Mobile Release 5.14.10

TCR1000

PRODUCT INFORMATION MANUAL

March 2014 EN

68015000890-E

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Copyright Information

Service Information – EIA

Service orders are dealt with by two centres: European Radio Support Centre (ERSC) and European Systems and Components Centre (ESCC). This section contains contact details to service centers in Europe, Middle East, and Africa.

European Radio Support Centre (ERSC)

ERSC provides a remote Technical Support Service to help customers resolve technical issues and quickly restore their systems. The centre handles service orders for subscribers and accessories. This team of highly skilled professionals is available to the customers that have current ERSC service agreements in place. For further information and to verify whether your current service agreement entitles you to benefit from this service, contact your local customer support.

To contact ERSC, use the following EIA Integrated Call Center details:

E-mail: *ersc@motorolasolutions.com* .

Telephone: +49 30 66 86 1555

European Systems and Components Centre (ESCC)

ESCC provides a repair service for infrastructure equipment. Customers requiring a repair service should contact the Customer Information Desk and obtain a Return Material Authorization number. Unless advised otherwise, the equipment should then be shipped to the following address:

Motorola GmbH, European Systems Component Center, Am Borsigturm 130, 13507 Berlin, Germany

E-mail: *escc.admin@motorolasolutions.com*.

Telephone: +49 30 66 86 1404

Mon – Fri, 08:00 am – 06:00 pm (CET)

Table 1: Service Information — Telephone Numbers to EIA Integrated Call Center

Country	Telephone Number
Austria	1206091087
Denmark	43682114
France	157323434
Germany	6950070204
Italy	291483230
Lithuania	880030828
Netherlands	202061404
Norway	24159815
Portugal	800552277
Russia	810800228 41044 (Alternative 8108001201011)
Saudi Arabia	8008445345
South Africa	0800981900
Spain	912754787

Table continued…

Country	Telephone Number
United Kingdom	2030277499
Other Countries	+42 0533336946

Parts Identification and Ordering

To get help in identification of non-referenced spare parts, contact your local Motorola Customer Care Organization.

To request replacement parts, kits and assemblies, place orders directly through your Motorola local distribution organization or through *http://emeaonline.motorolasolutions.com*.

EIA Test Equipment Support

For information related to support and service of Motorola Test Equipment, contact your local Motorola Customer Care Organization or see *http://emeaonline.motorolasolutions.com*.

For customers in Germany, contact the Equipment Service Group in Germany:

Telephone: +49 (0) 6128 702179

Fax: +49 (0) 6128 951046

Latest Versions of Manuals

To download the latest versions of technical manuals, see *http://emeaonline.motorolasolutions.com*.

Submit Your Comments

If you have any comments or would like to report a problem regarding Motorola publications, send an e-mail to:*escc.admin@motorolasolutions.com*.

Service Information – AME

This topic contains contact details to service centers in the 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 should be by telephone wherever possible. When contacting Motorola Technical Support, be prepared to provide the product model number and the serial number.

Further Assistance from Motorola

You can also contact the Customer Help Desk through the website: *http://www.motorolasolutions.com/tetra*. 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 the radio to a Motorola Service Center as listed in the following table:

Table 2: Service Information — Telephone Numbers and Addresses of the Asia and Pacific Motorola 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: Mareen Phua E-mail: *mareen@azure.com.sg* Enquiry: Tay Yong Hock E-mail: *yonghock.tay@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*
Thailand	Tel: +662-653-220 Fax: +668-254-5922	**Motorola Solutions (Thailand) Ltd.** 142 Two Pacific Place Suite 2201,

Table continued…

		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., Taipei 110,

Table continued…

		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 part number is assigned to the part, it is available from Motorola Radio Aftermarket and Accessory Division (AAD). If no part number is assigned, the part is not normally available from Motorola. 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 the radio. Tuning the radio can only be performed at the factory or at the appropriate Motorola Repair Center. Component replacement can affect the radio tuning and must only be performed by the appropriate Motorola Repair Center.

All orders for parts/information should include the complete Motorola identification number. All part orders should be directed to your local AAD office. See your latest price pages.

Parts Identification and Ordering

Request for help in identification of non-referenced spare parts should be directed to the Customer Care Organization of Motorola local area representation. Orders for replacement parts, kits, and assemblies should be placed directly on Motorola local distribution organization or via Motorola Online (Extranet).

Service Information – 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 part number is assigned to the part, it is available from Motorola. If no part number is assigned, the part is not normally available from Motorola. If the part number is appended with an asterisk, the part is serviceable by Motorola 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 3: Service Information — Telephone Numbers and Addresses of Latin America Radio Support Centers

Country	Telephone Number	Address
Colombia	571- 376-6990	MOTOROLA DE COLOMBIA SERVICE CENTRE Torre Banco Ganadero Carrera 7 No. 71-52 Torre B piso 13 Oficina 1301 Bogota
Mexico	5252576700	MOTOROLA DE MEXICO 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 CGISS representative.

Table 4: Service Information — Telephone Numbers and Addresses of Latin America Motorola Centers

Country	Telephone Number	Address
Argentina	5411-4317-5300	MOTOROLA DE ARGENTINA Ave. del Libertador 1855 B1638BGE, Vicente Lopez Buenos Aires
Brasil	5511-3847-668	MOTOROLA DO BRASIL LTDA. Av. Chedid Jafet 222 Bloco D Conjuntos 11,12,21,22 E 41 Condominio Millennium Office Park 04551-065- Vila Olimpia, Sao Paulo

Table continued…

Country	Telephone Number	Address
Chile	562-338-9000	MOTOROLA CHILE Ave. Nueva Tajamar 481 Edif. World Trade Center Of. 1702, Torre Norte Las Condes Santiago
Colombia	571-376-6990	MOTOROLA DE COLOMBIA, LTDA. Carrera 7 #71-52 Torre A, Oficina 1301 Bogotá
Costa Rica	506-201-1480	MOTOROLA 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 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 DE MEXICO, S.A. Calle Bosques de Alisos #125 Col. Bosques de Las Lomas 05120 México D.F.
Peru	511-211-0700	MOTOROLA DEL PERU, S.A. 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 DE LOS ANDES C.A. Ave. Francisco de Miranda Centro Lido, Torre A Piso 15, El Rosal Caracas, 1060

Icon Conventions

The following graphic icons, which help identify situations or settings crucial to proper radio operation and user safety, are used throughout this document:

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

Warning: The signal word WARNING with the associated safety icon indicates 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 indicates information that, if disregarded, may result in minor or moderate injury, or serious product damage.

Caution: The signal word CAUTION 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: NOTE 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 located on the screen. There is no warning level associated with a note.

Suggestion: SUGGESTION indicates a recommendation from Motorola that does not require to be followed, but might be helpful. There is no warning level associated with SUGGESTION.

Chapter 1

Product Overview

TCR1000 Overview

Motorola is a world leader in the development and deployment of TETRA communication solutions, and the TCR1000 covert TETRA radio from Motorola is the smallest, body worn TETRA radio available.

Figure 1: TCR1000

The Motorola TCR1000 Covert radio is the ideal solution to ensure secure communications in surveillance covert type operations allowing officers to blend right into the crowd. Motorola TCR1000 Covert TETRA radio delivers high-quality communication in a light and discrete package for those critical undercover applications.

There are no compromises in the design of the TCR1000. Motorola worked closely with police forces to ensure that it is intuitive and simple to operate, truly Technology that is Second Nature. The TCR1000 incorporates control features matched to the needs of officers in covert operations. Its design enables easy hiding inside of light clothing. A unique portfolio of covert accessories complements the TCR1000 and offer additional flexible options for undercover officers. This radio operates at 1 watt and the option for a body mounted antenna ensures excellent coverage and maintains the discreetness of the radio.

A small, easily concealable Remote Control Unit (RCU) controls the radio. The RCU allows the user to answer or to initiate calls, change talkgroups, and volume. It also allows using special surveillance features such as whisper mode or communication tones (like PTT Double Push feature). A connector is provided on the RCU to attach a remote PTT unit.

Specification

Table 5: General Technical Specification

Parameter	Value
Dimensions HxWxD mm	96 x 64 x 16.9

Table continued…

Parameter	Value
Weight g	<180 with PMNN4411A Li-Ion battery
Battery Operating Life (Time Expected) 05/35/60	> 8 hr
Talkgroups - TMO	4000 Entries (up to 2048 entries in one folder) 2048 Unique entries
Talkgroups - DMO	1024 Entries
Folders - TMO	256
Folders - DMO	128
Favorite Groups - Talkgroups accessible through RCU	10 Favorite Groups with 10 Entries
Operating Temperature °C	-30 to +60 **Note:** Li-Ion battery performance degrades at -10 °C
Storage Temperature °C	-40 to +85
Humidity	ETS300 019-1-7 class 7.3E, up to 95% R.H @ 50o C for 8 Hours
Dust and Water	IP54 (cat.2)
Salt Fog	8 hr exposure to 5% saline solution at 35 °C
Shock (Mechanical), Drop & Vibration	ETS 300 019-1-7 class 5M3

Table 6: RF Specification

Parameter	Value
Frequency Bands MHz	380–430 MHz
RF Channel Bandwidth kHz	25
Transmitter RF Output Power W	1
RF Power Control	3 Steps of 5 dB
RF Power Level Accuracy +/-dB	2
Receiver Class	A and B
Receiver Static Sensitivity dBm	-112 minimum (-116 typical)
Receiver Dynamic Sensitivity dBm	-103 minimum (-106 typical)

Table 7: GPS Specification

Parameter	Value
Simultaneous Satellites	12
Mode of Operation	Autonomous or Assisted (A-GPS) **Important:** The A-GPS feature requires network support. Contact network operator for availability of support.

Table continued…

Parameter	Value
GPS Antenna	Body worn folded monopole (semi-rigid) integrated into the TETRA antenna Body worn folded monopole (dribble) integrated into the TETRA antenna Integrated into the patch connected to the TETRA body-worn antenna
Sensitivity	-152 dBm / -182 dBW
Accuracy (Measured at -137 dBm)	5 meters - 50% probable 10 meters - 95% probable

Note: This specification may be subject to change without further notice. All product features are subject to infrastructure support. Selected features are subject to optional software upgrade.

