Mobile Release 5.14.3c

MTM800 E

PRODUCT INFORMATION MANUAL

April 2013

EN

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Contents

List of Figures

List of Tables

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Trademarks

European Union (EU) Waste of Electrical and Electronic Equipment (WEEE) directive

The European Union's WEEE directive requires that products sold into EU countries must have the crossed out trashbin label on the product (or the package in some cases).

As defined by the WEEE directive, this cross-out trashbin label means that customers and end-users in EU countries should not dispose of electronic and electrical equipment or accessories in household waste.

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

Service Information — EMEA

This topic contains contact details to service centers in Europe, Middle East, and Africa.

EMEA Systems Support Center (ESSC)

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

To contact ESSC, use the following EMEA Integrated Call Center details:

E-mail: ESCC.Admin@motorolasolutions.com.

Service Information — Telephone Numbers to EMEA Integrated Call Center

Country	Telephone Number
Austria	01206091087
Denmark	043682114
France	0157323434
Germany	06950070204
Italy	0291483230
Lithuania	880030828
Netherlands	0202061404
Norway	24159815
Portugal	0217616160
Russia	810800228 41044 (Alternative 8108001201011)
Saudi Arabia	8008445345
South Africa	0800981900
Spain	0912754787
United Kingdom	02030277499
Other Countries	+44 2030277499

EMEA Systems Component Center (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 66861555

Fax: +49 30 66861426

Mon—Fri 08:00 am—06:00 pm (CET)

Parts Identification and Ordering

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

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

EMEA Test Equipment Support

For information related to support and service of Motorola Test Equipment, contact Customer Care Organization of Motorola local area representation or see http://emeaonline.motorola.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, go to http://emeaonline.motorola.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 — APAC

This topic contains contact details to service centers in Asia and Pacific region.

Technical Support

Technical support is available to assist the dealer/distributor in resolving any malfunction which may be encountered. Initial contact 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:

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

Service Information — Telephone Numbers and Addresses of the Asia and Pacific Motorola Centers (cont'd.)

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, 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

Service Information — Telephone Numbers and Addresses of the Asia and Pacific Motorola Centers (cont'd.)

(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, 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. Contact: Adrian Connor, E-mail: c19183@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 — LACR

This topic contains contact details to service centers in Latin America and Caribbean region.

Technical Support

To request technical support, go to https://businessonline.motorola.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

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.

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

Service Information — Telephone Numbers and Addresses of Latin America Motorola Centers (cont'd.)

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

1 Product Overview

1.1 MTM800 Enhanced Overview

Discerning professionals demand high-quality voice communications with fast access to mobile applications. The MTM800 Enhanced delivers on both, with SDS, Multi-Slot Packet Data and WAP options.

Figure 1-1 MTM800 Enhanced

Developed for organizations where rugged and versatile mobile terminals are essential, Motorola MTM800 Enhanced is ideal for use where the application, location and/or circumstances demand fast, reliable, no-nonsense solutions.

- Ease-of-operation in the most demanding situations – unsurpassed audio quality, intuitive keypad, and high-definition, color display combined with a sleek yet durable design.
- Dust and water resistant to IP 54. rain, salt, fog, and dust protection tested to MIL 810 C/D/E/F for the standard control head.
- Motorcycle control head rated IP67 for dust and water resistance

The MTM800 Enhanced also supports the full suite of TETRA security functions, including air interface encryption, and End-to-End encryption. Users can request assistance by simply hitting the emergency button, which not only alerts colleagues to critical situations, but also sends an update dispatch on the user location. The radio is able to switch to covert mode at a press of a button. The radio has an integrated GPS receiver that enables users to locate their mobiles, and provides location-based services and mapping capabilities.

The radio offers various installation possibilities from typical Dashboard installation to Dual Control Head installation using an additional junction box. Currently the following options are supported:

- Trunnion Installation
- Dashboard Installation
- Desktop Installation
- Remote Mount Installation
- Motorcycle Installation
- Dual Control Head Installation
- Data Box Radio Installation

1.1.1 Specification

Table 1-1 General Technical Specification

Parameter	Value
Dimensions HxWxD mm	125 x 50 x 37.5 (radio only) 60 x 185 x 175 (with Next Generation Control Head)
Weight g	1350 radio only 1470 with Next Generation Control Head
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	384 (3 Favorite Groups folders containing up to 128 entries each)
Contact List	1000 Contacts up to six entries (numbers) per contact Max. 2000 entries
Text Message List	100 Short and 20 Long Messages for Outbox 100 Short and 10 Long Messages for Inbox
Status List	400 Entries
Country Code/Network Code List	100 Entries
Scan List	40 Lists of 20 Groups
Operating Temperature °C	-30 to +60
Storage Temperature °C	-40 to +85
Humidity	ETS 300 019-1-5 Class 5.1 and 5.2, up to 95% R.H.@50 0C EIA/TIA 603 (95%) MIL810 95% RH 50 deg.
Dust & Water	IP54 (dust - cat. 1) for Next Generation Control Head IP67 (dust - cat. 1) for Motorcycle Next Generation Control Head
Shock (Mechanical), Drop & Vibration	ETS 300019-1-5 class 5M2 and class 5M3 MIL 810 C - F
Thermal Shock °C	-40 to +80
SB9000 Support	No

Table 1-2 RF Specification

Parameter	Value
Frequency Bands MHz	260–275 MHz 350–390 MHz 380–430 MHz 410–470 MHz 806–870 MHz
RF Channel Bandwidth kHz	25
Switching Bandwidth TMO MHz	6 (260–275 MHz) 40 (350–390 MHz) 50 (380–430 MHz) 60 (410–470 MHz) 19 (806–870 MHz)
Switching Bandwidth DMO MHz	6 (260–275 MHz) 40 (350–390 MHz) 50 (380–430 MHz) 60 (410–470 MHz) 19 (806–870 MHz)
Transmitter/Receiver Separation MHz	9 (260–275 MHz) 10 (350–390 MHz) 10 (380–430 MHz) 10 (410–470 MHz) 45 (806–870 MHz)
Transmitter RF Output Power W	3 (Class 3)
RF Power Control	4 Steps of 5 dB
RF Power Level Accuracy +/-dB	2
Receiver Class	A and B
Receiver Static Sensitivity dBm	-112 minimum (-114 typical)
Receiver Dynamic Sensitivity dBm	-103 minimum (-105 typical)

Table 1-3 GPS Specification

Parameter	Value
Simultaneous Satellites	12
Mode of Operation	Autonomous or Assisted (A-GPS)
GPS Antenna	Supports an active antenna (5 V, 25 mA supply) through an FME male connector

Table 1-3 GPS Specification (cont'd.)

Parameter	Value
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.

1.2 Radio and Features Ordering Options

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 order by dongle.
- You can enable at DC — visit Order Management Electronic Catalog (OM-eCAT) Volume Descriptions
- If you have iTM, you can enable them with license.

1.3 Radio Ordering

Procedure Steps

1 Order the main radio model.

2 Order options from each of the categories:

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

NOTE

Export controls apply when ordering encryption.

1.4 Models, Options, Accessories

The up-to-date list of models, available options, and accessories is available through Order Management Electronic Catalog (OM-eCAT) Volume Descriptions.

1.5 Software Enablement Kits

Each software enablement kit ordered provides one dongle for the customer with a specific number of counters set according to the amount 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.

1.6 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.

