth Settings

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Bluetooth** → **Settings**.
3. Select one of the following options:

Option	Description
Bluetooth	Enables or disables Bluetooth.
Name	Edits the name of your radio. This name is visible to other remote devices.
Discoverable	Defines how long your radio remains discoverable.
Indications	Enables or disables audible indications from your radio during Bluetooth actions.

38.7 Pairing Bluetooth Devices with Your Radio

Pairing is a process that creates a link between two Bluetooth-enabled devices. Once paired, devices remember each other and every subsequent connection between them is authenticated automatically.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Bluetooth** → **Add Device**.

   The device that you want to connect with must be in pairing mode.
3. Highlight the required device and select **Connect**.

   Improve the connection between an accessory and your radio by pressing the **PTT** button on the accessory.
4. If needed, enter a PIN code or a passkey.

   NOTE: If you enter an incorrect PIN code and the subsequent pairing take too long or result in an error message, power cycle the Bluetooth device. Your radio accepts three attempts.

38.8 Connecting Devices

NOTE: If Secure Connection Only is enabled for your radio, your radio only connects to accessories that support secure connection. Your radio can only pair with one device using a secure connection.

Prerequisites:

- To connect to specific devices, contact your service provider to configure your radio.
- Use only preapproved sensor devices such as barcode scanners and heart rate sensors.

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Bluetooth** → **Devices**.
3. Highlight the required device, and press **Menu/OK**.

   NOTE:
   Depending on the languages installed on your radio, some characters in names will not display properly.

   Radio-initiated automatic reconnection with several remote Bluetooth devices at the same time cannot be guaranteed to be successful in 100%, due to the fundamental nature of Bluetooth. In case the reconnection fails after turning on, reconnect the device manually.
4. Select **Connect**.

38.9 Disconnecting Devices

Procedure:

1. From the home screen, press the **Menu** key.
2. Disconnect devices from your radio by using one of the following options.

Option	Actions
Disconnecting a device	**a.** Select **Bluetooth** → **Devices**. **b.** Highlight the required device and press **Disconnect**.
Disconnecting all devices	Select **Bluetooth** → **Disconnect All**.

38.10 Managing Devices

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Bluetooth** → **Devices**.
3. Highlight the required device, and press the **Menu** key.
4. Select one of the following options:

Option	Description
Name	Displays the name of the device. The name is editable only if your service provider did not preset it.
Type	Displays the type of device. This menu item cannot be configured.
Delete	Removes the device from the list of paired devices.

Chapter 39

Wireless Application Protocol (WAP)

NOTE: This is a Software Selling Feature.

Wireless Application Protocol (WAP) is a standard application layer network communications within a wireless communication environment such as TETRA network. The protocol is used to access the mobile web from a radio through a WAP browser.

39.1 WAP Browser

NOTE: This is a Software Selling Feature.

The Openwave Mobile Browser is a Wireless Application Protocol (WAP)-compliant user agent. The WAP browser is available only in Trunked Mode Operation (TMO) and on a network with Packet Data enabled, provides all the basic services of a computer web browser.

Depending on the configuration tool, the display can return to the browser session automatically after an interruption by the preemptive display. The WAP browser does not support right-to-left languages (such as Arabic and Hebrew), English is used instead. The characters of right-to-left scripts are not displayed.

NOTE: Depending on your radio configuration and the network conditions, the WAP browser may not display images properly (or may display them with a delay).

The browser menu includes the following panes:

Table 49: Browser Menu Panes

Menu Pane	Description
Navigate	Provides access to the home page and commonly used items.
Bookmarks	Provides access, editing, and storage options to stored bookmarks and saved pages.
History	Provides access to recently visited pages and shows the position of the currently loaded page in the history stack.
Tools	Provides access to applications and utilities.

The following panes are displayed according to the context:

Table 50: Additional Menu Panes

Menu Pane	Description
Options	Displayed only when there are additional options for the pane or page.
Image	Displayed only when an image is selected. Provides access to image details, storage, and display use.
Input Text	Displayed only in text entry mode. Provides access to text entry mode (for example, symbol).

39.1.1

Using the Browser

Setting Up Data

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Setup** → **Data Setup**.
3. Select **Data Only** or **Voice & Data**.

Entering the Browser

Procedure:

1. From the home screen, press the **Menu** key.
2. Select **Browser**.
3. To exit the browser, press and hold the **End** key.