Ordering Options for Radios and Features

TETRA terminals are only available to accredited channel partners who are advised of the discount structure applied to these products.

Software options can be ordered and enabled in three ways:

- You can have them enabled at the Distribution Centre (DC).
- If you have iTM, you can enable them with a license.
- You can order by using dongle.

Dongle Enablement – Software Enablement Kits

Each software enablement kit ordered provides one dongle for the customer with a specific number of counters set according to the number of software options ordered. This kit number is applicable to both new orders or existing fielded terminals which require software enablement.

The features are enabled at the same time the customer programs the radio. The enablement for all the selected features is performed in one operation.

Ordering a Software Enablement Kit

Procedure:

1 Order the standard software enablement kit (main kit) – GM0193.
2 Add software feature options.

Note: You can select more than one feature for each main kit.

3 Order a quantity equaling the number of models requiring an option.

Radio Ordering

Procedure:

1 Order the main radio model.
2 Order options from each of the following categories:

- Software Selling Features
- Customer Programming Software
- Integrated Terminal Management
- Accessories

Note: Export controls apply when ordering encryption.

Golden Codeplug

The Golden Codeplug covers all standard codeplug fields and required optimal settings. In a Golden Codeplug, field parameters are pre-configured and fine-tuned for high quality and to get better performance from your new radio.

Chapter 2

Services and Features

Features Overview

Trunk Mode Operation (TMO)

- Air Interface Encryption - SCK, CCK, DCK, GCK
- Air Interface Migration
- Ambience Listening
- Announced Type 2 handover
- AT commands
- Broadcast Call
- Congested Cell Handling
- DGNA (Individually and group addressed)
- Dynamic Key Encryption
- Emergency group call
- Group call
- Hot Mic and Alternating Hot Mic
- Multi-Network Operation
- Mutual Authentication
- OTAR (Over The Air Re-keying)
- Preemptive Priority Call
- Secondary Control Channel
- SwMI Initiated Authentication
- Talkgroup and Priority monitor
- Temporary/Permanently Enable/Disable
- Transmit Inhibit (RF Sensitive Area Mode)

Direct Mode Operation (DMO)

- AT commands
- DMO Group Call
- DMO Group Emergency Call
- DMO Inter-MNI (including open group and open MNI)
- DMO Repeater Capability
- DMO Static Key Encryption (DMO SCK)
- DMO/TMO Emergency Switching
- Transmit Inhibit (RF Sensitive Area Mode)

Platform Specific Features

- Energy Economy
- Flashing via USB

General Features

- Covert Mode
- Favorite talkgroups
- Flexible size talkgroup folders
- High Assurance Boot (HAB) memory access protection
- Super groups of scan groups

Features Not Supported in Dimetra

- Background scanning
- CCK per LA
- DCK Forwarding
- SwMI controlled groups
- SwMI initiated attachments

System Support

The 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.

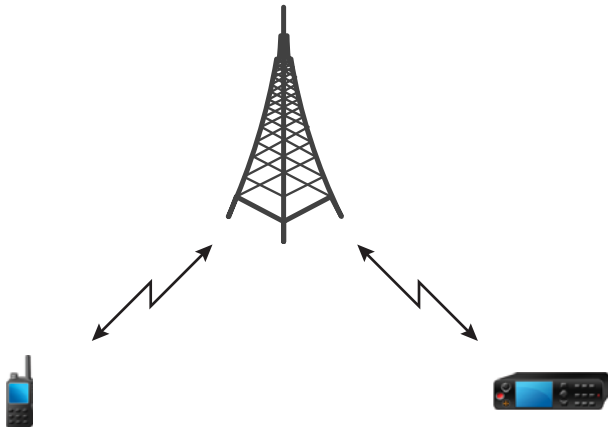
The radio is designed to operate optimally on the Dimetra IP system. The radio operates properly on all SwMIs that comply with the following IOP TIP documents:

- TIP-Core TTR 001-01, TIP — Part 1: Core.
- TIP Auth TTR 001-04 TIP — Part 4: Authentication.
- TIP-SS-AL TTR 001-09 TIP — Part 9: Ambience Listening.
- TIP AIE TTR 001-11 TIP — Part 11: Air Interface Encryption.
- TIP Disable TTR 001-13 TIP — Part 13 - Enable/Disable.

Trunked Mode Operation

Trunked Mode Operation requires the switching and management infrastructure. This operation mode enables various voice and data communication types (for example, group calls) and access to the infrastructure-related features.

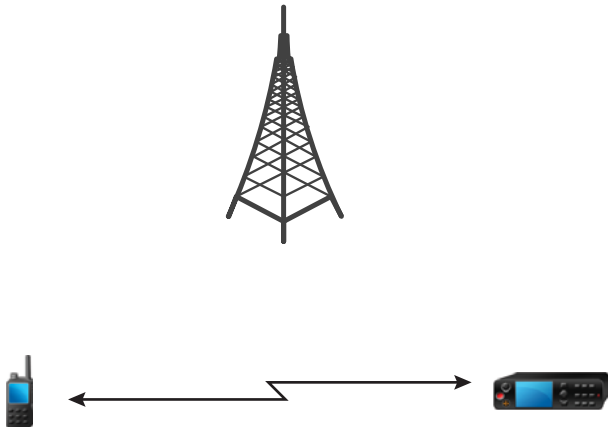
Figure 2: Trunked Mode Operation



Direct Mode Operation

Direct Mode Operation is a mode of simplex operation where radios communicate directly.

Figure 3: Direct Mode Operation



Group Call

The group call service enables the radio to communicate with a group of other TETRA radios using point to multi-point operation. This service is available in both TMO and 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.

Note: Before the radio can be used for making group calls, the RCU must be initialized. You initiate the RCU by pressing one of its buttons (other than the PTT), or by rotating the rotary switch to another position.

Programmable Talkgroups

The 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 the radio capabilities. Talkgroups are configured separately for TMO and DMO modes. To program a talkgroup in TMO define its name and GSSI. To program a talkgroup in DMO define its name, GTSI and frequency. The 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 CPS. In such a case a corresponding talkgroup is automatically selected during mode switching, irregardless of the previously selected talkgroup.

Note: Neither the group name nor the corresponding group address can be edited using the radio MMI.

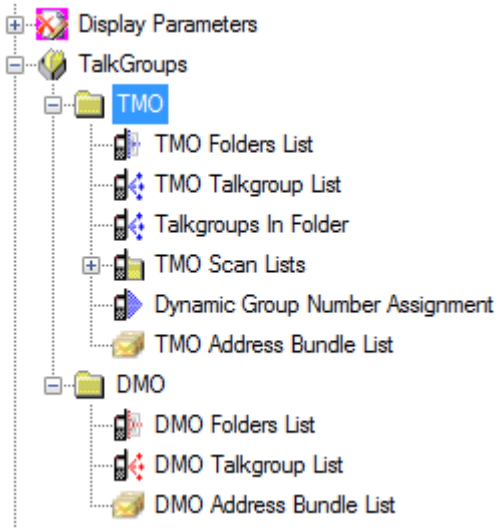
Talkgroup Folders

The talkgroups are organized in folders. You can select a talkgroup by first choosing a folder and then the talkgroup in the folder. Use the rotary knob or the Option button to select the talkgroup, for detail procedure see the *Feature User Guide*.

The talkgroup folders are organized in a tree-structure:

- Level 1 Folders
  - Placed at the root of the folder structure.
  - Can contain both level 2 folders and talkgroups at the same time.
  - Can contain any number of level 2 folders.
- Level 2 Folders
  - Placed in level 1 folders.
  - Any given level 2 folder can only be subfolder to one level 1 folder.

Figure 4: Talkgroup Tree



The maximum of 256 folders is allowed, regardless of their level.

Note: The folder definitions cannot be changed using the radio MMI. Any talkgroup folder or subfolder which is either empty or does not contain any programmed talkgroups is hidden in the MMI.

Talkgroup Selection

Talkgroup selection from the stored list of talkgroups in the favorite folder is performed by rotating the rotary knob to the corresponding position of the talkgroup in the favorite list.

The radio does not allow dialing a group SSI, nor select a talkgroup from outside the favorite talkgroups list.

Favorite Folders

If the **Folder Selection** is enabled in the codeplug, you can access up to 100 favorite talkgroups programmed in the list using dedicated RCU controls. The ranges of favorite talkgroups with their talkgroup assignments are kept through the radio power cycle.

The favorite talkgroup list can be a combined list of TMO and DMO groups. When a TMO group is selected in DMO mode, the radio automatically switches to TMO mode and selects that group. Similarly, when a DMO group is selected in TMO mode, the radio automatically switches to DMO mode and selects that group.

Talkgroup Blind Operation

The Remote Control Unit has a physical end-stop for use in blind operation. Tones are played in the earpiece to notify of the position to which the rotary knob has been scrolled.

Receive-only Talkgroups

Talkgroups can be provisioned as receive-only talkgroups. This setting depends on the settings of the folder the talkgroup is in. Any talkgroup from the receive-only folder can be selected. The radio allows to receive calls, however, no call can be initiated to this talkgroup.

Talk Time Limit

The 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.

Group Call Reception

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

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

Broadcast Call Initiated by User

This feature allows you to make a Broadcast Call from the radio initiated on the predefined talkgroup. The alias (message) displayed during Broadcast Call, as well as the call priority and destination address (talkgroup), can be configured in codeplug. This feature can only be used in TMO mode.

During Broadcast Call, other features are impacted:

- No other services except emergency are allowed (same as in emergency mode)
- Hot Mic functionality cannot be used.
- When Broadcast Call begins, any other ongoing services are terminated.

Note: If the type of the encryption is defined by the BSI feature (radio with a SIM Card), the Broadcast Call is always clear. Otherwise if the radio uses other encryption service the type of the encryption used for that Call is up to the encryption settings of that service.

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

Timed Talkgroup Change

This feature allows switching between the original and the predefined talkgroup (TMO or DMO) by using the OPTION button function.

The radio attaches to the selected, predefined talkgroup only for a specified amount of time (**Functional Timer**). After the timer expires, the radio returns to the previously attached, original talkgroup. Returning to the original talkgroup can also be assigned to the second press action of the button.