1.7 Ordering Software Enablement Kit

Procedure Steps

1 Order the main kit.

2 Add a software feature option.

NOTE

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

3 Order quantity equaling number of models requiring an option.

Example:
The following order is placed:

- 20 terminals
- 10 GPS software enables
- 20 GPS feature software enables

To accompany the terminals (ordered as per price pages, see Order Management Electronic Catalog (OM-eCAT) Volume Descriptions), the following Software Enhancement Kit should be ordered:

- 1 dongle (1 x GM0193)
- 10 GPS (10 x QA00177)

- 20 GPS feature (20 x QA03185AA)

1.8 Software Feature Options

Table 1-4 Main Kit Number

Radio	Main Kit Number
MTM800 Enhanced	GM0127

Table 1-5 Feature Options and Availability

Feature Option	MTM800 Enhanced
QA00177AA GPS	Yes  **NOTE** The GPS Feature is a hardware option. If GPS is required select the appropriate radio configuration while ordering. The radio is then shipped with the hardware required to enable the feature.
QA00175AA WAP	Yes
QA00176AA MSPD	Yes
QA00771AA Enhanced Security	Yes
QA00772AA Permanent Disable (Kill)	Yes
QA01003AA Kill/Unkill (Permanent Disable v2)	Yes
QA01089AA Call Out	Yes
QA01090AA RUI/RUA	Yes
QA01261AA Secondary Control Channel (SCCH)	Yes
QA01275AA Dual Control Head	Yes  **NOTE** The Dual Control Head Feature requires selecting the hardware option GA00311AA while ordering. The radio is then shipped with the hardware required to enable the feature.
QA01276AA Air Interface Migration	Yes
QA01628AA RMS/FMS	Yes
QA01629AA SDS Remote Control	Yes
QA01652AA Cell Select by Talkgroup	Yes
QA01746AA WAP Push	Yes

Table 1-5 Feature Options and Availability (cont'd.)

Feature Option	MTM800 Enhanced
QA01847AA SDS E2EE	Yes
QA01848AA Immediate Text Message	Yes
QA02765AA Local Site Trunking Ignoring	Yes
QA02766AA Sticking to Home Cell	Yes

NOTE

To enable WAP Push on the radio, WAP feature is required.

NOTE

Depending on the way you order software options (order by dongle or enabled at DC) visit Order Management Electronic Catalog (OM-eCAT) Volume Descriptions to verify your numbers.

2 Services and Features

2.1 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
- BUP and RL
- Call-Out
- Congested Cell Handling
- DGNA (Individually and group addressed)
- Duplex private call
- 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)
- Packet Data (Multi-Slot)
- Preemptive Priority Call
- PTT Double Push
- Radio Messaging System
- RUA/RUI
- SDS Remote Control
- SDS Store and Forward
- Secondary Control Channel
- Short Data Services (Status, Text Message)
- Simplex private call
- SwMI Initiated Authentication
- Talkgroup and Priority monitor
- Targeted SDS Status (to SSI)
- Telephone call (PSTN /PABX)

- Temporary/Permanently Enable/Disable
- TNP1
- Transmit Inhibit (RF Sensitive Area Mode)
- WAP Push

Direct Mode Operation (DMO)

- AT commands
- DMO Group Call
- DMO Group Emergency Call
- DMO Inter-MNI (including open group and open MNI)
- DMO Private Call
- DMO Repeater Compatibility
- DMO Static Key Encryption (DMO SCK)
- DMO/TMO Emergency Switching
- PTT Double Push
- Short Data Services (Status, Text Message)
- Targeted SDS Status (to SSI)
- Transmit Inhibit (RF Sensitive Area Mode)

Platform Specific Features

- 4-way navigation key
- Built-in GPS receiver
- Data Box Radio operation
- Dual Control Head operation
- Dual-function rotary (volume, list selection) with the push button
- Energy Economy
- Flashing via USB
- GPS over Multi-Slot Packet Data
- High-resolution color display

General Features

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

Features Not Supported in Dimetra

- Background scanning
- Call modifications
- CCK per LA
- DCK Forwarding
- Emergency Private call
- SDS via PSTN Gateway (SDS to PABX is not possible)
- SwMI controlled groups
- SwMI initiated attachments

2.2 System Support

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

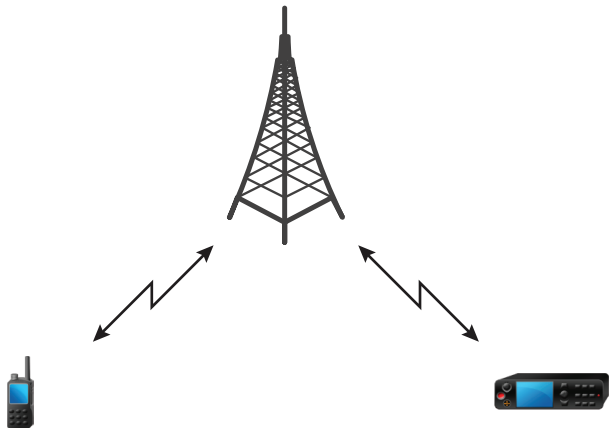
The radio is designed to operate optimally on the Dimetra IP system. The radio operates properly on all SwMIs that comply with the following IOP TIP documents:

- 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.

2.3 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, short data service messages) and access to the infrastructure-related features (for example, packet data).

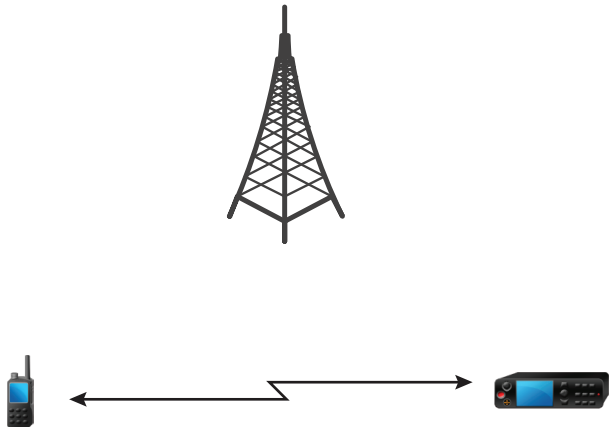
Figure 2-1 Trunked Mode Operation



2.4 Direct Mode Operation

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

Figure 2-2 Direct Mode Operation



2.5 Numbering and Addressing

Each radio has a TETRA ITSI used for addressing the radio over the air interface. However, it is undesirable to require you to enter a long number to address another radio. To this end, a set of short number schemes can be used.

Alternatively, the radio can be provisioned to treat a short number as an SSI. This scheme can be refined to allow short dialing within a fleet by combining the ID entered with the radio own SSI.

If the radio is provisioned to treat a short number as a TETRA Short Subscriber Identity (SSI), and the number entered is less than seven digits, the radio own identity is combined with the number entered to produce the actual ISSI. Using this scheme, an ISSI can be comprised of a fleet number part and a member part.

The radio own ISSI is used for determining the leading digits for the digits omitted as in the following scenario:

1. The radio has the following ID: 1234567
2. You enter: 890
3. The SSI sent is: 1234890

The following services can use the short SSI for identification for both the called and the calling party:

- Duplex private call
- Simplex private call
- Group call
- Mobile status
- Short data bearer service
- Text message service

Regardless of the short addressing scheme used, if you are provisioned with the capability of entering a real TETRA ISSI and you enter an ID of seven digits, the number is interpreted as a real TETRA ISSI.

2.6 Dialing Methods

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

The direct dialing provides the radio user with a possibility to dial a number before entering the mode (modeless operation for all types of calls). To start dialing from the idle display activate the private number dialing editor by pressing and holding an assigned key. The default call type is suggested with the possibility to change the call type.

Scrolling keys are used to scroll back and forth through the contact list or talkgroup/folder names.

2.6.1 Talkgroup Dialing

The talkgroup dialing by index allows calling from a radio to a talkgroup by using the talkgroup speed dial number (in other words the Talkgroup ID or Index). By default, you scroll through a list of talkgroups to find the one and call. With the talkgroup dialing by index option enabled, you can use the keypad and enter the talkgroup speed dial number followed by the * key. For example, to call a talkgroup which ID is 19, a radio user enters 1, 9, and * from the keypad and then presses the PTT button.

2.6.2 Individual Dialing

If the One-Touch Button method is provisioned, you can call an individual by pressing and holding down one of the programmable buttons.

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

You can re-dial numbers from the call history stack.

The private ID number is a number with up to 16 digits. If you enter less than 16 digits, the Individual Short Subscriber Identity (ISSI) part is padded to full Individual TETRA Subscriber Identity (ITSI) with leading zeros. The private ID number consists of MCC (Mobile Country Code), MNC (Mobile Network Code) and ISSI.