Entering Browser Menu Panes

Procedure:

1. Press the **Menu** key.

   Your radio displays the Navigate pane, or the last browser menu pane.

2. If you navigate to a web page with two or more soft keys options, the **Options** pane appears. Perform one of the following actions:
   - In the **Options** pane, scroll to other panes by pressing the **Left** or **Right** navigation keys.
   - Select **Browser Menu** and scroll to the required pane.

Exiting the Browser

Procedure:

To exit the browser, press and hold the **End** key.

39.1.2

Tips for Browsing

Tips for methods that help with easy browsing.

39.1.2.1

Creating Bookmarks Using the Navigate Pane

Procedure:

1. Open the browser, and browse to the required page.
2. To enter the browser menu, press **Menu**.

3. Select **Mark Page**.

   The screen displays the title and URL of the marked page.

4. Press **Save** or **Select**.
5. Select **Menu**.
6. Perform one of the following actions:
   - Confirm the created bookmark by selecting **Save**.
   - Edit the title, folder, choice, and URL of the created bookmark by selecting **Edit**.

39.1.2.2
Creating Bookmarks Using the Bookmarks Pane

Procedure:

1. Open the browser, and scroll to the **Bookmarks** pane.
2. Select **Organise** or **More...**.

   The **Organise** option is for when no bookmarks are saved.
3. Select **Menu**.
4. Scroll to **New Bookmark**.
5. Enter the title and URL of the bookmark, and select the location of the bookmark.
6. Press **Save**.

39.1.2.3
Downloading Pages Using Bookmarks

Procedure:

1. Open the browser, and scroll to the **Bookmarks** pane.
2. Scroll to the required bookmark, and select **Go**.

Result:
The bookmark downloads the selected page.

39.1.2.4
Creating Hotkeys

Procedure:

1. Open the browser, and scroll to the **Bookmarks** pane.
2. Scroll to the required bookmark, and press **Menu**.
3. Select **Hotkeys** and an unassigned key.

   The available keys are **1** to **9**.
4. Select **Assign**.

Result: The display shows the bookmark and assigned hotkey.

39.1.2.5
Downloading Pages Using Hotkeys

Procedure:

1. Open the browser.
2. To download a bookmarked page, press and hold the corresponding hotkey.

39.1.2.6
Saving Pages for Offline Browsing

Procedure:

1. Open the browser, and browse to the required page.
2. Press **Menu**.
3. Scroll to the **Tools** pane.
4. Select **Save Page**.

   If required, edit the suggested page title.
5. Scroll down, and select **Save**.

Result: Your radio saves the page into the **Bookmarks Saved Pages** folder.

39.1.2.7
Selecting Saved Pages

Procedure:

1. Open the browser, and scroll to the **Bookmarks** pane.
2. Select **Organise** or **More...**.

   The **Organise** option is for when no bookmarks are saved.
3. Enter the **Saved Pages** folder by selecting **Go**.
4. Select a saved page, and press **OK**.

Result: The display shows the saved page. Depending on the saved page, you can browse the web from there.

39.1.3
Disabled Packet Data Service

If there is no Packet Data Service, your radio displays `Error: No Network Available` when entering the browser for the first time. Select **Left** Soft key to retry entering, or **Right** Soft key to enter the browser menu.

When re-entering the browser with previously available Packet Data, your radio displays the last browsed page, or the last page to which you navigated off-line.

39.1.4
Disabled Browser Entry

Browser entry is disabled:

- During any type of voice call, except Ambience Listening Call.

- In DMO Mode.
- During Emergency Mode.
- During PIN lock.
- Service provider has not configured this feature.
- When your radio is disabled.

NOTE:

- Browser entry is enabled during Ambience Listening (AL) Call. If you navigate to previously stored pages, the AL state remains.
- When you activate Packet Data for the first time, AL is disconnected, and you have the same look and feel as if you were not in AL before.

39.1.5
Managing Bookmarks

Procedure:

1. From the Bookmarks pane, select **Organise** or **More...**

   The **Organise** option is for when no bookmarks are saved.
2. Scroll to a bookmark and press **Menu**.
3. Select one of the following options:

Option	Description
Back	To display the bookmarked page.
Details	To modify the title and URL of the bookmark.
Delete	To delete the bookmark.
New Bookmark	To create a bookmark.
New Folder	To create a folder.
Move	To move the bookmark to a new folder.
Delete All	To delete all bookmarks.
Hotkeys	To assign hotkeys to bookmarks.