A campus university combines four buildings: A, B, C, and D. A security procedure is to raise an internal alarm for the building and then notify the entire campus. The staff in each campus building configures radios with three types of talkgroups.

1. Internal Communication Talkgroups – regular talkgroups for the entire campus and individual buildings to communicate between staff members.
2. Internal Alarm Talkgroups – emergency talkgroups, individual for each building.
3. External Alarm Talkgroup – an emergency talkgroup to alert the entire campus.

The staff in individual buildings uses the dedicated Internal Communication Talkgroups for daily routines and the Internal Alarm Talkgroup for safety procedures. The campus staff in every building also scans the External Alarm Talkgroup.

The campus IT administrator assigned in CPS the **Timed TG Change** function to a One-Touch Button to switch between the original Internal Communication Talkgroup, and the Internal Alarm Talkgroup. This way the radio users can immediately switch to the emergency talkgroup and start an internal emergency call.

One of the staff members in building A is in an emergency situation. The person presses the One Touch Button to switch to the Internal Alarm Talkgroup and starts the emergency call. The other staff members in building A hear the voice communication on the Internal Alarm Talkgroup. It turns out that the emergency is serious and one of the building administrators starts the global alarm for all campus buildings.

Call Ownership

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

Note: The SwMI decides about the ownership of a call.

Transmission During Group Call

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

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

Call Restoration

If the radio roams to a new cell during a call, it attempts to continue the call on the new cell. Cell reselection and call restoration procedures are employed for this attempt.

If the radio roams while being the transmitting party in the call, an announced cell reselection, if possible, is carried out in the new cell.

If the radio is not the transmitting party, an unannounced cell reselection is employed, followed by call restoration procedures.

Temporary Group Address

The radio supports the temporary group address assigned by the SwMI. The address is valid only for the lifetime of the call.

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

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

Late Entry

The user can join the group call even if not participating in it from the beginning. This is possible for example, if a user turns on their TETRA terminal, in such a case the system diverts the user's terminal to a talkgroup call, if a call is already in progress. Similarly, if the user's terminal has been outside of the radio coverage, for example in a tunnel, the control channel will also divert the user's 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.

User Initiated Group Attachment

To enable a radio to use a group, the radio should attach the group. The radio initiates a group attachment request to the SwMI after the RCU initialization. The attachment occurs whenever you initiate a group change and when the radio registers on a new site.

SwMI Initiated Group Attach/Detach

The Switching and Management Infrastructure (SwMI) can send a talkgroup attachment to the radio. The radio will attach to it, even if this talkgroup had not been programmed in the codeplug.

If the radio receives a SwMI initiated attachment for the group already currently selected, the radio accepts the attachment, and keeps the group selected.

If the radio receives a SwMI initiated attachment for a group in the currently active scan list, the attachment is accepted. If it is for a group that is not in the current active scan list, the attachment is rejected.

If the detachment is for the selected group, the display indicates that no group is currently selected. If the detachment is for a group that is in the scan list, the group remains in the list. However, it is not monitored. If the detachment is for a group that is in the SwMI controlled list, it is removed from that list.

Emergency Operations

Emergency Operations are used in critical situations.

Pressing the EMERGENCY button or entering Emergency number and pressing the SEND key, activates one or more services (depends on the service provider setting):

- Sending Emergency Alarm
- Sending SDS Status
- Starting Silent Emergency
- Starting Hot Microphone operation
- Starting Emergency Individual Call (Private or MS-ISDN)

Note: It is possible to power up the radio by pressing the Emergency Button. Depending on the service provider settings the radio can start Emergency Operations automatically. If the radio was PIN-protected (except SIM PIN), Emergency Operations will bypass the PIN lock for the duration of the Emergency Operations.

During Emergency Operations, the radio automatically rejects phone, PABX and private calls, and does not monitor the talkgroups in the selected scan list. However, if an ATG is the selected group, the radio monitors the sub-groups associated with the ATG.

When entering Emergency Operation, any ongoing voice call is aborted or cleared down. Any packet data transfer in progress is aborted. However, the session is kept open.

Emergency Group Call

The Emergency Group Call has the highest communication priority that means it is the pre-emptive call. Emergency Group Call is available in both TMO and DMO modes. During Emergency Operations, Emergency Group Call can be started by pressing PTT. The MS may also support Hot Microphone operation, which allows the Emergency Call to be conducted without pressing PTT.

If a radio receives an incoming group call with emergency priority, the display shows that an emergency call has been received, and a special audio alert is played.

An emergency group call can be configured as non-tactical or tactical:

- A non-tactical call is initiated on a talkgroup designated by the codeplug setting. When in non-tactical emergency mode, you cannot switch talkgroups.
- A tactical call is initiated on the currently selected talkgroup

In TMO, if the radio enters emergency operations while the emergency broadcast call is active the radio continues on the call without initiating any calls and sends an emergency alarm.

Non-Tactical Emergency

In Non-Tactical Emergency, the radio switches to a designated Emergency talkgroup when starting Emergency Operations. This talkgroup is used for the complete duration of the Emergency Operations (you cannot change the talkgroup).

In TMO, it is possible to configure the radio to make Emergency Non-Tactical Group Calls without sending attachment. If this is set, the radio assumes implicit attachment after receiving a temporary address.

In DMO, the Non-Tactical Emergency proceeds on the same frequency as the previously selected talkgroup. The service provider can designate any ITSI address to be used for Emergency Operations, (this can be an Open Group – broadcast address).

After exiting from Non-Tactical Emergency, the radio goes back to the previously selected talkgroup.

Emergency Alarm

The emergency alarm is a special status message sent to the infrastructure while starting the Emergency Operations. The radio may wait for infrastructure acknowledgment for this alarm and attempts retries.

Each time the radio enters the Emergency operation, it sends an emergency alarm. When an emergency alarm is sent successfully, the respective audible tone sounds.

In addition, once the radio is in the Emergency Operation on pressing the EMERGENCY button, an additional emergency alarm is sent. (Exception: during Hot Microphone transmission).

The message can be dispatched both in TMO and DMO.

Emergency Hot Microphone

The Hot Microphone allows you to talk without pressing the PTT button during Emergency Operations. The transmission continues for a provisioned amount of time. Pressing the PTT button before the Hot Microphone time expires ends the Hot Microphone operation. Then normal PTT operation in Emergency group call takes over (that is, the transmission is ongoing for the time the PTT button is held).

If a talk permit is granted to another member of the group, the Emergency Call received tone is played. If configured, the radio automatically attempts to get talk permit again.

Disaster Alert

Disaster Alert call is a broadcast emergency call initiated by the radio in all modes, with emergency pre-emptive priority that everyone in a broadcast area can hear. This feature is specifically designed for catastrophic situations, such as earthquakes, and has the highest priority over other calls.

Your radio can only receive Disaster Alert calls

During Disaster Alert, other functionality is impacted:

- When Disaster Alert begins, any other ongoing services are terminated.
- No other services 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. Please consult with your service provider before enabling this feature.

Security Services

The radio provides TETRA security features as described in the TETRA Security ETS 300 392-7 standard, TTR 001-11 TIP, and TTR 001-13 TIP.

Terminal Equipment Identity

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

Authentication

Authentication establishes a level of a trust between a radio and SwMI. It is a challenge-response result protocol between two parties based on their common knowledge of a secret key (K) to verify each others identity.

The SwMI authentication centre (AuC) provides a single K for authentication, which is shared only with the radio. Authentication is always initiated by the SwMI, the radio can also authenticate the SwMI (if set by the service provider).

Air Interface Encryption

The 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 12 000 000 000 000 000 000 000 000 key combinations.

TETRA TMO has three classes of encryption:

- Class 1 — clear (none).

- Class 2 — static key encryption (SCK).
- Class 3 — derived key encryption (DCK, sometimes called the dynamic key), the Common Cipher Key (CCK), and the Group Cipher Key (GCK).

TETRA DMO has two classes of encryption: Class 1 and Class 2.

The security features supported in the radio depend on the security mode.

Table 8: 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
OTAR	N/A	Optional	Mandatory	Mandatory
SCK AIE	N/A	Mandatory	N/A	N/A
DCK AIE	N/A	N/A	Mandatory	Mandatory
GCK AIE	N/A	N/A	N/A	Mandatory

Note: In the current release the radio does not support the following security features:

- Radio initiated authentication
- Support for TEA4
- Explicit authentication during DGNA

Enhanced Security, which consists of TMO Air Interface Encryption class 3G and DMO class 2, is a selling feature.

Clear Radios (Class 1)

A radio can be configured as a clear radio. In such case the 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.

Static Cipher Key Encryption (Class 2)

The radio supports static AIE using a set of up to 32 static cipher keys (SCK) shared by the SwMI and all authorized radios. The 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 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 DMO, the system manager may choose the SCK and the key may be distributed from the TMO SwMI using the OTAR mechanism or provided manually using KVL.

Derived Cipher Key and Common Cipher Keys Encryption (Class 3)

DCK/CCK are required to prevent over-exposure of key material. Existing encryption systems use Static Cipher Keys (SCK), where one key is used for all radios and all calls. 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 the radio to the BTS) communication and Common Cipher Key (CCK) for downlink (from the BTS to the radios) group communication. The DCK is derived from either the one way or mutual authentication process and the CCK is received during registry.

The radios supporting the dynamic key encryption identify themselves 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 call traffic encryption using CCKs. The radios support Over-the-Air-Rekeying (OTAR) of the CCK by the system.

A clear radio can set up calls to and receive calls from encrypted radios. The system informs the encrypted radios that the call 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.

Group Cipher Keys Encryption (Class 3G)

For the Security Class 3G the system allows grouping addressed signaling and dedicated group call traffic encryption using GCKs to cryptographically isolate talkgroups. The downlink signaling is encrypted using MGCK that is cryptographically derived from the CCK associated with the serving cell and the GCK associated with a given talkgroup. The SwMI does not change GCK and CCK simultaneously. Whenever a GCK change occurs, CCK changes are frozen for this time period.

The 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 OTAR mechanism only.