Table 2-1 Dialing Scheme

MCC	MNC	ISSI
16–14	13–9	8–1

NOTE

For the MNC of a private ID (digits 13-9) values from 00000 to 16383 are accepted.

Two options are given to the user:

- Fixed — provide up to 16 digits which include the MCC, MNC, and ISSI numbers. If you enter less than 16 digits, then the rest is filled with the digits that are set in the codeplug.
- Automatic — provide up to eight digits. If you provide more, it switches to fixed mode. If you enter less than 16 digits, the radio fills the rest of the number with its own ITSI.

If you try to enter more than 16 digits, you receive a prompt informing about an incorrect input.

2.7 Unified Address Book

The radio offers an address book facility, where multiple numbers are associated with a single name tag. This facility presents an interface to the address book and provides a natural way to call an individual who can be contacted in different ways.

Each individual can have up to six associated numbers:

- Private (a TETRA ISSI).
- Home (phone number).
- Mobile (phone number).
- Work (phone number).
- PABX (local short number).
- Other (phone number).

The Contact List has a maximum capacity of 1000 Contacts, with up to 1000 associated Private and up to 1000 associated either Phone or PABX numbers distributed among the contacts.

The radio provides editing capabilities to the address book to allow adding or deleting entries.

The radio provides with the possibility to view the number of used and free address book entries.

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

2.8 Call History

A call history stack is provided which consists of the following:

- Last dialed numbers
- Missed call numbers
- Answered (Received) call numbers

Additionally for the recent calls the time when a call was established and the call duration is available.

The Call History stack holds private TETRA IDs as well as phone and PABX numbers.

Numbers from the stack may be viewed, selected, and called. However, outgoing duplex calls from Recent Calls list display in DMO are not allowed. When you scroll through the lists, the entries appear in the opposite order (the most recent shown first).

When a call is made to a number that exists in the last dialed list, this number is not duplicated in the list and is moved to the beginning of the list. However, a missed call and received entries are duplicated in the corresponding call list.

The call history lists are available after next power-up.

You can save a number from the call history stack to the address book.

2.9 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.

2.9.1 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.

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

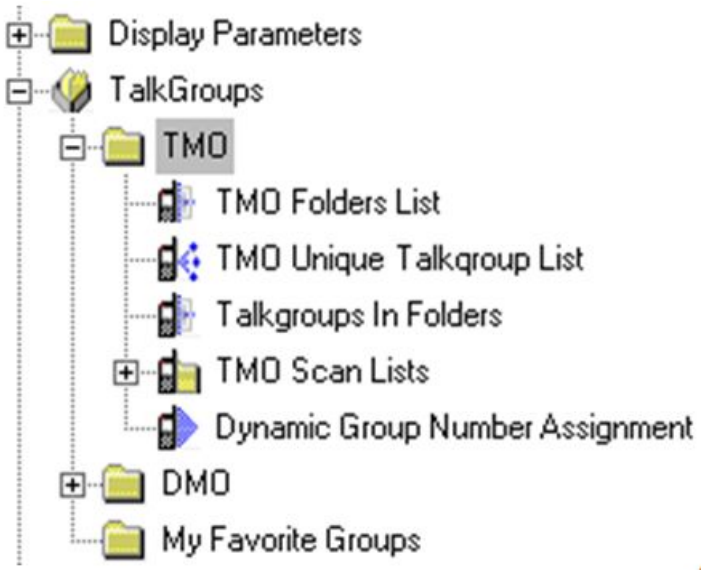
2.9.2 Talkgroup Folders

The talkgroups are organized in folders. You can select a talkgroup by first choosing a folder and then the talkgroup in the folder. Use the rotary knob or the Option button to select the talkgroup, for detail procedure see the *Feature User Guide*.The size of each folder is flexible and can be defined through provisioning.

The talkgroup folders are organized in a tree-structure:

- Level 1 Folders
  - 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.
- Level 3 Folders
  - Placed in level 2 folders.
  - Any given level 3 folder can only be subfolder to level 2 folder.

Figure 2-3 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 shall be hidden in the MMI.

2.9.3 Talkgroup Selection

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

Talkgroup scrolling can be provisioned to scroll in a folder only, or continuously through the folders acting as one continuous list of groups.

The radio does not allow directly dialing a group SSI.

2.9.4 Favorite Talkgroups

This feature allows a quick access to frequently used talkgroups by including the groups in up to three favorite talkgroups ranges. These ranges are separately stored in the data storage.

The favorite talkgroups feature operates in both TMO and DMO modes. The favorite talkgroups ranges are shared for TMO and DMO talkgroups. You can select, view, and edit **My Groups** ranges. Once a group from the **My Groups** range is selected, you can select any of the favorite talkgroups in that range using normal procedure.

A favorite talkgroup range name replaces a talkgroup range name on the radio display whenever a favorite talkgroup is selected, or is in use for appropriate operation. The ranges of favorite talkgroups with their talkgroup assignments are kept through the radio power cycle.

2.9.5 Talkgroup Blind Operation

The radio can be provisioned with a virtual rotary end-stop option for use in blind operation. When you have scrolled to the beginning or the end of the list, the first or the last talkgroup is displayed even if you continue to scroll. To change this setting for the rotary knob you can select “Wrap around Rotary Knob Group Scrolling” option in the CPS.

2.9.6 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.

2.9.7 Non-Selectable Talkgroups

A talkgroup can be provisioned as a non-selectable talkgroup. Such talkgroups are not visible when scrolling through the talkgroup list, and thus cannot be selected. The group name is displayed only upon receiving a call for the group, for instance, if it is an announcement talkgroup associated with the selected group, or if it is a scanned one.

2.9.8 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.

2.9.9 Receiving a Group Call

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.

2.9.10 Talkgroup Scanning

Talkgroup scanning allows the radio to monitor signaling of a number of talkgroups at the same time. In addition to monitoring signaling addressed to the selected talkgroup, the radio can monitor signaling addressed to multiple talkgroups.

To use the multiple group monitoring, define a scan list — the user-activated scan list. This list holds up to 20 talkgroups, which you monitor in addition to the selected group.

You can choose only one user-activated scan list at a time. When this list is activated, the radio begins to monitor traffic for these groups in addition to the traffic for the selected group. The radio can allow creating and editing the scan list using MMI. Up to 40 scan lists can be defined.

If the SwMI instructs a radio to detach one of the scanned groups, the radio stops monitoring the group, but the group remains in the scan list. Subsequent attachment of a group by the SwMI causes the radio to begin monitoring the group again.

The SwMI may also instruct a radio to attach groups from out of the scan list. If the group attachment is accepted, the radio monitors the group.

The radio may passively monitor the following talkgroups if they have been attached or are always attached:

- Selected talkgroup.
- ATG associated with the selected talkgroup (if this talkgroup is not set as **Permanently detach**).
- Talkgroups associated with the selected ATG (if this talkgroup is not set as **Permanently detach**).
- Talkgroups in the user-activated scan list (if scanning is enabled and the SwMI-initiated detachment has not been performed on these groups).
- Talkgroups in the SwMI-controlled scan list (if scanning is enabled).
- Talkgroups with the class of usage set to **Always Scanned** (if supported).
- Supergroup of the selected talkgroup.
- Supergroups of the scanned talkgroup.

2.9.11 Priority Monitor

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

The following priority types are applicable to calls:

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

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

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

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

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

2.9.12 Announcement Talkgroup

The radio supports the concept of a group hierarchy. A special group, an announcement talkgroup (ATG), in addition to being a group, logically contains up to 20 subgroups.

When you select an ATG as the selected group, the radio monitors traffic received for the announcement group as well as the traffic received for any of the associated subgroups. However, the radio does not monitor the active scan list groups when an announcement group is selected.

When you select one of the subgroups of the ATG, the traffic for the subgroup is monitored as well as the traffic for its announcement group, not other subgroups though.

Each normal talkgroup may be associated with only one ATG. An ATG cannot be associated with another ATG.

Depending on the codeplug settings, you may be prohibited from initiating ATG calls. In such case, you are still permitted to initiate an emergency call to an ATG group.