39.1.6
Managing Saved Pages

Procedure:

1. From the Bookmarks pane, select the **Saved Pages** folder.
2. Scroll to a saved page and press **Menu**.
3. Select one of the following options:

Option	Description
Back	To display the saved page.
Details	To modify the title and URL of the saved page.

Option	Description
Update Page	To replace the saved version with the current version that must be downloaded from the server.
Delete	To delete the page from the cache.
Delete All	To delete all saved pages from the caches.
Cancel	To exit and return to the previous page.

39.1.7
Managing Documents

Procedure:

1. From the Tools pane, select **More...**
2. Scroll to a document and press **Menu**.
3. Select one of the following options:

Option	Description
Show URL	To display the URL of the current page.
Save Page	To create a snapshot of the document.
Find Text	To find a text string in the document.
Copy Text	To copy text from the document to the clipboard.

39.1.8
Searching for Visited URLs

You can search up to nine recently visited pages from the History pane.

Procedure:

1. From the History pane, select the URL.
2. Press **OK**.

39.1.9
Inserting URLs

The Text Input pane is visible when text entry fields are active. This pane allows you to input alphanumeric characters and symbols.

Procedure:

1. From the browser, select the URL.
2. Open the Text Input pane by pressing the **abc** softkey.
3. Insert the URL by pressing the following softkeys:

Option	Description
abc	To insert alphabetic characters in lower case.

Option	Description
ABC	To insert alphabetic characters in upper case.
123	To insert numeric characters and symbols.

4. Select **www** for HTTP mode.
5. Select **.com** or other required extensions.

Result: The display shows the URL with the selected extension.

39.2
WAP Push

NOTE: This is a Software Selling Feature.

Wireless Application Protocol (WAP) Push allows WAP content to be pushed to a radio.

This push is carried out by sending a specially formatted (Push Access Protocol) XML document to the Push Proxy Gateway, that in turn forwards the document to your radio.

A WAP push message is an encoded message including a link to a WAP address. When receiving a WAP push, a WAP enabled radio automatically gives the option to access the WAP content. The implemented WAP push is compliant with WAP 2.0 standard.

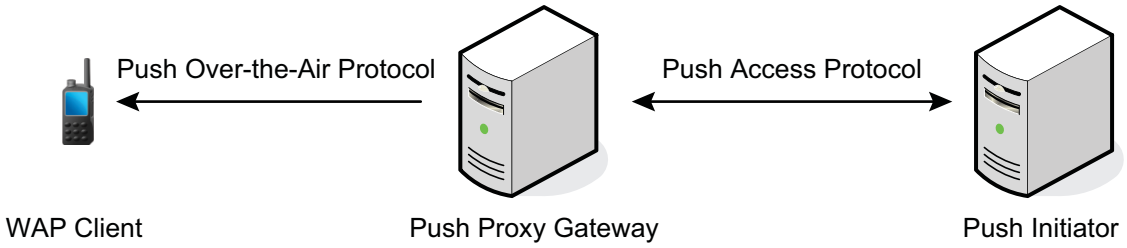
Your radio supports WAP 2.0 through a proxy only. Proxy-less connections are not supported.

39.2.1
WAP Push Framework

A push operation in Wireless Application Protocol (WAP) is carried out by allowing a Push Initiator (PI) to transmit push content and delivery instructions to a Push Proxy Gateway (PPG). The PPG delivers the push content to your radio as per to the delivery instructions.

The PI is an application running on a web server and communicating with the PPG using the Push Access Protocol (PAP). The PPG uses the Push Over-The-Air (OTA) Protocol to deliver the push content to your radio.

Figure 19: Push Framework



39.2.2
WAP Push Service Indication

The service indication (SI) presents a notification and an associated URL with a prompt to enter the URL on your radio display. The notification is then stored in the Wireless Application Protocol (WAP) box for subsequent presentation.

The SI can be valid only for a certain amount of time. After the specified time elapses, the SI indicates void content. The author of an SI can set the expiration date and time, that is, when the SI is automatically deleted from your radio.

The service provider can remotely delete SIs that became invalid. The removal is carried out through sending a special SI to delete the invalid entity.