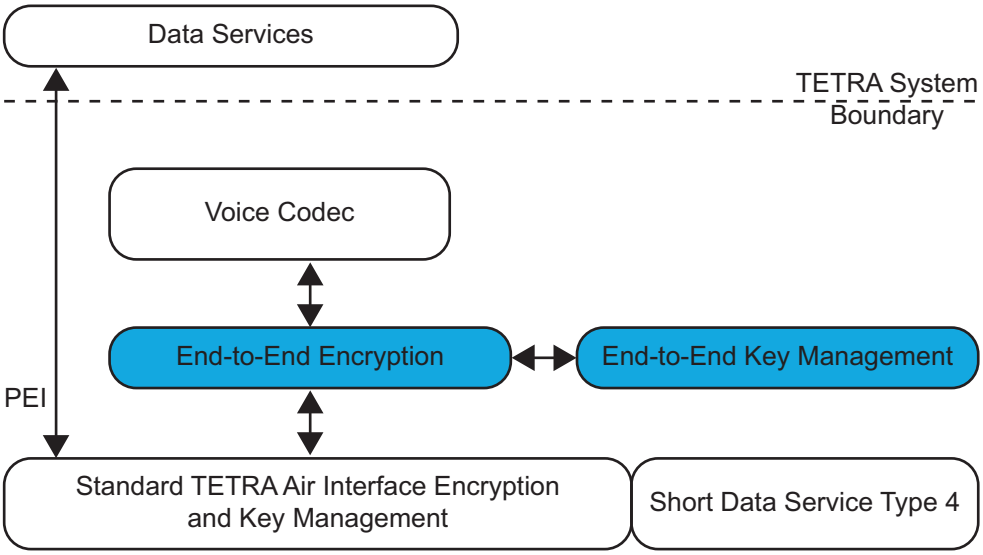
The radio supports over-the-air and manual provisioning of key associations that link a GCK to one or more TMO talkgroups, and manual provisioning of KAG to one or more DMO talkgroups.

The system can provide the ability for the operator to group contiguous ranges of TMO 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.

End-to-End Encryption

The TETRA standard supports air encryption. The 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 5: 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 Universal Crypto Module (UCM), located in the radio, carries out voice encryption. The UCM takes the voice stream and encrypts this stream using a set of keys. Likewise, the UCM 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, the radio notifies and informs whether the call, being made or received, is voice-encrypted.

This feature is relevant for group calls in TMO and DMO.

Radio Disable/Enable

On reception of an appropriate TETRA signaling for subscription disable with the correct SSI and MNI of the radio, the radio becomes disabled.

When disabled, the radio does not participate in any voice call and ignores all supplementary services sent on the downlink. All visible and audible indications are disabled, and the radio appears to be turned off. All user inputs (key presses, knob operation) are ignored, and the PEI interface is closed.

The radio continues to perform mobility management functions, such as roaming, to facilitate subsequent enabling (or further disabling).

The radio stores the disabled/enabled state in the codeplug, so the unit remains in that state after turning on.

If the radio is in the disabled state, and receives an appropriate TETRA signaling for subscription enablement with the correct SSI and MNI, it restores to its normal operative state.

The TEI Query feature provides TEI information to the infrastructure during registration. This allows to disable the radio by sending an appropriate TETRA signaling for equipment disable with the correct TEI for this radio. Replacing the SIM card does not activate the radio.

If the radio is in the equipment disabled state, and receives an appropriate TETRA signaling with the correct TEI, the radio restores to its normal operative state (if the subscription is also in the enabled state).

Radio Permanent Disable

Permanent disabling is intended to protect a network from attack from a compromised or faulty radio. It can be used when the 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 the radio should be recovered and reprogrammed before being used again by the service provider.

When the radio is permanently disabled, it becomes inoperable.

- All its security key material, that is GCK, GSKO, DMO SCKs, Ks, DCK, CCK, 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 the radio (using the 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 Centre and the Authentication Centre. 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 the radio K-REF association is also removed from the other Authentication Centres in the network, in cases where the K-REF pairs are duplicated across the network.

If this association is not removed, the radio could be assigned a new home zone that lies in a cluster where the K-REF association has not been deleted.

Radio Permanent Disable and Radio Permanent Disable v2 are mutually exclusive selling features.

High Assurance Boot

The radio has a facility that ensures that the code and data flashed in the radio is authentic and has not been altered. The hardware forces the HAB module to run at boot time. The module checks if all software comes from a trusted source. The radio is checking the signature of the code and data segments present in the radio using a public/private key mechanism.

If the HAB authentication of the flashed software fails, it does not allow the radio software to run.

Mobility Services

Following is the description of the Mobility Services.

Main Control Channel Frequencies

The radio can find a wide range of main control channels. The radio maintains stored lists of carrier frequencies which are scanned in order.

1. A dynamic list of up to 32 discrete entries maintained only by the radio software.
2. A static list of up to 32 discrete frequencies specified by the operator that can be preprovisioned. The system operator can modify this list using the programming tool.
3. A frequency range specification, using a specific offset, that can be preprogrammed in the factory. The system operator can modify this range using the programming tool. Then the radio scans all frequencies in 25 kHz intervals in the specified range.
4. An additional frequency range specification. Having two separate range specifications allows for two non-contiguous blocks of frequencies or two different offsets.

Control Channel Selection

Each TDMA frame on a given carrier is comprised of four time slots, of which any 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.

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 provides the ability to distribute the radio 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, the 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 the radio.

SCCH is a selling feature.

Multi-System Operation

The radio holds a list of up to 100 allowed network identities – Mobile Country Code (MCC)/Mobile Network Code (MNC) combinations, that are considered friendly networks. The first network in this list must be the radio home network. Each network can have an associated name that can indicate to the user which network it is. The radio can perform initial cell selection and registration on these networks and only these networks. Registration on any of these networks is performed using the radio 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 migration defined by ETSI standard is NOT supported by the BTS, multi-system operation is only supported as follows:

You can change the network mode using the MMI. A top-level menu item called **Networks Sel** allows choosing between **Home Only**, **Select Net** and **Any Net**. If the radio chooses a network different from the current one, the 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 the 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 the radio recognizes only the first system in the allowed list. As a result, the 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 the radio recognizes only the system you selected in the list of allowed systems. As the result, the 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. The radio registers to any network that it finds that is already programmed into its codeplug list of networks, i.e. 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. The radio uses its own ISSI.

The radio operates in all networks as it does in its home network. All calls are placed using SSI addresses, and it is the SwMI responsibility to reject calls 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 migrating modes used when migration is supported by the BTS, refer to Air Interface Migration and Dynamic Air Interface Migration sections.

Registration

On camping on a cell, the radio sends a registration request PDU to the SwMI, which includes a request to attach to the selected talkgroup.

If the registration and attachment succeeded, the 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, the radio attempts to camp on a different cell.

If the SwMI denies the registration request due to the location area rejection, the radio does not attempt to register again at this cell until the next power-on. The 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 the radio or next ITSI attach.

The radio does not send registration signaling when one of the following occurs:

- Roaming and registration fail before the radio receives the random access acknowledgment and the radio goes back to the last serving cell.
- The radio discovers a link failure on the serving cell, the link failure is shorter than the predefined timer and the radio is not in the transmit inhibit mode.
- The radio discovers a link failure on the serving cell and is in the transmit inhibit mode. In this case the radio always goes back to the serving cell without registration and stays in the transmit inhibit mode until the mode is turned off.

Note: When two or more scenarios occur at the same time, the radio registers with signaling.

If the radio discovers a link failure on the serving cell, a specific timer starts counting. If the link failure remains after the timer expires, then the radio acts as during a normal link failure. If the link failure ends before timer expires, then the 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 the radio does not perform the registration on going back in the range.

Call Roaming

The 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 the radio has lost the serving cell, the radio employs cell reselection procedures using the following methods:

- If not in a call — undeclared cell reselection.
- If in a call and not transmitting or link failure occurs — unannounced cell reselection.
- If transmitting in a call, and a neighbor has been scanned, and the cells are synchronized — announced type-1 or type-2 cell reselection.
- If transmitting in a call and no neighbor has been scanned or the cells are not synchronized — announced type-3 cell reselection.

For compatibility with systems that do not support type-1 or type-2 cell reselection, the radio can be provisioned to never perform these types of reselections.

The 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/Wide Trunking)
2. Valid/Invalid Subscriber Class
3. Relinquishing criteria
4. Congestion level
5. Security Class
6. Subscriber Class
7. Home Location Area (Home Location area)
8. LA Boundary
9. Cell Load

The radio prefers a cell that has a higher service level to one with a lower service level. If the radio is operating on a serving cell that has a lower service level than a neighbor cell, the 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. In order 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 the 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 PDUs to other cells. Link failures and other related scenarios are not randomized not to cause any unwanted delays in restoring the link.

Seamless Handover

Seamless handover eliminates voice interruption during calls by enabling the radio to roam faster between cells while transmitting. Faster roaming is possible because the radio asks its serving cell to perform the reselection and the SwMI performs all of the roaming signaling. The radio then moves straight to the traffic channel on the new cell and continues the call without call restoration.

Air Interface Migration

The Air Interface Migration (AIM) feature enables the radio to migrate to a foreign SwMI, that is, the radio registration in a foreign SwMI is allowed. The AIM also enables the radio to attach the groups in a foreign SwMI and to make and receive calls and SDS.

The AIM services cover individual call, group call and individually addressed SDS or Status. In order to receive group calls or group addressed SDS and Status from a group of the current network, the radio has to attach the nominated group. The radio cannot migrate to a foreign network while it is in an active call. The radio also cannot attach a foreign group on the current network hence no group-addressed status/SDS messages can be sent to home network of the migrated radio. After migrating the radio is in the Clear Mode.

When AIM feature is enabled the radio selects the network in the **Foreign Net** mode (selectable in the radio MMI).

Foreign Network (Foreign Net)

In this mode radio selects the network automatically where the home network is not available. The radio registers to any network that it finds that is already programmed into its codeplug list of networks, i.e. 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. The radio uses Visiting Short Subscriber Identity (VSSI).

AIM, DAIM and Any Networks features are mutually exclusive.

This is a selling feature.