2.9.13 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.

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.

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

2.9.14 Timed Talkgroup Change

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

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.

Example:

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.

2.9.15 Broadcast Call

This kind of call enables dispatcher to transmit to all radios in the specific area.

The radio joins calls received with a communication type broadcast and displays a notification that this call is a broadcast call.

Typically, this call type is addressed to the broadcast address (ISSI).

A broadcast call takes precedence over any other call that has the same or lower call priority.

The radio cannot initiate a broadcast call, however, the radio is able to initiate the "broadcast-type" call restricted to the particular talkgroup using the Announcement Call feature.

2.9.16 Announcement Call

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 Announcement Call, other features are impacted:

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

2.9.17 PTT Double Push

The PTT double push (D-PTT) feature enables to generate a specific tone sent to radios in the talkgroup. You can send the tone by pressing PTT twice. After the D-PTT tone is played, you can press and hold the PTT once again to get the permission to talk. Otherwise if you press the PTT while the D-PTT tone is played, it is ignored. After D-PTT tone is sent keeping PTT pressed results in permission to talk. D-PTT tone is not audible on sending radio.

To send the tone (when the feature is enabled), you press the PTT twice in a period defined in CPS. The D-PTT is triggered only when the radio is in idle or group call mode. The D-PTT tone is not played on the sending radio.

If the PTT is kept pressed after second press and the radio finishes sending the D-PTT tone it allows starting group call. You are notified of the behavior by the permission to talk tone after D-PTT tone ends. If PTT is released after the second press, only the D-PTT tone is sent.

The D-PTT tone is sent as voice, hence the receiving radio plays the sound no matter whether the feature is enabled on it.

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

2.9.18 PTT Queue

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

2.9.19 Talking Party Identification

The PDUs and facility elements for these TETRA Supplementary Services are not supported. However, identification presentation functionality is supported in most cases using the information found in the call setup messages.

2.9.20 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.

The SwMI decides about the ownership of a call.

2.9.21 Transmission During Group Call

While talking in an ongoing 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.

2.9.22 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.

2.9.23 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.

2.9.24 Late Entry

The user can join the groupcall 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 control channel automatically 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.

This feature must be configured on SwMI. Acknowledged late entry, and late entry paging are not supported.

2.9.25 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. When you change the selected talkgroup, the radio initiates an attachment to the SwMI, detaching the old group and attaching the new one.

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

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

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

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

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

2.9.26 SwMI Initiated Group Attach/Detach

The 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.

2.10 Private Call

The Private Call, also called point-to-point, or individual call, enables calling between two individuals. No other radio can hear the conversation. This call type can be carried out in two ways:

- Duplex call (if the system allows), in TMO Mode. Both parties can speak at the same time.
- Simplex call, in TMO or DMO Mode. Only one party can speak at a time.

From your radio, an Private Call can be started using one of the following methods:

- Dialing ISSI number on the idle screen
- By selecting contact from the address book
- By selecting ISSI number from the recent call list
- Using Remote Control feature
- By pressing predefined One Touch Button
- Other

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

Interaction with the accessories:

- Fist Microphone — during the Private Call, if you hang the microphone into the clip the call ends or the audio switches to the speakers (if connected). Exact behavior depends on CPS configuration.
- Telephone Style Handset — during the Private Call, if you hand the handset into the holder, the call ends or the audio switches to the speakers (if connected). Exact behavior depends on CPS configuration.

Take the Fist Microphone or Telephone Style Handset off the hook. If the Handset is off the hook, the radio's external speaker mutes and the Handset's internal speaker activates. If you are using the fist microphone or telephone style handset, replace it firmly on it's clip or holder when done. Both fist microphone and handsets can be equipped with Hook functionality. You can answer the call by taking the fist microphone or the telephone style handset off-hook. If the handset is off-hook, the radio's external speaker mutes and the handset's internal speaker activates. In case of accessories connected directly to the radio the microphone follows PTT (accessories connected to the Control Head). In case of accessories connected through the junction box, the active microphone depends on accessory hook state. If the accessory is on the hook, the visor microphone is the active one. If it is off the hook, the microphone of the accessory connected to the TELCO connector is the active one. So, in case of accessories connected to the junction box, active microphone does not depend on which PTT is pressed (accessory or external). The microphone is selected based on hook setting.

2.10.1 Simplex Private Call

The radio is able to make and receive private calls to and from other TETRA radios with simplex speech capability. This call type uses TETRA individual call signaling.

All private calls are initiated using the on-off hook method. For incoming calls, the radio accepts both direct and on-off hook setup.

2.10.2 Duplex Private Call

The radio allows making and receiving private calls to and from other TETRA radios with duplex speech capability. Depending on the configuration, the radio may prohibit you from initiating duplex private calls.

The radio always initiates duplex private calls using on-off hook signaling with the traffic channel allocated by the SwMI only after the called party has answered the call. Therefore, the radio generates all progress tones during the call setup. In addition, the radio allows the SwMI to modify the call setup to direct. This modification enables the infrastructure to generate the progress tones.

2.10.3 Talk Time Limit

In a simplex call, 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.

2.10.4 Call Restoration in Private Call

If the radio roams while you are the transmitting party in a private call, the announced cell reselection is employed (if possible). Call restoration procedures are performed in the new cell.

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

2.10.5 Call Modification

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

Modification can cover:

- Call priority — modified during call setup.
- Call type — modified during call setup.
- Call encryption — modified during an ongoing call (but not in the transmission phase).

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

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

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

When call priority is changed to emergency:

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

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

If call modification requested by your service provider cannot be followed by the radio (due to its settings), the radio rejects it and displays **Service Not Available** message.

2.10.6 Assistance Call

Assistance Call feature helps you to call for assistance during normal and non-critical situations. Starting an Assistance Call means starting a private call on a configured ISSI number. Assistance Call destination address and priority can be configured in the codeplug. This feature is only supported in TMO mode.

Assistance Call can be a simplex or duplex call depending upon your service provider settings. An Assistance Call is full-duplex when you start the call using radio menu. When you type the number and press PTT, then your radio starts a half-duplex call, but if you type the number and press SEND, then the call is duplex.

2.10.7 DMO Individual Call Presence Check

If the other party is listening, the Presence Check feature allows the user making a DMO private call to have a confirmation. This is important in situations where it is crucial that the message gets through. A radio with Presence Check enabled displays the “Party not available” message if the other party does not answer. To use this feature, both radios need to support it.

In addition, radios can be configured to Accept DMO Individual Calls with Presence Check. If enabled, the radio accepts incoming calls with or without the presence check. If disabled, the radio only accepts private calls without the presence check.

2.10.8 DMO Individual Only Talkgroups

It is possible to configure some or all DMO talkgroups to allow only individual calls. This helps optimize frequency allocation in Direct Mode Operation.

2.11 Phone Call

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

Two phone call types are available:

- PSTN (a full phone number) is addressed to the defined PSTN gateway address.
- PABX phone number, for internal calls, numbers dialed are addressed to the defined PABX gateway address.

NOTE

The PSTN phone call is supported when PSTN/PABX feature is enabled in the codeplug and the SwMI supports this functionality. The PSTN/PABX gateway must be configured properly.

No more than one PSTN/PABX gateway ID and one PABX/PABX gateway ID are available in the radio.

2.11.1 Initiating a Phone Call

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

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

Phone calls can also be made between TETRA radios using the MS-ISDN number as the called party number. MS-ISDN calls share the same gateway as phone calls, that is, PSTN gateway configured in the codeplug. If an MS-ISDN call is placed, two radios can have a simplex or duplex call based on assigned ISDN number.

NOTE

The Dimetra Infrastructure does not support private calls and SDS through MS-ISDN.

2.11.2 Receiving a Phone Call

Incoming phone calls (land gateway to mobile) use on-off hook signaling. The radio extracts the gateway ID from the call setup signaling, to determine whether to start phone or PABX call. That means you need to answer the call e.g. by pressing the SEND button.