A new SI is indicated with a respective status icon, tone, and a pop-up. The pop-up occurrence depends on the SI priority (high and medium) and your radio conditions (for instance, if your radio is in a call the pop-up does not appear). Depending on the periodic alert feature availability, a notification of an unread SI can be indicated with periodic notification, similarly to a Short Data Service (SDS) message.

39.2.3
WAP Push Service Load

Service Loads (SL) differ from the Service Indications (SI) by the fact that they do not prompt to enter the URL. Instead, the browser is automatically activated. The SL contains a URL indicating what service to load.

A new SL is indicated with a respective status icon, tone, and browser activation. The browser activation depends on the SL priority (high) and your radio conditions (for instance, if your radio is in a call, the browser does not display).

SL messages sent with urgency cache is not indicated directly to the user. Such SL messages load content and store it in the cache (the process works in the background, only the PD icon is visible to the user).

Chapter 40

General Purpose Input Output

The General Purpose Input Output (GPIO) port contains a group of GPIO pins that are mostly programmable.

There are two programmable GPIO on Control heads such as NGCH/IP54 RECH/IP67 RECH and two programmable GPIO in radio through transceiver.

40.1 Control Head GPIO

The DB25 and 10-pin back connectors are available on the following control heads:

- IP67 Remote Ethernet Control Head (IP67 RECH)
- IP54 Remote Ethernet Control Head (IP54 RECH)
- TELCO Control Head
- Telephone Style Control Head (TSCH) (GPIO 2 only)

The corresponding pins on the DB25 and 10-pin connectors are:

DB25 Connector (all Control Heads except TSCH)

Car Audio Mute – pin 1 (not programmable)

GPIO1 – pin 14 (programmable through configuration tool)

GPIO2 – pin 3 (programmable through configuration tool)

10-pin connector (TSCH)

GPIO2 – pin 2 (programmable through configuration tool)

Figure 20: DB25 Connector on the Remote Control Head

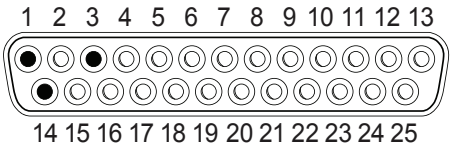
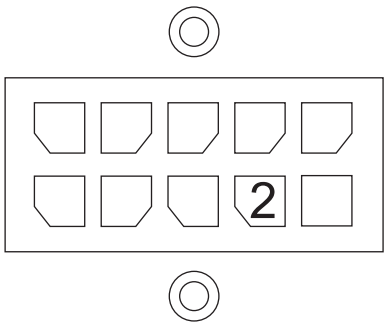


Figure 21: 10-pin Connector on the Telephone Style Control Head



The Car Audio Mute signal is set to high by default. During transmission of an ongoing call, the signal changes to low regardless of the call type. This signal cannot be reversed. It is always available and does not require any additional configuration.

The default functions of the Control Head GPIOs on the following devices are:

NGCH/RECH

GPIO1 is disabled.

GPIO2 is disabled.

GPIO3 for external PTT on the CH Rear (not programmable).

GPIO4 for Rx/Tx Indication (not programmable).

TSCH

GPIO1 for external PTT on the TSCH cradle (not programmable).

GPIO 2 is disabled.

You can configure programmable GPIOs as input or output. When the GPIOs are configured as input, your radio reacts to low or high level on the GPIO input and triggers the configured action. The supported functions are:

- Send a Predefined Message (if a predefined template is configured in the configuration tool).
- Send Status to the currently selected talkgroup.
- Announcement.

NOTE: The Announcement function is only for the TSCH. Voice is transmitted from the visor microphone connected to the TSCH cradle.

For GPIO input, the following signal levels must be provided regarding the ground:

- Low level < 0.7 V.
- High level must not exceed the maximum Vcc.

When the GPIOs are configured as output, the supported functions are:

Receive (Rx) or Transmit (Tx) Indication

In Rx or TX Indication mode, the GPIO output works similarly as the Car Audio Mute output. The only difference is that in Rx or Tx Indication, you can configure the default signal level as low or high. It is not possible to configure the GPIOs to only indicate the Rx or Tx condition of your radio. The signal always changes whenever your radio is in transmission regardless of the call type.

Specific Message Received Indication

In this mode, your radio changes the state of the GPIO when a Short Data Service (SDS) message is received on the selected Protocol Identifier (PID). You can configure the default state of the GPIO. You can determine which PID receives the control message to trigger a GPIO state change. To increase security, there are two options you can configure. The first is the allowed Individual Short Subscriber Identity source. The second is the content of the control message that triggers a state change on the GPIO.