Dynamic Air Interface Migration

The Dynamic Air Interface Migration feature offers users a quick and easy way to switch between networks. Depending on that setting, every time a radio is powered up or a talkgroup is changed, it automatically roams to the assigned network. If a talkgroup has no particular network assigned, the radio stays on the current network.

This feature consist of these major functionalities:

- It allows your radio to dynamically select the appropriate network after your radio is powered up.
- If you change talkgroup to the one from a different network, radio automatically migrates to this network (in this feature it is possible to assign network to particular talkgroup in the codeplug). It gives you an option to automatically migrate to a network which is available in the region (network needs to be first pre-configured in the codeplug). It is useful in case of loosing signal from dynamically selected network as the radio attempts to establish communication with any available network.

This feature is useful where quick switching between networks is required, for example when entering a building that uses its own infrastructure.

When DAIM feature is enabled the user has these selectable options:

Migrate to
In this mode the radio user selects the network manually. Once network is selected terminal performs migration as to the foreign SwMI. If you change talkgroup to the one from a different network, radio automatically migrates to this network.

Auto
In this mode the radio selects the network automatically.

After migrating the radio is in the Clear Mode. AIM, DAIM and Any Networks features are mutually exclusive.

Any Networks

This feature allows to use the radio on any network that was pre-configured in that radio, like it was its Home network. This is useful when the radio loses its Home network coverage, but is within coverage of another network (for example, if a radio travels between different locations). Note that calls between networks are not possible.

Note: Air Interface Encryption services are not available when roaming to a different (not Home) network.

Dynamic Air Interface Migration and Any Networks features are mutually exclusive.

This is a selling feature.

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 CPS.

Subscriber Class

When the radio powers up, or whenever it performs registration or roaming, it always uses its provisioned Subscriber Class (SC).

When the 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 the radio SC does not match the cell SC (the feature is configurable using the CPS), it either uses normal ranking procedures (see section *Call Roaming on page 39*), or does not roam to the cell at all.

Subscriber Class by Talkgroup

The Subscriber Class by Talkgroup feature forces all the radios attached to the same talkgroup to have the same Subscriber Class.

The Subscriber Class by Group feature helps to avoid issues as presented in the following scenarios:

- Preserving traffic channel capacity. For two cells having the same coverage and placed together to multiply traffic capacity a number of radios is attached to Talkgroup 1 on the first cell and only one radio is attached to Talkgroup 1 on the second cell. A group call uses two traffic channels (one on the first cell and one on the second). In this scenario, multiplying traffic capacity would not work without the feature. However, as radios on the same talkgroup are forced (by Subscriber Class mismatch) to roam to one cell, all the radios should use only the first cell.
- Spreading radios population across cells and prohibit them from roaming. Many radios used on a small area with multiple BTS coverage causes huge roaming traffic. A congestion occurs and as a result you would not be able to communicate. However with the feature, radios do not roam to a cell with mismatched Subscriber Class, what stops the roaming traffic.

A radio Subscriber Class changes when the user changes between talkgroups which are assigned to another Subscriber Class.

Up to 16 Subscriber Classes can be configured (in the CPS) and talkgroups assigned to them. The assignment is carried out by talkgroup GSSI or by folder (except Favorite) which the talkgroup was chosen from.

Talkgroup may be assigned to more than one Subscriber Class (either by folder or Talkgroup range). The first assigned Subscriber Class is used. Upon receiving Subscriber Class from the SwMI radios change their Subscriber Class to the received one. The Subscriber Class received from the SwMI over the air has always higher priority than Subscriber Class by Group. If a radio already uses the same Subscriber Class as the one received from the SwMI, the current Subscriber Class is not changed. On powering on, the radio is set to the default Subscriber Class or Subscriber Class assigned to an attached talkgroup.

Favorite folders cannot be assigned to any Subscriber Class.

Super Groups are treated as scanned groups and Subscriber Class by Talkgroup feature does not apply to them.

Subscriber Class by Talkgroup is a selling feature.

Local Site Trunking

Local Site Trunking (LST) is a feature enabling a base station to operate stand-alone. The base station may enter the mode when the link from the local cell to the central switch has gone down. The radio limits functionality when the cell is in this mode.

Note: Whether a radio can register on cells in LST depends on the codeplug settings.

If system broadcasts indicate that system-wide services are not available (LST) on a cell, the radio registers on this cell only if there are no system-wide cells available.

When the radio is operating on an LST cell, the radio may prevent you from invoking the following services (depends on infrastructure settings):

- Private call
- Phone call
- PABX call
- Packet data
- SDS data

Depending on the codeplug configuration, the 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, the radio will temporarily ignore the LST/WST parameter when selecting a site. However, the radio will still take other parameters (such as the cell's RSSI level) into consideration when deciding on roaming.

Local Site Trunking Ignoring is a selling feature.

Supplementary Services

Following is the description of the TETRA Supplementary Services (SS) that the radio supports in the TMO.

Dynamic Group Number Assignment

The radio supports dynamic addition and removal of talkgroups in its talkgroup list through TETRA Dynamic Group Number Assignment (DGNA) and De-assignment signaling (SS-DGNA).

The radio responds to DGNA directed to it or to DGNA directed to a group the radio is attached to.

When a dynamic group number assignment to add a new talkgroup is received, the radio adds the group into the rotary position 9 or 10 of the Favorite Talkgroup list. The radio assigns the newest received group to the rotary position containing the oldest assigned group. If any of the previously assigned groups has been deassigned and an additional DGNA group is received, the radio assigns the newest received group to the smallest free rotary valid position (that is position 9 or 10).

You can then scroll to the talkgroup to select the group. The groups are assigned as not attached and they are attached once selected using the rotary knob.

If the selected talkgroup is de-assigned, the group that was programmed on that rotary position is restored.

The radio supports the reception of a DGNA Assignment that is addressed to its selected talkgroup as a supergroup of the selected group. All signaling addressed to the supergroup is monitored in addition to signaling addressed to the selected group, any announcement or associated groups, and groups in the active scan lists.

When the selected group is unselected, the radio ceases processing signaling to the supergroup that was associated with that selected group.

The radio receives the lifetime of the supergroup as part of the assignment signaling. If a subsequent assignment to the same group is not received within that lifetime, the radio ceases monitoring that supergroup.

The radio also supports supergroups of scanned groups, such that a group addressed DGNA assignment received on one of the user scan group addresses causes the 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.

The following DGNA functionalities are not supported:

- Call-related DGNA.
- Functionality of the authorized user.
- Network authentication before accepting DGNA.

Ambience Listening

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

When the radio receives a call setup message with an AL call, the radio accepts the call. Then the 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.

The radio imposes no time limit on the transmission. The radio continues to transmit until the SwMI ends the call or the user performs an action that releases the call. If the user attempts to start a service while the AL call is in progress, the radio disconnects the call and initiates the requested service. The radio allows performing actions that can be performed without releasing the AL call. These actions include access of most menu items, activating, deactivating scan lists, and changing talkgroups. When changing talkgroups, the radio appears as if it is performing an attachment. The attachment appears to be 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 power down the radio in the active Ambience Listening call, the radio enters Pseudo Power-Off state.

Preemptive Priority Call

If during a call, a call setup is received for a call with higher priority than the present call, and the new call priority is Preemptive Priority 3 (value 14 in the codeplug) or Preemptive Priority 4 – Emergency (15), the radio disconnects from the present call and joins the new high priority call.

If the call priority of the new call is Preemptive Priority 1 (12) or Preemptive Priority 2 (13), depending on configuration the radio either accepts or rejects the new call.

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

Transmit Inhibit Mode

The Transmit Inhibit Mode is a mode in which the radio sends no radio transmissions. It is recommended to activate the mode in RF sensitive areas, for example hospitals, airplanes, where safety can be jeopardized due to transmission radiation.

In this mode, the radio does not transmit under any circumstances except for the Emergency Calls. All the functions and keys which cause transmission, for example registration to the network, changing talkgroup or folder, or pressing the PTT button are disabled. Any transmission trial causes the radio to play a tone.

When no danger to safety exists anymore (for example, you leave the RF sensitive area), you can deactivate the Transmit Inhibit Mode and the radio returns to standard operation.

You can deactivate the mode by using the OPTION button or implicitly when initiating an Emergency Call.

The Transmit Inhibit Mode is deactivated automatically, when you turn the radio off.

Note: RF Transmissions from the radio are prevented under the following conditions:

- TXI Mode is activated.
- Battery is removed.
- The radio is turned off.

On entering or exiting the transmit inhibit mode, when the radio is camped on a cell, it sends a specially designated SDS status message. This SDS message indicates to the SwMI that the radio is entering or exiting transmit inhibit mode.

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

In transmit inhibit mode the radio joins group calls for any group that the radio is monitoring, but the transmitting on that call is still prohibited.

If you initiate an emergency call, the radio immediately leaves transmit inhibit mode and attempts to start the emergency call if the radio is in service.

DMO Gateway and Repeater Communication

The radio provides the capability of communicating in DMO mode with a TMO group via the IOP certified gateways.

A DMO repeater re-transmits information received from one DMO radio to other DMO radios over the DMO air interface.

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

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

Specific gateway
The radio can initiate calls on a talkgroup directly or through a specific gateway address that is specified for a talkgroup. The gateway address can be edited through the radio MMI.

Auto gateway
The radio can initiate calls on the selected talkgroup directly with another radio or through any available gateway that is detected as present.

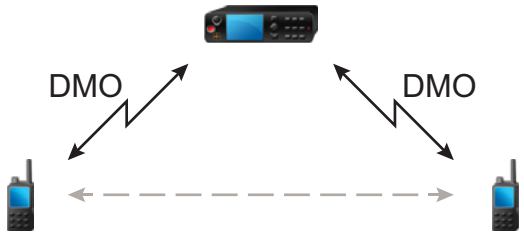
Repeater
The talkgroup links to a DMO repeater.

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

Automatic gateway and repeater
The radio uses the first available gateway for a talkgroup and/or a DMO repeater. If either specific gateway or auto gateway mode is chosen, and a suitable gateway is found, all outgoing calls are placed through the gateway. If a suitable gateway is not found, or a call setup through the gateway fails, the radio attempts to set up the call directly.