2.11.3 Call Restoration in Phone Call

If the radio roams while being in an active phone call, and the announced cell reselection is possible, then the announced cell reselection is employed. Also the call restoration procedures are performed.

2.12 Emergency Operations

Emergency Operations are used in critical situations.

Pressing the EMERGENCY button or entering Emergency number and pressing 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.

2.12.1 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.

2.12.2 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.

2.12.3 Emergency Individual Calls (Private or MS-ISDN)

The Emergency Individual Calls are Simplex or Duplex Calls with emergency priority. On pressing the EMERGENCY button, the radio initiates an Individual Call to the provisioned address (private or MS-ISDN). During this kind of call all user indications are unavailable and all other services are rejected. Emergency Operation ends as soon as the Emergency Individual Call is ended.

2.12.4 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.

2.12.5 Emergency SDS Status

Radio sends a status message with a preprogrammed value to the destination address set up in the codeplug. Emergency SDS Status is available in TMO only. If no status acknowledgment or negative acknowledgment is received, the radio retries sending the message. Status is not resend if Emergency Alarm or Hot Microphone is configured.

2.12.6 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).

Subsequent EMERGENCY button presses during the Emergency Operation restarts the Hot Microphone transmission.

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.

Pressing **End**SOFT key or END key ends the Hot Microphone operation.

2.12.7 Alternating Hot Microphone

The Alternating Hot Microphone is an enhancement of the Hot Microphone feature. It allows you to have the Hot Microphone switched on and off alternately.

If this feature is enabled, you can initiate the Alternating Hot Microphone by pressing the EMERGENCY button.

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

- The radio exits the Emergency Mode.
- The Alternating Hot Microphone timer expires.
- The PTT button is pressed.
- The right SOFT key is pressed (only during the transmission timeslot).

To skip your transmission timeslot and jump to a receiving timeslot, press END key.

NOTE

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

NOTE

When the user is in the Emergency Mode, pressing EMERGENCY button restarts the Alternating Hot Microphone.

2.12.8 Silent Emergency Mode

The Silent Emergency Mode is a type of emergency services that provides no audible indications and no keypad tones at the entrance. All the display indications are as in the idle mode. However, the radio cannot use any services except for:

- Receiving Ambience Listening
- Sending Silent Emergency Alarms
- Sending GPS location reports

NOTE

If you try to activate any other feature, it is blocked.

If the Silent Emergency feature is enabled, the radio enters Silent Emergency Mode on pressing the EMERGENCY button. After entering this Mode the radio stays in TMO or switches to it, depending on the actual state. Once in TMO, the radio sends Silent Emergency Alarm.

NOTE

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

The radio keeps re-sending the alarm until successful sending is confirmed. After the alarm is successfully delivered, the radio stays in Silent Emergency Mode and waits for the Ambience Listening.

Your radio exits the Silent Emergency Mode, under the following conditions:

- Press MENU and then # key within 3 seconds.
- Press MENU simultaneously with right NAVIGATION key.
- Press both SOFT keys simultaneously.
- No success in sending the Silent Emergency Alarm and the maximum number of retries has been reached.
- The control room terminates the Silent Ambience Listening.
- The Ambience Listening is disconnected due to another reason.

If you turn off the radio in the Silent Emergency Mode, the radio switches to pseudo power off state. In this state, the radio appears to be turned off. However, the radio is still on and in the Silent Emergency Mode. On turning the radio on during the pseudo power off state, the radio acts as during turning on and still is in the Silent Emergency Mode.

2.12.9 Invisible Emergency

It is possible for the service provider to disable visual and audible indications of performing Emergency Operations on the radio. The purpose of this feature is to hide the fact of using Emergency Operations in a critical situation (e.g. direct attack on the user) and thus to provide additional layer of safety.

2.12.10 Disaster Alert

Disaster Alert call is a broadcast emergency call initiated by the radio, 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. All radios under Disaster Alert display emergency notification on their screens. The alert message, its duration and destination talkgroup can be configured in the codeplug.

In order to initiate Disaster Alert, switch the radio to Disaster Alert mode and press PTT button. When the call ends, the radio will exit the Disaster Alert state.

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.

NOTE

Not all infrastructures support this feature. Please consult with your service provider before enabling this feature.

2.13 DMO Gateway and Repeater Communication

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

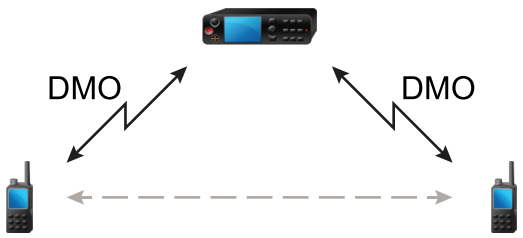
A DMO repeater re-transmits information received from one DMO radio to other DMO radios over the DMO air interface.

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 shall attempt to set up the call directly.

2.13.1 Communication through Repeater

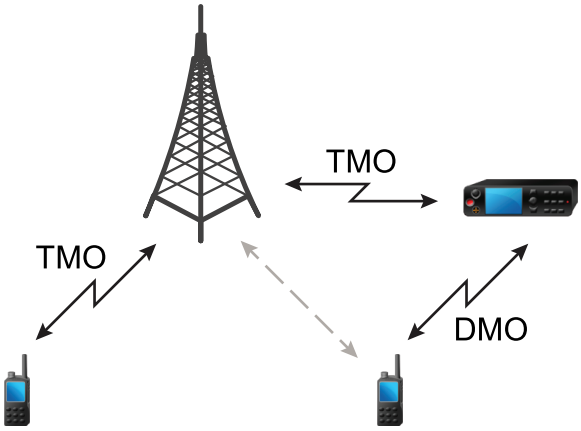
Radios that are out of range and cannot communicate directly one with another in DMO Mode can do it through the repeater. The repeater is a radio that repeats all communication on a chosen channel, and as a result increases radios' DMO range.



When the radio connects to a repeater, it plays a tone, displays the **Repeater available** message, and shows an appropriate icon. When the radio looses connection with the repeater, it plays a tone, displays the **Repeater not available** message, and the repeater icon is blinking. Messages and sounds are configured by the service provider.

2.13.2 Communication through Gateway

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



When the radio connects to a gateway, it plays a tone, displays the **Gateway available** message and shows an appropriate icon. When the radio looses connection with the gateway, it plays a tone, displays the **Gateway not available** message, and the gateway icon is blinking. Messages and sounds are configured by the service provider.

2.14 Short Data Services

The radio supports the following Short Data Service (SDS) message types:

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

The feature supports the following addressing modes:

- Radio to radio.
- Radio to talkgroup.
- Radio to external subscriber number (gateway address).

NOTE

For SDS-TL, the message can be sent through the service center.

The radio provides a short data bearer service for both internal and external applications.

The radio supports SDS-TL services which provide end-to-end acknowledgments, delivery report requests, and message numbering for SDS user-defined data type 4 messages. The TL also provides SDS access for applications that do not request these transport layer services, however, use a Protocol Identifier (PI). The radio can send the delivery report by using an appropriate TETRA signaling, even if the originator requested a short report. The radio can support the old SDS-TL standard for operation on legacy systems, or for operation on other SwMIs.

An externally connected device may access the SDS services in the radio using AT commands and TNP1 protocol. An external application may use this service to send and receive SDS statuses, SDS user-defined data types 1, 2, 3, and 4.

Downlink SDS messages type 4 are presumed to contain a PI for identifying the target application. If an external application has registered with the radio for that PI, the radio delivers the message to the target application. The radio may receive downlink SDS messages that are successive retransmissions of a message already received and acknowledged by the radio. The radio does not display these messages, nor store in them in the inbox, nor send them to an external application.

2.14.1 Status Messages

You can select from a list of up to 100 pre-programmed alphanumeric aliases each of which corresponds to a status value. The valid range of uplink status values is a set of provisioned parameters. If the radio is not enabled with targeted status, the status value is sent over the air interface to the address of the selected group. The radio recognizes the general status acknowledgment sent from the SwMI, as well as the negative acknowledgment. In TMO, if no status acknowledgment or negative acknowledgment is received, the radio retries sending the message. The number of retries and time to wait before retrying are provisioned parameters. You are notified of the delivery status. As there is no acknowledgment for DMO status messages, you are notified only of sending the status message. The radio does not initiate sending of status messages on a traffic channel.