If an ongoing call in the Rx or Tx Indication mode triggers a GPIO state change, the signal remains in the changed state during the call. If an incoming SDS message in the Specific Message mode triggers the GPIO state change, the duration of the signal on the GPIO can be configured.

For GPIO output and Car Audio Mute, the following signals are provided regarding the ground:

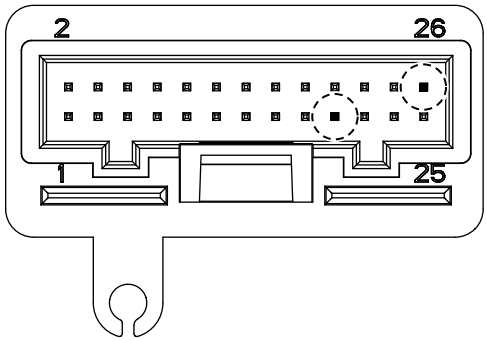
- Low level < 0.7 V
- High level is Vcc -0.7 V

40.2 Transceiver GPIO

Your radio provides two General Purpose Input Outputs (GPIOs) through the transceiver 26-pin rear connector. The two GPIOs (#19 and #26) are accessible and configurable using the configuration tool. The

GPIO pins functionality must be preconfigured using the configuration tool prior to usage as there is no auto-detection mechanism.

Figure 22: Transceiver 26-Pin Accessory Connector



The logical GPIOs must be mapped to physical pins on the Transceiver rear 26-pin connector as the following:

- Transceiver GPIO1 to 26-Pin Accessory Connector #19
- Transceiver GPIO2 to 26-Pin Accessory Connector #26

NOTE: If the two pins are not configured as GPIOs through the configuration tool, they remain as the existing 26-Pin Accessory Connector functions as the following:

- #19 as HOOK_PA_EN
- #26 as EXTERNAL_ALARM

The configuration options for GPIO1 or GPIO2 are as the following:

- Configure as active high or active low pin.
- Configure the GPIO function as an input or output function.

For GPIO1 (pin 19) input, the following signals are provided regarding the ground:

- As input pin: low level < 1 V, high level > 4 V and maximum at Vcc (which is 5 V)
- As output pin: low level < 0.55 V, high level > 3.8 V

For GPIO2 (pin 26), it is an open drain IO with internal 4.75 kohm to vehicle battery.

Table 51: GPIO Functions as Input or Output Ports

Input Ports	Output Ports
• Send Predefined Message • Send Status • TMO or DMO Switch • Turn On or Off Repeater Mode • Turn On or Off Gateway Mode • Transmit Inhibit • Turn On or Off Bluetooth • Location Information Protocol Report	• Specific Message • Receive or Transmit Indication • Receive Indication • Transmit Indication • One-Touch Button Transceiver GPIO Toggle

Chapter 41

Test Page

Only authorized persons can use the Test Page option and this option must be enabled in the codeplug.

NOTE: If Test Page option is not enabled in the codeplug, you can only access the Key Variable Loader (KVL) mode option. When using a KVL device (a portable device used to load encryption keys to a secure entity), set the baud rate to 19200 bits/second.

Use the following key sequence to access the test page: ***** → **#** → **Menu** → **Right**.

The following information is available in the test page:

- **Ver Info** – Version Information – displays software or hardware version information.
  - **Build Date** – software build (a compiled version of software).
  - **CP Ver** – Codeplug version.
  - **DSP Ver** – Signaling Processor Software version.
  - **Host Ver** – Application Software version.
  - **HardwareID** – hardware identification number.
  - **EquipID** – TETRA Equipment Identity (TEI).
  - **LLS version** – Local Language Package version.
  - **NGCH Software Version** – software version of the Control Head.
- **Addresses**
  - **Home MNI** – country identification code, network code.
  - **Group ID** – number of the currently selected talkgroup.
  - **Own ISSI** – Own Individual Short Subscriber Identity.
  - **ASSI** – Alias Short Subscriber Identity.
- **Err Logs** – Error Logs – displays information about software errors.
- **Cells Info** – Cell Information – displays information about the foreground and background cells (BTS sites). This menu displays the RSSI levels of the cells.
- **Cell Lists** – Displays frequency lists.
  - Frequency **List1** (32 variable frequencies)
  - Frequency **List2** (32 fixed frequencies)
  - Frequency **List3** (comprehensive hunt)
  - Frequency **List4** (comprehensive hunt)
- **Data Svc** – Data Services – allows access to the air tracer enable, the conformance tests, and the KVL mode.
  - **Air Tracer**
  - **Conf Test** – Conform test.
  - **KVL Mode**