Communication through Repeaters

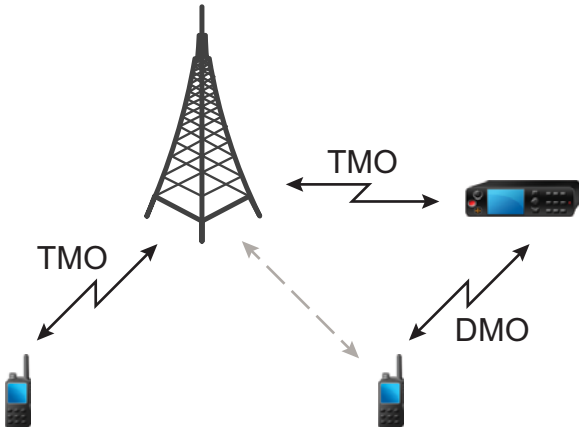
Radios that are out of range and cannot communicate directly one with another in DMO Mode can do it through the repeater. The repeater is a radio that repeats all communication on a chosen channel, and as a result increases radios' DMO range.



Your service provider can configure the radio to play a tone each time it connects to or disconnects from the repeater.

Communication through Gateways

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



Your service provider can configure the radio to play a tone each time it connects to or disconnects from the gateway.

Hibernation

Normally, the radio can be turned on or off only using the dedicated button. However, there is a possibility to switch the radio to stand-by mode.

In stand-by mode, the radio has all the signaling, all the audio, GPS, RF, and everything other than the PEI port for AT commands shut down. The radio is not registered to the network and does not stay on the cell. The radio consumes minimal power in this mode.

To switch into the standby mode, press the VOLUME UP and VOLUME DOWN buttons for a minimum of 2 seconds simultaneously. Switching back on into normal operation requires the same sequence. Afterwards the radio turns on as usual.

In the stand-by mode the battery does not last longer than 24 hours.

Chapter 3

Man-Machine Interface

Controls, Indicators and Related Features

LED Indications

Table 9: LED Indications

Indication	Status
Solid green	In use Battery charging finished and charger connected KVL mode enabled
Blinking green	In service Encryption key erasure succeeded
Solid red	Out of service Self-check fails
Blinking red	Connecting to the network Entering DMO Periodic low battery alert
Solid orange	Transmit inhibit in service Channel busy in DMO Battery charging ongoing
Blinking orange	Incoming call Detecting/diagnostics in progress
No indication	Idle Radio in covert Radio powered down

Controls and Indicators

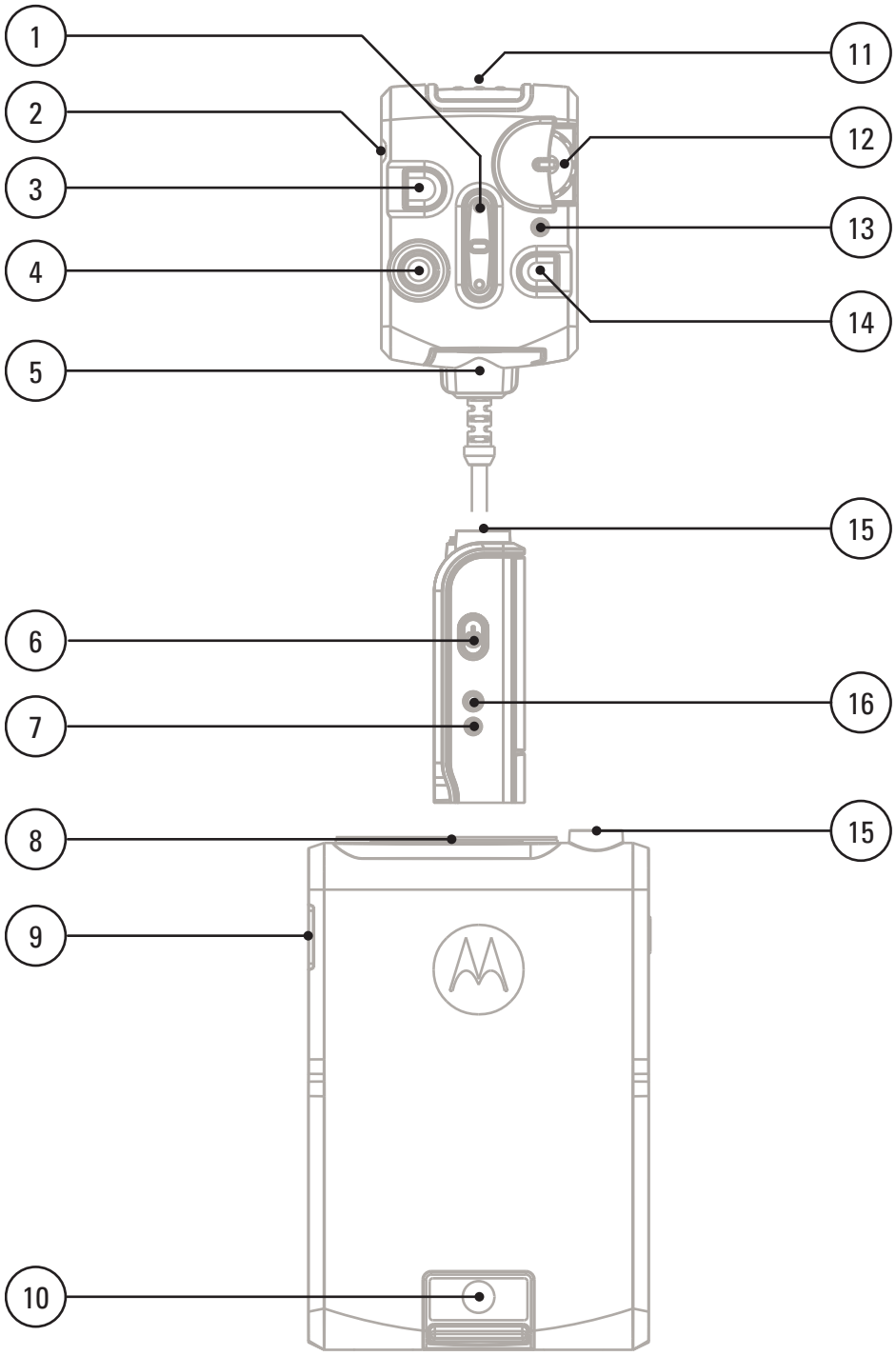


Table 10: TCR1000 Controls and Indicators

Annotation	Description
1	VOLUME up and down buttons Press VOLUME up or down buttons to adjust earpiece audio volume.

Table continued…

Annotation	Description
	Press VOLUME up and down buttons simultaneously for at least 2 seconds to enter/exit the Hibernation.
2	REMOTE PTT CONNECTOR
3	TONE button Press TONE button to give a tone indication on the selected talkgroup. The TONE button transmits the number of tones as pressed by the radio user. **Note:** The TONE button does not work in Emergency Mode.
4	TMO/DMO/EMERGENCY button It can have following functions: • If the EMERGENCY button is shared between emergency and TMO/DMO switch, press for a short time to switch between TMO and DMO. The radio attaches to a group mapped to the talkgroup on currently selected rotary position, or if a such mapping is not configured to first talkgroup in first range. • Press and hold to enter Emergency Mode. **Note:** The required time you to press and hold the EMERGENCY button is set to default to 0.5 second. Your service provider can configure the time.
5	RCU TO RADIO INTERFACE Connects Remote Control Unit (RCU) to the radio.
6	ON/OFF key Press and hold ON/OFF key to power on/off the radio.
7	LED Shows operations states of the radio. **Note:** Your service provider can disable LED indicator.
8	CE CONNECTOR Connects Remote Control Unit and audio accessories. Used for battery charging, radio programming and key loading.
9	EXTENSION BATTERY CONNECTOR **Note:** Extended battery cannot be changed while connected to the radio itself. Use the single or multi unit charger to charge it separately.
10	EXTENSION BATTERY STRAP ANCHOR
11	PTT Press and hold to initiate a group call, release it to listen.
12	ROTARY KNOB Turn the knob to select different talkgroup.

Table continued…

Annotation	Description
13	RESET button Press to reset the Remote Control Unit (RCU).
14	OPTION button It can be used in the following ways: • Short press — press for a short time (less than 0,5 second by default). • Long press — press and hold (default less than 5 seconds). • Very Long press — press and hold (default more than 5 seconds). Your service provider can assign each way to a different function: • toggle Whisper Mode. • toggle TXI Mode. • switch between TMO and DMO Modes. • talkgroup folder selection. • talkgroup change for predefined time. • not used — no function assigned.
15	ANTENNA CONNECTOR
16	ENCRYPTION KEYS button If the radio is turned on, the ENCRYPTION KEYS button has the following functions: • Press and hold to enter KVL Mode (default settings - longer than 1 second). • Press and hold to erase encryption keys (default settings - longer than 5 seconds). Otherwise, press it with the ON button to enter the Programming Mode.

Note: A detailed list of compatible accessories is included in *Accessory Leaflet*, part number: 6866587D14. To obtain the document, contact your service provider.

Audio

Tones

Note: To listen to the audio signal tones samples, click .