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

- When the default address type of targeted SDS status is set to **Private** or **Phone**, the default address is used as ISSI or ISDN, depending on configuration.
- When the default address type of targeted SDS status is set to group, the selected talkgroup address is used.

The radio accepts status messages from addresses it is monitoring. The radio can be preprogrammed with an appropriate text associated with each status value. The radio notifies when a new status message has been received. Upon receiving an incoming status message, the stored text corresponding to the status value is extracted and placed in the text message buffer as a text message. Receiving a status causes the radio to display the message mail screen, allowing the user quick access to read the message. A received status can be stored in the radio text message buffer.

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

2.14.2 Text Messages

The radio supports an internal text messaging application using the TETRA SDS Transport Layer. The radio can send and receive up to 140 bytes of payload data (which can be up to 160 characters, if a 7-bit encoding is used).

Depending on radio settings, for each message in the **Inbox** , the following options are available:

- **Store** — used to save the message as a template.
- **Delete** — used to remove the message from the list.

- **Delete All** — used to remove all the messages from the list.
- **Reply** — used to send a reply to the message originator with the option to edit the text (where available).
- **Forward** — used to send the current message to another recipient with the option to edit the text.
- **Refresh** — used to reorder the messages list and see the newest at the top. When you are in the **Inbox** and the new message comes, refresh the list to see the new message.

The radio provides an edit facility for composing and editing a text message. The message can be sent to a target TETRA radio using SSI addressing, and is sent with a request for a received delivery report.

All the outgoing text messages (short or long) are stored in **Outbox**, when the store and forward mechanism is not in place. When the store and forward feature is enabled and the messages go through the store and forward server, the short messages are stored regardless the delivery status. Whereas, long messages are stored only if delivered (even if only to the store and forward server). Depending on radio settings, for each **Outbox** message the following options are available.

- **Store** — used to save the message as a template.
- **Delete** — used to remove the message from the list.
- **Delete All** — used to remove all the messages from the list.
- **Resend** — used to send the message again to the same recipients with the option to edit the text.
- **Forward** — used to send the message to the other recipient with the option to edit the text.
- **Refresh** — used to reorder the messages list and see the newest at the top.
- **Delivery Status** — used to check the time and the date when a message was sent, delivered, read, expired, or not delivered. Every status change is communicated.

Delivery report is saved in the **Inbox** and in the associated message in **Outbox**. However, the report is deleted from the Inbox after viewing it.

Outbox and **Inbox** share memory area, hence their capacity depends on the combination of stored short and long messages in each of these folders. If **Inbox** is empty, **Outbox** may store up to 100 short messages or at least 20 full size long messages. If **Outbox** is empty, **Inbox** may store up to 100 short messages or at least 10 full size long messages. When you enter **Messages** submenu, the number on the right side of **Inbox** and **Outbox** is indicating the number of the messages stored. If the **Outbox** is empty, then the radio displays**No Messages** notification.

Upon receiving a text message, the radio places the text into a circular buffer. You are notified when a new text message is received and a quick access to read the message is provided. If a delivery report is requested, the radio sends it upon receipt of the message by SDSTL. If a consumed report is requested, the radio sends it when you read the message.

If you read the message when the radio is out of service, the report may not be sent.

You can save incoming or edited (outgoing) text messages. These messages can be edited and sent.

For each message, you can verify its timestamp. The timestamp displayed is extracted from the SDS TL PDU. The timestamp is generated and inserted to the message by the SwMI.

2.14.2.1 SDS Messages Concatenation

This feature allows sending long text messages up to 1000 characters. All the messages that are longer than 140 characters are divided and sent separately one after another. When a recipient receives all the parts of the message, it displays as one on the screen.

When the radio receives an SDS message and the **Inbox**/**Outbox** is full, the radio acts according to the **Buffer Full, Overwrite Policy** codeplug field settings.

When the text or status message is received and accepted, the radio retrieves actual time information from its internal clock.

The radio can reconstruct a long text message consisting of up to ten short messages. The maximum length of the message is 141-1000, what can be defined in the codeplug. The radio recombines the text segments independently of the order they have been received to the correct order of the original message. The message can be combined only if all their message reference number are correct and the segmented receiver timer is still valid.

You can send long text messages to an individual destination. However, sending long text messages to groups is not possible:

- Receiving the message during group/broadcast call — radio allows receipt of the text message during ongoing group call and broadcast call. The group/broadcast call is displayed with the **New mail arrived** icon and tone for mail reis played.
- Emergency Mode — you can receive SDS messages. To read the SDS messages the radio have to leave the emergency mode. Sending the SDS messages in the emergency mode is prohibited.

2.14.3 Immediate Text Messages

Immediate Text Messaging is a selling feature which enables displaying the text message immediately on the radio display. This feature is used for sending high important information from the console to radios.

When the radio has the feature enabled and receives an immediate text message, then:

- the immediate text message is stored in the **Inbox**.
- the content of the immediate text message is displayed.
- the relevant audio tone is played.
- additionally if the periodic alert feature is enabled, the periodic alerting is active until the immediate text message is skipped or closed.

NOTE

When the feature is disabled in the radio, then immediate text messages are processed as normal text messages.

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

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

2.14.4 Home Display Text Message

Your radio is provided with a feature that allows your service provider to send special text messages to the display. The message stays on the home screen until a new message is received. Power cycle your radio to replace the Home Display message to the predefined one.

2.14.5 Predefined Templates (ATS Entry Prompt)

This feature assists the radio in sending formatted messages with a predefined destination address (MS-ISDN, SSI or TSI) for computer applications.

You can select a predefined entry prompt which defines a message format to assist in the construction of an SDS message. The prompt definition is set in the codeplug. The definition sets areas that are read-only, areas that can be edited, and the type of characters that can be entered (numeric, alpha-numeric or phone digits). Along with the message definition, the address to send the message is provided.

When you send the message, it is sent using SDS-TL with the PI that is provisioned in the codeplug. A receipt report is requested.

2.14.6 SDS Air Interface Aspects

The radio can be provisioned to send a short-form SDS-TL receive report when the originator of the message allows short-form report. The short form report uses specially designated SDS status values instead of SDS-REPORT.

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

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

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

2.14.7 SDS Encryption

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

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

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

If the feature is enabled, then the radio prompts you to enter the PIN if any of the following menu items are selected from the MMI.

- **Messages → Inbox**.
- **Messages → Outbox**.

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

- Exiting from the radio menu.
- Turning off the radio.

- Changing the PIN from the MMI.

If you disable the PIN lock through the MMI or change the PIN, the protected messages are deleted. Before deleting the messages, you are prompted to ensure that the operation should proceed. If the PIN lock is changed through the PEI, all the protected messages stored in the **Inbox**, **Outbox** are deleted. On enabling the radio permanent disable, the access to the protected messages is lost.

2.14.8 Store and Forward

This feature allows communicating with each other without being available at the same time. If the destination is not reachable, the message is stored in the system (if supported) until it is available or the expiration time is exceeded. The system is configured to delete the message after a preconfigured time and this time cannot be configured using the radio.

You can send the store and forward messages to an individual address or a group. Depending on the codeplug settings, if you choose to send it to the group, the message status is switched from **Store and Forward** to **Immediate**.

When the **Sending group message to Store and Forward Server** is enabled, an SDS message sent to group is conveyed with assistance of the store and forward service. The radio does not request a delivery report, thus you are not notified of the delivery status.

Verify whether the infrastructure system supports this functionality.

2.15 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.

2.15.1 Terminal Equipment Identity

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

2.15.2 PIN/PUK User Authentication

In order to authenticate yourself, the radio supports a Personal Identification Number (PIN) and PIN Unblocking Key (PUK) mechanisms. These mechanisms prevent from an unauthorized access to the radio. The PIN/PUK operations are available from both MMI and PEI (using AT commands).