    NOTE: You can exit KVL Mode by power cycle.
  - **E2E Key Del**

- **MS Logging**

- **CE Monitor** – Circulator Eliminator Monitor.
- **Key Info** – Key Information allows your radio to display security information for the following conditions:
  - For the serving cell:
    - **Curr Cell SC** – Security class of the serving cell, that is Security Class 1, Security Class 2, Security Class 3, Security Class 3 with Group Cipher Key (GCK).
  - For the group OTAR:
    - **CMG GSSI** – Crypto-Management Group (CMG) group of MSs with common key material
  - For SDMO and TM-SCK OTAR:
    - **SCK SubsGrType** – SDMO SCK Subset Grouping Type.
    - **Curr Subs Info** – current SDMO SCK Subset Number and SCK-VN.
    - **Fallback TMSCK** – current Fallback TMO SCK, that is SCKN and SCK-VN attributes.
    - **SCK List** – list all SCKs stored in your radio, that is SCKN and SCK-VN attributes.

      NOTE: When checking for SDMO key information in your radio, the SDMO KAG range in the AuC is from 0 to 9, and the range in your radio is from 1 to 10.
  - For the GCK:
    - **Full GCK-VN** – current Full GCK-VN.
    - **GCK List** – list all GCKs stored in your radio, that is GCKN and GCK-VN attributes.
- **DMO info** – Direct Mode Operation information (RSSI and Frequency)

Chapter 42

Hardware Test

This mode allows performing basic hardware tests and share the results immediately on the display.

NOTE: The hardware test mode is only for use by authorized persons.

Use the following key combinations to access the hardware test: **1**, **2**, **3** (hold all simultaneously) and then press **On/Off** key.

Appendix A

Service Information for EMEA

Technical & Repair Support (for Contracted Customers Only)

If you would like to contact the Motorola Solutions Customer Care team, use the appropriate contact details below. Please be prepared to provide your contract number, product serial numbers, and detailed issue description for a faster response and a resolution. If the support request is Technical Support related, the request will be handled by the Technical Support Operations (TSO) team. This team of highly skilled professionals provides Technical Support to help resolve technical issues and quickly restore networks and systems. If you are unsure whether your current service agreement entitles you to benefit from this service, or if you would like more information about the Technical or Repair Support Services, contact your local customer support or account manager for further information.

EMEA Motorola Solutions Service Desk Numbers and Contact Details

Country	Telephone Numbers
Austria (German)	0800 281 195
Denmark (English)	80 253 546
France (French)	0800 914 532 or +33 176 775 609
Germany (German)	0800 724 6872 or +49 69 22221568
Israel (Hebrew)	180 931 5818
Italy (Italian)	800 791 276
Netherlands (English)	0800 0249 893
Norway (English)	800 14 802
Poland (Polish)	00800 1215 772
Russia (Russian)	810 800 286 15011
Saudi Arabia (English)	800 811 0523
South Africa (English)	0800 994 886
Spain (Spanish)	9009 416 84
United Arab Emirates (English)	8000 3570 4387
United Kingdom (English)	0800 731 3496 or +44 207 019 0461

NOTE: Services are available 24 hours a day, 7 days a week. For English speakers, services are only available from 7PM to 7AM CET.

Email Non-Technical Support at http://customercare.emea@motorolasolutions.com. Customers may also raise non-technical support requests and check the status of such requests via the MyView portal, where available.

E-Mail Technical Support at http://techsupport.emea@motorolasolutions.com. Customers may also raise technical support requests and check the status of such requests via the MyView portal, where available.

E-Mail Hardware Repair Support at http://repair.emea@motorolasolutions.com. Customers may also raise repair requests and check the status of such requests via the MyView portal, where available.

Parts Identification and Ordering

To get help in identification of non-referenced spare parts, contact your local Motorola Solutions Customer Care Organization.

To request replacement parts, kits and assemblies, place orders directly through your Motorola Solutions local distribution organization or through https://shop-business.motorolasolutions.com/.