Table 11: Radio Tones

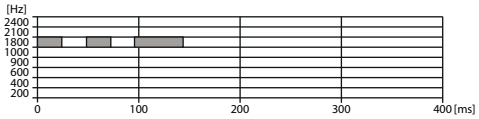
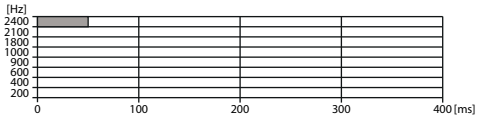
	Tone Name	Tone Diagram
	Back to Coverage Back to Full Service	
	Clear-to-send	

Table continued…

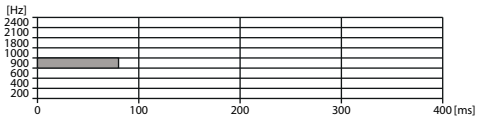
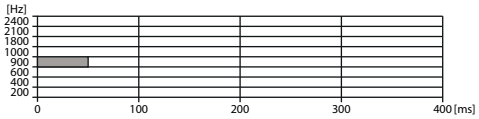
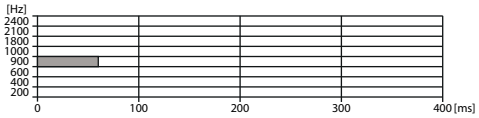
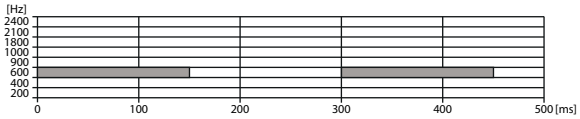
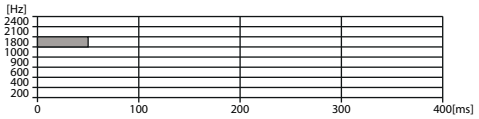
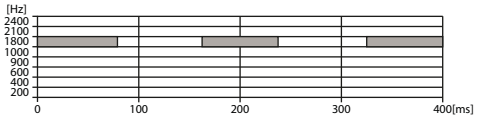
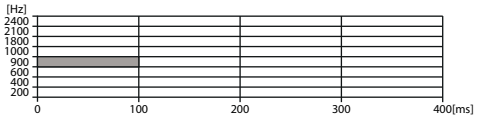
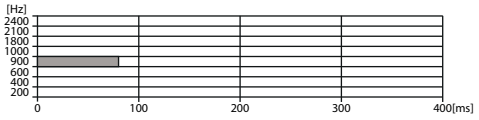
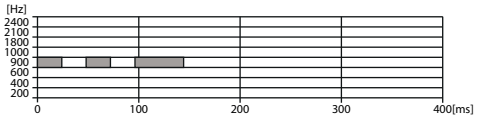
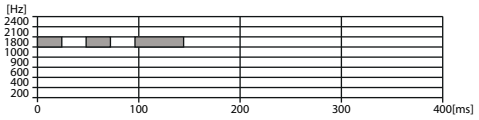
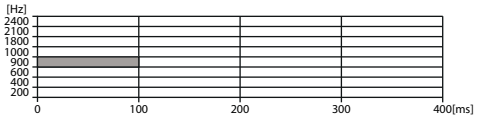
Tone Name	Tone Diagram
Bad Key Pressed	
From Out-of-Service to In Service	
Talkgroup Selected Rotary Switch position determines how many times the following sequence is repeated.	
Talkgroup Folder Selection	
In DMO	
In Emergency	
In Whisper Mode	
Call Clear Warning	
Talk Permit	
Talk Permit without Gateway	
• Talk prohibit • System busy • Time-out timer expire • Called radio not available or busy	

Table continued…

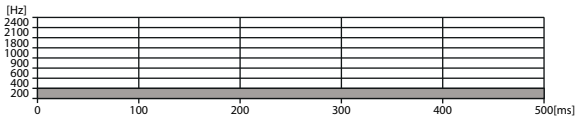
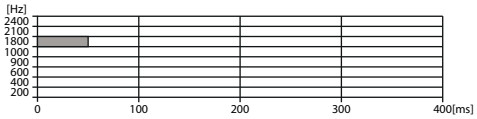
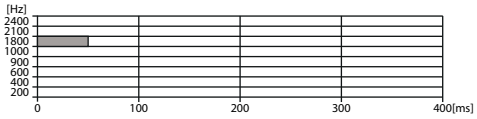
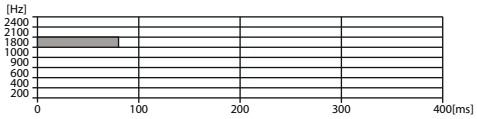
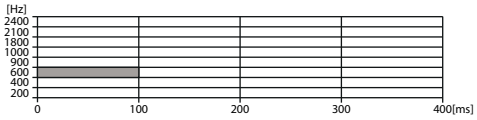
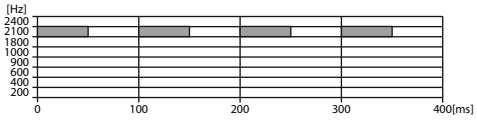
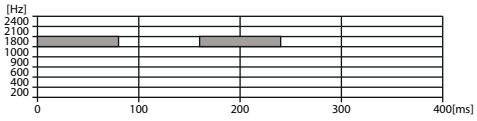
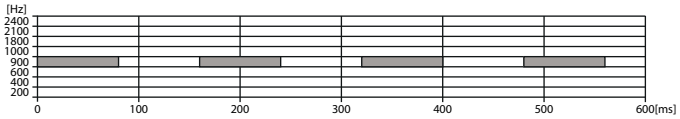
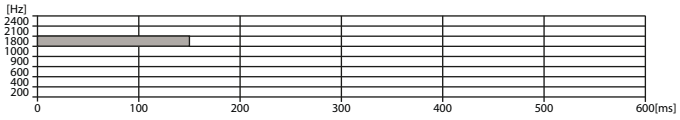
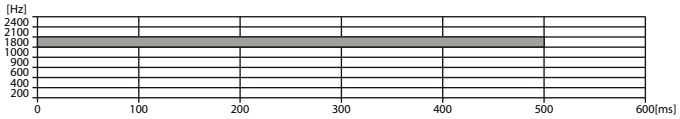
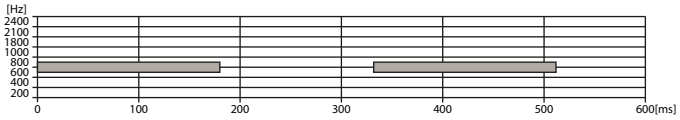
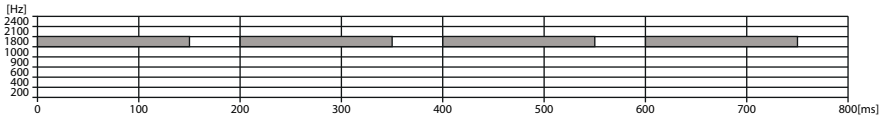
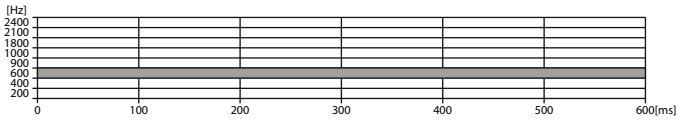
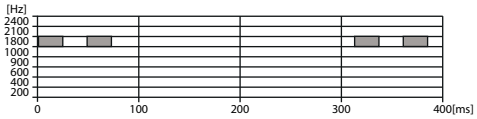
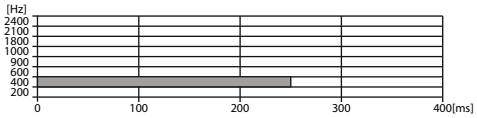
Tone Name	Tone Diagram
Call Disconnected or Failed Due to Network	
Entering DMO	
Exiting DMO	
Entering/Exiting Local Site Trunking	
Tone Button Pressed	
Receiving High-priority Group Call	
Receiving/Sending Emergency Alarm	
Emergency Alarm Failed	
Entering Emergency	
Exiting Emergency	
Entering/Exiting TXI	
Enabling Whisper Mode	

Table continued…

	Tone Name	Tone Diagram
	Disabling Whisper Mode	
	Low Battery Alert	
	RCU Not Installed	

Note: All the audible indications can be disabled by your service provider.

Whisper Mode

In situations where talking at normal volumes may be an issue the radio supports a high sensitivity microphone mode that can be toggled. You radio has a single audio input through the CE connector. The microphone can be fed from the inductive loop or the inductive patch. Although these devices have different audio characteristics, the Whisper Mode microphone gain delta is constant. This feature can be activated by pressing OPTION button.

Note: Whisper Mode is deactivated at power on.

Audio Features

There are many situations where the demand of audio quality changes according to the working environment. For example, an airport worker, who works partly in the field where there is lots of noise coming from the surrounding environment and partly inside the airport where there is relatively less noise, may experience different audio quality. In the working environments like these ones, there is a need for different audio quality and adaptive audio parameters which can be configured according to the working environment.

Audio Templates Names and Availability

Table 12: Available Audio Templates

Template Name
Normal
Whisper

Note: You can modify an audio profile by changing some of the audio parameters in the codeplug to modify an audio profile. The subject to the change are for example: Mic Gain, Speech Volume, AGC, Voice Filters, and Alert Tones Volume. The full list of the parameters specific to particular radio is available in the **Audio Parameters** node of the corresponding audio profile.

Appendix A

Glossary

ADD

Audio Device Descriptors

AIE

Air Interface Encryption

Air Interface Encryption (AIE)

Provides confidentiality on the radio link over the air.
See also:
Encryption on page 59

Announced Cell Reselection

Cell reselection where radio Mobile Link Entity (MLE) informs the Switching and Management Infrastructure (SwMI) both in the serving cell and in the new cell that cell change is performed.

APAC

Asia Pacific region

ASSI

Alias Short Subscriber Identity
See also:
Short Subscriber Identity on page 66

Audio Device Descriptors (ADD)

A structure which provides hardware information about a particular audio accessory (for both IMPRESS and core accessories). Files with ADD have an extension .add.

Base Station

Term used to identify the installation including the BTS, antenna and ancillary equipment.

BTS

Base Transceiver Station

Calibration values

A set of important and unique, factory-defined values (such as frequency tuning) assigned to radios. Also known as Sensitive data.

CCK

Common Cipher Key

Central Network Equipment

The equipment located at the Master Site or Mobile Switching Office.

Class 3

DCK encryption, ESI with CCK, authentication.

Clear

Not encrypted.

Common Cipher Key (CCK)

Used to encrypt group and broadcast addressed downlink signaling (from infrastructure to a radio). Also used to protect ISSI identities.

See also:
Encryption on page 59
Individual Short Subscriber Identity on page 61

Control Channel

The always active control channels transmit and receive the signaling to monitor and control the operation of radios.

CPS

Customer Programming Software

Customer Programming Software (CPS)

The software application used for programming radios.

DCK

Digital Car Kit

DCK

Derived Cipher Key

Derived Cipher Key (DCK)

Used to encrypt all uplink signaling (from radios to infrastructure) and individually addressed downlink signaling (from infrastructure to a radio).

See also:
Encryption on page 59

DGNA

Dynamic Group Number Assignment

Direct Mode Operation (DMO)

Direct communications between two or more radios without the use of any infrastructure.