For the authentication purpose the radio prompts you to enter a valid 4-digit PIN, before the radio allows to access all the available services. The PIN is defined in the codeplug.

If the maximum number of consecutive failed attempts is reached, the radio is blocked and remains in this state until unblocking. The permissible number of consecutive failed attempts is defined in the codeplug. The blocked status is sustained regardless of turning off or battery removal.

When the radio is PIN locked, you have no or limited access to the radio services. The PIN is defined in the codeplug. The radio is unblocked either by entering the PUK or by using the CPS. The PUK can be entered through the MMI or through the PEI. The PUK is defined in the codeplug.

2.15.3 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).

2.15.4 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 2-2 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

2.15.4.1 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.

2.15.4.2 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.

2.15.4.3 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.

2.15.4.4 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.

2.15.4.5 Over-the-Air-Rekeying

TETRA systems support GCK encryption for specific talkgroups:

- Group Over-the-Air-Rekeying (OTAR) of GCK.
- Group OTAR of fallback TM-SCK.
- Group OTAR of DM-SCK, including management of the cryptographic schedule of DM-SCKs.

The group OTAR mechanisms require a use of the group session key for OTAR (GSKO). The GSKO is delivered to the radio only by using individual OTAR and the session key for OTAR (KSO).

For the systems utilizing group OTAR, the fundamental system operation (with respect to SCK/GCK OTAR) relies on the sites regular transmission. In other words, the sites are regularly broadcasting information regarding which security class and associated keys are in use. The sites transmit future versions of the respective keys to groups of radios belonging to the same cryptographic management group (CMG). The radios acquire the keys before the SwMI activates them. Then the air interface encryption service uses the keys. The sites also broadcast the current key that is in use which can be sent using OTAR mechanism to the radio on request.

NOTE

When a radio has not received a new key before activation by the SwMI, the radio requests the missing keys.

Some systems adopt only individual OTAR methods for delivery of SCK and GCK to the radio. In such cases GSKO is not used. Some systems employ a mix of individual and group OTAR methods. The radio supports the complement to functionality required for supporting the superset of different SwMI behaviors, for example:

- Individual OTAR (using KSO) of SCK and GCK.
- Group OTAR (using GSKO) of SCK and GCK.
- Individual OTAR (using KSO) of GSKO.
- Secure DMO Key Management (via SwMI).
- Crypto Management Group.
- Storage of 10 KAG (equivalent to 30 DM-SCK).

- Storage of 16 GCK (includes current/future versions).
- Storage of 2 TM-SCK.
- Storage of Group Association attribute per Talkgroup.
- GCK Air Interface Encryption.
- Seamless key changes of GCK.
- Seamless security class changes to SC3G.

The SwMI can support the group OTAR feature. Where supported, the SwMI groups radios that share the same set of cryptographic key material into a specific crypto management group (CMG). Any radio belonging to the same CMG is addressed using a CMG GTSI. The primary purpose of the addressing is to transmit group OTAR messages conveying TM-SCK, DM-SCK and/or GCK. Any radio that supports TM-SCK group OTAR, DM-SCK group OTAR or GCK group OTAR is assigned to a specific CMG.

Each CMG has a designated specific GSKO. The system deploys over the air a CMG GSKO (and CMG GTSI) to each radio belonging to the CMG. The GSKO is used as the sealing key for TM-SCK, DM-SCK, and GCK, when sent across the air interface. The SwMI can perform scheduled transmissions of the future TM-SCK addressed to each CMG. The radio requesting a TM-SCK triggers the site to schedule additional transmissions of the requested TM-SCKs. These transmissions are addressed to either the CMG GTSI that the radio belongs to or its ITSI.

The SwMI can perform scheduled background transmissions of the future GCKs addressed to each CMG. The radio requesting for a given GCK triggers the site to schedule additional transmissions of the current and the future versions associated of the requested GCK. These transmissions are addressed to either the CMG GTSI that the radio belongs to or its ITSI.

The SwMI can perform scheduled background transmissions of the current and the future DM-SCK addressed to each CMG. The radio requesting for a DM-SCK triggers the site to schedule additional transmissions of the requested DM-SCK. These transmissions are addressed to either the CMG GTSI that the radio belongs to or its ITSI.

2.15.4.6 Encryption Mobility

A Class 2 or Class 3 radio can operate on a lower class SwMI (depending on configuration). A radio that is provisioned not to allow operation on a lower class SwMI, does not register on such a cell.

A Class 2 or Class 3 radio moves to a cell that supports an SCK/CCK/GCK that the radio possesses, applies AIE to the registration PDU. If no acknowledgment is received, the radio sends the registration in clear.

2.15.4.7 Encryption MMI

A Class 2 or Class 3 radio that is involved in a clear call provides a visual and an audible indication informing that the call is not encrypted (if enabled by the service provider).

2.15.4.8 AIE Key Storage

The radio stores all the keys, SCK/CCK/DCK/GCK, in a sealed manner in non-volatile memory of the radio. However, they are not stored in the codeplug.

The radio supports loading of the SCK keys manually using the Key Variable Loader (KVL).

By using a special key combination, you can delete the cipher keys in the radio. Depending on configuration, you may erase either all keys or only the short-term keys.

2.15.4.9 Deleting User Keys

Prerequisites:
The user key deletion is enabled in the codeplug.

Procedure Steps

1 Verify that the radio is turned on.

2

CAUTION

The key deletion takes up to 30 seconds.

Result:
Encryption and/or Authentication keys are deleted. The radio enters Temporary Disable state and must be manually restored by the service provider.

2.15.5 Secure DMO

The Secure DMO feature guarantees key ciphered transmission in the DMO.

When DM-SCKs are provided by OTAR, you are informed in case the radio does not contain the complete set of SDMO keys. Whenever the radio enters DMO and the radio does not possess past and present DM-SCKs for all provisioned KAG and/or it has not yet successfully received SCK Subset Grouping Type, SCK Subset Number and SCK-VN information from the SwMI, then the radio:

- plays a special reject tone.
- prompts a message indicating **OTAR incomplete**.

The radio provides SDMO status information to the user via the MMI **DMOSCK Validity** submenu inside the **Security** menu (present only when configured in the codeplug):

- **DMO SCK is Valid** — DMO SCK OTAR is disabled and all DM-SCKs are provided using the KVL.
- **DMO SCK is Valid** — DMO SCK OTAR is enabled and the radio knows the current SCK information and has all the corresponding past and present DM-SCKs.
- **DMO SCK is Invalid** in all other cases.

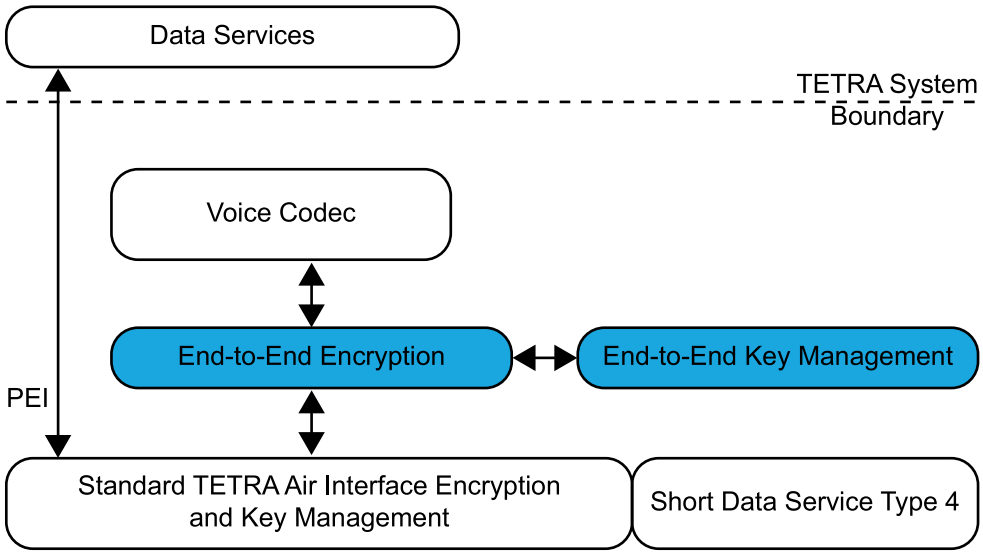
The radio supports system management of SDMO keys. The radio using system managed SDMO requires the structure of DM-SCKs used for SDMO, the current active SCK Subset Number, and Version Number information to coordinate key schedules. The radio considers the last received variant of this information PDU as the most accurate indication of SDMO key configuration.