Latest Versions of Manuals

To download the latest versions of technical manuals, see https://learning.motorolasolutions.com/.

Submit Your Comments

If you have any comments or would like to report a problem regarding Motorola Solutions publications, send an e-mail to: customercare.emea@motorolasolutions.com.

Appendix B

Service Information for APAC

This topic contains contact details to service centers in Asia and Pacific region.

Technical Support

Technical support is available to assist the dealer/distributor in resolving any malfunction, which may be encountered. Initial contact must be by telephone wherever possible. When contacting Motorola Solutions Technical Support, be prepared to provide the product model number and the serial number.

Further Assistance from Motorola Solutions

You can also contact the Customer Help Desk through the website: http://www.motorolasolutions.com/en_xp/products. If a unit requires further complete testing, knowledge and/or details of component level troubleshooting or service than is customarily performed at the basic level, send your radio to a Motorola Solutions Service Center as listed in the following table:

Table 52: Service Information – Telephone Numbers and Addresses of the Asia and Pacific Motorola Solutions Centers

Country	Telephone Number	Address
Singapore	+65-6352-6383	**Motorola Solutions Singapore Pte. Ltd,** c/o Azure Engineering, 49 Jalan Pemimpin, #03-11 APS Industrial Building, Singapore 577203 Contact: Alvin Tan E-mail: alvin.tan@motorolasolutions.com Contact: Gan Saw See E-mail: gan.sawsee@motorolasolutions.com
Malaysia	+603-7809-0000	**Motorola Solutions Sdn. Bhd.** Level 14, Persoft Tower, No. 68, Pesiaran Tropicana, 47410 Petaling Jaya, Selangor Darul Ehsan, Malaysia Contact: Koh Tiong Eng E-mail: A21001@motorolasolutions.com
Indonesia	+62-21-3043-5239	**PT. Motorola Solutions Indonesia** 30th Floor, Gedung BRI II, Suite 3001, Jl. Jend. Sudirman Kav. 44-46, Jakarta 10210, Indonesia Contact: Eko Haryanto E-mail: Eko.Haryanto@motorolasolutions.com

Country	Telephone Number	Address
Thailand	Tel: +662-653-220 Fax: +668-254-5922	**Motorola Solutions (Thailand) Ltd.** 142 Two Pacific Place Suite 2201, 3220 Sukhumvit Road, Klongtoey, Bangkok 10110 Contact: Nitas Vatanasupapon E-mail: Nitas@motorolasolutions.com
India	+91-9844218850	**Motorola Solutions India Pvt. Ltd.** C/o Communication Test Design India Private Limited, #4, 5 Maruthi Industrial Estate, Rajapalya, Hoodi Village, Bangalore - 560048, India Contact: K. Umamaheswari E-mail: umamaheshwari@motorolasolutions.com
China	+86-10-8473-5128	**Motorola Solutions (China) Co. Ltd.** No. 1 Wang Jing East Road, Chao Yang District, Beijing, 100102, P.R. China Contact: Sophy Wang E-mail: C18170@motorolasolutions.com
Hong Kong	852-2966-4823	**Motorola Solutions Asia Pacific Ltd.** Unit 1807-1812, 18/F, Two Harbourfront, 22 Tak Fung Street, Hunghom, Kowloon, Hong Kong Contact: Judy Leung E-mail: Judy.Leung@motorolasolutions.com
Philippines	Tel: +632 858-7500 Fax: +632 841-0681	**Motorola Communications Philippines, Inc.** Unit 2102, One Global Place Building, 5th Ave., Bonifacio Global City, Taguig, Philippines 1634. Contact: Arthur Nieves E-mail: Arthur.Nieves@motorolasolutions.com
Korea	+822-3497-3649	**Motorola Solutions Korea, Inc.** 9th Floor, Hibrand Building, 215, Yangjae-Dong, Seocho-Gu, Seoul, 137-924, Korea. Contact: KS Kwak E-mail: r45321@motorolasolutions.com
Taiwan	+886-2-8729 8000	**Motorola Solutions Taiwan, Ltd.** 8F, No. 9, Songgao Rd.,

Country	Telephone Number	Address
		Taipei 110, Taiwan (R.O.C.) Contact: Michael Chou E-mail: ftpe239@motorolasolutions.com
Australia	+613-9847-7725	**Motorola Solutions Australia Pty. Ltd.** 10 Wesley Court, Tally Ho Business Park, East Burwood Victoria 3151, Australia. E-mail: servicecentre.au@motorolasolutions.com

Piece Parts

Some replacement parts, spare parts, and/or product information can be ordered directly. If a complete Motorola Solutions part number is assigned to the part, it is available from Motorola Solutions Service Organization. If no part number is assigned, the part is not normally available from Motorola Solutions. If a list of parts is not included, that means that no user-serviceable parts are available for that kit or assembly.