DMO

Direct Mode Operation

DTE

Data Radio Equipment

DTMF

Dual Tone Multi-Frequency

Dual Tone Multi-Frequency (DTMF)

Tone-based signaling scheme which combines two of a set of standard frequencies. The result is a third or beat frequency (signal) which is the desired or usable signal. DTMF signaling is used as tone-dialing in the common telephone.

Dynamic Group Number Assignment (DGNA)

DGNA is a possibility to provision talkgroups into the radio over the Air Interface.

See also:
Talkgroup on page 66

Encryption

Secure communications systems are designed to provide coded (?encrypted?) signals between some or all links in the system. In order to do this, each device involved in secure communications is loaded with a multi-digit encryption variable (called a key). This key is used by an encryption algorithm built into the device to encrypt voice or data as needed. Only devices in the system with the same algorithm and encryption key can decode the encrypted signals.

Encryption

The manipulation of a packet's data in order to prevent anyone but the intended recipient from reading that data. There are many types of data encryption, and they are the basis of network security.

ESI

Encrypted Short Identity

ESSC

EMEA System Support Center

ETSI

European Telecommunications Standards Institute

European Telecommunications Standards Institute (ETSI)

The European standards organization responsible for the TETRA standard.

Firmware

Computer instructions that reside as read-only software on a radio's flash memory.

Fixed Network Equipment

Switching and Management Infrastructure

Flash

A storage chip integrated in to radio hardware, that can be erased and reprogrammed.

Flashing

Writing a software image file to a radio.

GCK

Group Cipher Key

GCK KAR

Group Cipher Key Key Association Range

GPIO

General Programmable Input Output

Group Call

An instant communication between users that belong to the same talkgroup.
See also:
Talkgroup on page 66

Group Cipher Key (GCK)

Predetermined cipher key used to provide confidentiality in Class 3 system with corresponding algorithm. Used to generate MGCK.
See also:
Modified Group Cipher Key on page 62
Class 3 on page 58

Group Short Subscriber Identity (GSSI)

TETRA term, in Dimetra called Group ID or Talkgroup ID.
See also:
Short Subscriber Identity on page 66

GSSI

Group Short Subscriber Identity

Home Location Address

Area within radio coverage of a base station or group of base stations within which a radio is allowed to operate.
See also:
Base Station on page 57

Individual Short Subscriber Identity (ISSI)

TETRA term for a unique, individual ID assigned for each radio.
See also:
Short Subscriber Identity on page 66

Individual TETRA Subscriber Identity (ITSI)

Consists of ISSI plus MCC and MNC codes.
See also:
Individual Short Subscriber Identity on page 61
Mobile Country Code on page 62
Mobile Network Code on page 62

ISSI

Individual Short Subscriber Identity

ITSI

Individual TETRA Subscriber Identity

Key

Each device involved in secure communications is loaded with a multi-digit encryption variable ? an encryption key. An encryption algorithm built into the device uses this key to encrypt voice or data as needed. Only devices in the system with the same algorithm and encryption key can decode the encrypted signals.
See also:
Encryption on page 59

LIP

Location Information Protocol

Local Site Trunking (LST)

Allows radio subscribers of the same cell site to communicate when the link between the site and network central controller fails. Entering and exiting Local Site Trunking (that is, returning to Site Wide Trunking) is done automatically ? the display shows the ?Local Area Service? message Any call in progress is dropped upon entering Local Site Trunking mode. Registration, Group Call, and Emergency Call are available in Local Site Trunking.
See also:
Central Network Equipment on page 58

Location Request/Response Protocol (LRPP)

This protocol allows for a single and efficient format of passing location information (requests and responses).

LRPP

Location Request/Response Protocol

LST

Local Site Trunking

MACE

Motorola Advanced Crypto Engine

Main Control Channel (MCCH)

The main control channel at a site. The channel is used by radios to register on the system and to request and setup speech calls with other radios.

See also:

Control Channel on page 58

Man Machine Interface (MMI)

Relates to the CPS Plus and radios user interface.

MCCH

Main Control Channel

MLE

Mobile Link Entity

See also:

Announced Cell Reselection on page 57

MMI

Man Machine Interface

Mobile Country Code

The MCC and MNC together form a unique TETRA system identifier that is broadcast by a Dimetra system over the air interface.

Mobile Network Code

The Mobile Network Code should be allocated by the national authority that allocates frequency assignments in a country and should be requested from that authority at the same time as frequency allocations are requested. The MCC and MNC together form a unique TETRA system identifier that is broadcast by a Dimetra system over the air interface.

Modified Group Cipher Key

Used to encrypt group addressed downlink signaling.

NGCH

Next Generation Control Head

OTAR

Over-The-Air-Rekeying protocol

Over-The-Air-Rekeying protocol (OTAR)

Used in connection with Air Interface Encryption.

See also:

Air Interface Encryption on page 57

PABX

Private Automatic Branch Exchange

PABX Gateway

A device that provides connectivity from a TETRA user to a PABX subscriber and the other way around.
See also:
Private Automatic Branch Exchange on page 63

PDV2

Permanent Disable Version 2

PEI

Peripheral Equipment Interface

Permanent Disable Version 2 (PDV2)

You can restore a disabled radio using CPS Plus.

Personal Hands-Free kit (PHF)

In other words an earpiece or a handset.

PHF

Personal Hands-Free kit

Private Automatic Branch Exchange (PABX)

Allows to call local (office) extension numbers.

Private Call

An individual call between two radios or between a radio and a console operator. Apart from the two interlocutors, no one else can participate or listen to the call.

Private Duplex Call

A private call between two radios that resembles a telephone conversation. The two individuals can talk and listen at the same time without pressing PTT.
See also:
Private Call on page 63
Push-to-Talk on page 64

Private Number

Also called Private ID.

PSTN

Public Switched Telephone Network

PSTN Gateway

A device that provides connectivity from a TETRA user to a PSTN subscriber and the other way around. Additionally, for the duration of the call, the PSTN gateway allows TETRA signaling information to be passed from TETRA Switching and Management Infrastructure to the external network user and from the external network user to the TETRA SwMI in accordance with the TETRA Call Control (CC) procedures.

See also:
Public Switched Telephone Network on page 64
Switching and Management Infrastructure on page 66

PTPC

Point-to-Point Call

See also:
Private Call on page 63

PTT Button

Push-to-Talk button

Public Switched Telephone Network (PSTN)

Traditional telephone network.

Push-to-Talk

Pressing this button on a radio allows the subscriber to transmit.

Radio

A two-way communication device used for voice and data.

Radio User Assignment/Radio User Identity (RUA/RUI)

This feature allows to assign alphanumeric user names to radio users, and to authenticate the radio users in a logon process.

Radio User Assignment (RUA)

Part of RUA/RUI feature.

See also:
Radio User Assignment/Radio User Identity on page 64

Radio User Identity (RUI)

Part of RUA/RUI feature

See also:
Radio User Assignment/Radio User Identity on page 64

RCU

Remote Control Unit

Remote Control Unit (RCU)

A small device attached to a covert radio over a thin wire, used for operating the radio.

Remote flashing

Programming the transceiver via the control head.

RSM

Remote Speaker Microphone

RSSI

Radio Signal Strength Indicator

RUA

Radio User Assignment

RUA/RUI

Radio User Assignment/Radio User Identity

RUI

Radio User Identity

SCK

Static Cipher Key

SDMO KAG

Secure Direct Mode Operation Key Association Group

SDS

Short Data Service

Selling Feature

Requires a USB dongle with purchased licenses.

Semi-Duplex Private Call

Also called Private Call or Express Connect Call. In this type of one-way call, the user presses and holds the PTT while talking, and releases the PTT while listening.

See also:
Private Call on page 63
Push-to-Talk on page 64

Sensitive Data

A set of important and unique, factory-defined values (such as frequency tuning) assigned to radios.

Short Data Service (SDS)

A flexible bearer service that transfers information from one interface to another.

Short Subscriber Identity (SSI)

The network specific portion of a TETRA Subscriber Identity. An SSI is only unique within one TETRA subdomain (one TETRA network).

SIM

Subscriber Identity Module

Software Image

A collection of files distinguished by individual releases. It contains firmware, codeplug, and audio template files dedicated to specific radio models.

SSI

Short Subscriber Identity

Static Cipher Key (SCK)

Key used for encryption between radios and BTS in Class 2 systems with corresponding algorithm.
See also:
Encryption on page 59

Status ID

A feature that makes it possible for a subscriber to send status messages to other subscribers. The user can enter a status message for each ID in a Status ID list. When a subscriber sends a status message, the ID of the subscriber?s unit is sent along with the status message.

Subscriber Identity Module (SIM)

A smart card that holds subscriber information (including the authentication key) and is inserted into the radio to grant its personality.

Switching and Management Infrastructure (SwMI)

All the system components excluding the mobile equipment that is the CNE and all the remote site equipment.
See also:
Central Network Equipment on page 58

SwMI

Switching and Management Infrastructure

Talkgroup

A group of radio users that can share calls and messages as a group. Normally a talkgroup is comprised of users who have a need to communicate with each other on a day-to-day basis.

TEI

TETRA Equipment Identity

Telephone Interconnect (TI)

A call feature that provides subscriber access to the Public Switched Telephone Network (PSTN). Telephone interconnect can be used for both land-to-mobile calls and mobile-to-land calls.

See also:

Public Switched Telephone Network on page 64

TETRA

Acronym for TErrestrial Trunked RAdio. The digital trunked radio standard produced by ETSI providing detailed telecommunications specifications to which Base Stations and radios should adhere.

See also:

Base Station on page 57

European Telecommunications Standards Institute on page 59

Radio on page 64

TETRA Equipment Identity (TEI)

An electronic serial number that is permanently embedded in the TETRA equipment, like radios.

TI

Telephone Interconnect

TMO

Trunked Mode Operation

Trunked

Trunked Radio Communications

Trunked Radio Communications (Trunked)

A computer controlled communications system that allocates speech channels on demand selecting on a random basis from the group of channels available.

Upgrade

To replace radio firmware with a newer version and preserve User and Sensitive Data.

User Data

A set of codeplug nodes and values, that can be edited and replicated to other codeplugs or radios.

VASSI

Visitor Alias Short Subscriber Identity