Customer Programming Software has no capability to tune your radio. Tuning your radio can only be performed at the factory or at the appropriate Motorola Solutions Repair Center. Component replacement can affect your radio tuning and must only be performed by the appropriate Motorola Solutions Repair Center.

All orders for parts/information must include the complete Motorola Solutions identification number. All part orders must be directed to your local Motorola Solutions Service Organization. See your latest price pages.

Parts Identification and Ordering

Request for help in identification of non-referenced spare parts must be directed to the Customer Care Organization of Motorola Solutions local area representation. Orders for replacement parts, kits, and assemblies must be placed directly on a Motorola Solutions local distribution organization.

Appendix C

Service Information for Americas

This topic contains contact details to service centers in Latin America and Caribbean region.

Technical Support

To request technical support, go to https://businessonline.motorolasolutions.com, **Contact Us**.

Some replacement parts, spare parts, and/or product information can be ordered directly. If a complete Motorola Solutions part number is assigned to the part, it is available from Motorola Solutions. If no part number is assigned, the part is not normally available from Motorola Solutions. If the part number is appended with an asterisk, the part is serviceable by Motorola Solutions Depot only. If a list of parts is not included, that means that no user-serviceable parts are available for that kit or assembly.

Warranty and Repairs

Table 53: Service Information – Telephone Numbers and Addresses of Latin America Radio Support Centers

Country	Telephone Number	Address
Colombia	571- 376-6990	Motorola Solutions de Colombia Service Centre Torre Banco Ganadero Carrera 7 No. 71-52 Torre B piso 13 Oficina 1301 Bogota
Mexico	5252576700	Motorola Solutions de México Service Centre Bosques de Alisos #125 Col. Bosques de las Lomas CP 05120 Mexico DF

Piece Parts

To order parts in Latin America and the Caribbean contact your local Motorola Solutions CGISS representative.

Table 54: Service Information – Telephone Numbers and Addresses of Latin America Motorola Solutions Centers

Country	Telephone Number	Address
Argentina	5411-4317-5300	Motorola Solutions Argentina Ave. del Libertador 1855 B1638BGE, Vicente Lopez Buenos Aires
Brasil	5511-3847-668	Motorola Solutions Ltda Av. Chedid Jafet

Country	Telephone Number	Address
		222 Bloco D Conjuntos 11,12,21,22 E 41 Condominio Millennium Office Park 04551-065- Vila Olimpia, Sao Paulo
Chile	562-338-9000	Motorola Solutions Chile S.A. Av. Nueva Tajamar 481 Edif. World Trade Center Of. 1702, Torre Norte Las Condes Santiago
Colombia	571-376-6990	Motorola Solutions Colombia LTDA. Carrera 7 #71-52 Torre A, Oficina 1301 Bogotá
Costa Rica	506-201-1480	Motorola Solutions de Costa Rica Parque Empresarial Plaza Roble Edificio El Portico, 1er Piso Centro de Negocios Internacional Guachepelin, Escazu San Jose
Ecuador	5932-264-1627	Motorola Solutions del Ecuador Autopist Gral. Rumiñahui, Puente 2 Conjunto Puerta del Sol Este-Ciudad Jardin Pasa E, Casa 65 Quito
Mexico	52-555-257-6700	Motorola Solutions de México, S.A. Calle Bosques de Alisos #125 Col. Bosques de Las Lomas 05120 México D.F.
Peru	511-211-0700	Motorola Solutions del Peru Ave. República de Panama 3535 Piso 11, San Isidro Lima 27
USA	954-723-8959	Motorola Solutions, Inc. Latin American Countries Region 789 International Parkway Sunrise, FL 33325
Venezuela	58212-901-4600	Motorola Solutions de Los Andes C.A. Ave. Francisco de Miranda Centro Lido, Torre A Piso 15, El Rosal Caracas, 1060