DMO SCK can only be used if Enhanced Security feature is purchased.

2.15.6 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 2-4 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.

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.

2.15.7 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).

2.15.8 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 MMI interfaces on the radio are disabled.
- 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.

2.15.9 Radio Permanent Disable v2

Similarly to the permanent disable, once the radio is disabled using the permanent disable v2, it cannot be recovered over the air. When the radio accepts the permanent disable command, and if the permanent disable v2 flag is enabled in the codeplug, the radio appears to be inoperable.

- All its MMI interfaces on the radio appear to be disabled.
- All its security key material; GCK, GSKO, DMO SCKs, Ks, DCK, CCK, TMO SCKs, and End-to-End key material are deleted.
- The radio automatically turns off on powering attempts without any audible/visible indications to the end users.
- The permanent disable flag is set in the codeplug.

Unlike in the permanent disable, a permanent disabled v2 radio can be re-enabled using the software selling dongle. If you have the software selling dongle, you can read the codeplug and clear the permanent disable flag.

NOTE

When a radio has been disabled using the permanent disable v2, entering programming mode procedure is different. For the details, see TETRA Terminals CPS Start-up User Guide (Motorola Part Number: 6802974C10).

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

2.15.10 SIM Security

The SIM security consists of the following security functionality groups:

- Voice E2EE and related key management.
- Network access parameters and authentication.
- Key management for AIE.
- OPTA, modification, encryption, and transfer.
- AES for E2EE of SIM Interface and SIM-Terminal Authentication.

The SIM is an integrated circuit card, which holds a file system and an application. The application performs the following actions:

- Generation of key stream segments (KSS).
- Synchronization for E2EE.
- TETRA authentication algorithm based on K key on the SIM.
- Key management for E2EE keys.
- SIM interface encryption and authentication using the AES.

The file system holds the following.

- Network access parameters as ITSI.
- Security class definition and authentication definition.
- Integrated circuit card identifier.
- SIM version number.
- Operative Tactical Address (OPTA).

The E2EE keys are also kept on the SIM. However, they are accessible for the SIM application only, thus E2EE key management is transparent to the radio.

The keys for AIE remain on the radio. The SIM application handles AIE key management.

2.15.11 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.

2.16 Packet Data

The radio provides, in the TMO, a TETRA bearer service for applications that use the IP protocol. This service is available to external applications by connecting using the PEI.

The radio supports TETRA standard multi-slot packet data using the IP network layer protocol through Point-to-Point Protocol (PPP), and TETRA SNDCP protocol. The IP connection is established between Terminal Equipment and Mobile Terminal, allowing external applications to communicate with Terminal Equipment using predefined IP addresses.

NOTE

This IP connection is referred to as the local link. The link established between the radio and the SwMI is referred to as the wide link. When a wide link has been established, the radio is considered to be in the wide mode.

Packet data applications reside internally, over UDP, or in an externally connected device connected via an 8-wire RS232 data port in the radio. Communication to the external radio is initialized using AT commands. Once the connection is established, the external application may request Point-to-Point Protocol (PPP) mode, and then operates in PPP mode until the data connection is terminated. The radios can operate both on the single-slot packet data channel and the multi-slot packet data channel.

The system provides point to point IP connectivity allowing the following datagram exchanges.

- Radio ←→ External Equipment (Terminal Equipment) (for example PC).
- External Equipment (Terminal Equipment) ←→ Network (through radio).

The radio supports only IP version 4 packets. The radio routes datagrams independently of the protocol sitting on top of IP.

The radio supports an MTU of 1500 bytes.

The radio provides the best effort delivery service. However, if the delivery fails, the originating user application is informed by sending back to Terminal Equipment an ICMP message, if possible.

The radio generates ICMP messages addressed to the Terminal Equipment in case of failed delivery due to the radio environment. The delivery may fail due to, for example:

- no radio coverage.
- failed transmission.
- service interaction.

The packet data service PDCH access signaling has the same priority as circuit mode setup-related signaling. The radio uses advanced link for PD transmission and supports advanced link flow control. The advanced link roaming, if the advanced link is not disconnected between cells, is supported, where the SwMI supports it.

The radio does not support data compression. If an application attempts to negotiate data compression during context activation, it is rejected. If a data compressed IP packet is received from the SwMI, it is silently discarded. The radio supports IP header compression negotiation received from Terminal Equipment during PDP context activation, and transparently transfers IP packets with the header compression between Terminal Equipment and the SwMI.

The packet data service employs the TETRA standard cell selection and re-selection. The packet data service is suspended while the reselection is occurring, and resumes when the cell reselection procedure is complete.

NOTE

The cell reselection is undeclared in a strict TETRA sense. However, the SNDCP protocol defines a procedure for reconnecting the packet data service on the new cell. In this sense, the cell reselection procedure resembles the unannounced cell re-selection procedure.

Multi-slot packet data is a selling feature.

2.16.1 Voice and Data Support

The radio can alternate voice and packet data service. However, voice and data running in parallel are not supported. This behavior corresponds to Packet Data Type B - IP dual mode.

If the SwMI rejects the context activation due to **PD MS type not supported**, the radio reinitiates context activation indicating that supports **Type C**. It is done to accommodate legacy SwMIs that uses an older definition of these types.

The radio supports transmitting and receiving SDS on the packet data channel. Thus, these services may be conducted in parallel.

The radio can operate in one of the voice-data interaction modes.

Table 2-3 Voice-Data Interaction Modes

Voice-Data Interaction Mode	Description
Voice Only Mode	You have the option to select **Voice Only mode**, in which Packet Data service is disabled. If an external application attempts to start up in this mode, packet data registration for a wide link is rejected. If the packet data service is active when this mode is selected, the radio deactivates packet data. The PEI operates in the local mode only (data transfer between TE and MT).
Data Only Mode	You have the option to select **Data only mode**, in which normal voice calls are not permitted. Incoming non-emergency voice calls are rejected, and you cannot initiate non-emergency voice calls. Incoming and outgoing emergency calls are allowed.
Voice and Data Mode	In **Voice and Data mode** any voice call activity that occurs during a data session takes priority over the packet data. Once a voice call has interrupted the data session, the PD session is suspended, until the voice activity has ended. Then the session is resumed. Voice priority mode is the default mode.

You can choose one of the interaction modes. The choice of interaction mode is stored in non-volatile memory and remembered at power up.

In **Voice and Data mode**, if the radio moves to the traffic channel due to the voice service, the radio terminates any active packet data transmission or reception. The data service is suspended. The data service resumes when the voice service ends.

The radio accepts any downlink SDS message received on the Packet Data Control Channel (PDCH). The radio can send uplink SDS messages on the PDCH.

The radio allows PEI, and PD applications to activate and use the PD context simultaneously. The first application initiates PD context activation. The next PD context activation from another PD application results in sending a reply indicating that the PD context is active. When , and PEI PD applications are using the active PD context, the radio can filter the downlink IP packets based on their TCP/UDP port.

- UDP packets not addressed to the GPS ports are routed to the PEI (using PPP).

NOTE

When activating another PD context on the radio, use the same settings in both PD contexts.

2.16.2 Packet Data IP Addressing

Table 2-4 Packet Data IP Addressing

Addressing Mode	Description
Wide IP Address	An IP address may be assigned to the terminal by the SwMI during the Packet Data context activation. When assigned, both Terminal Equipment and Mobile Terminal applications use this address as the source address in IP packets delivered to the infrastructure.
Local IP Address	By default both Terminal Equipment and the radio have their own IP addresses. Terminal Equipment and Mobile Terminal use these addresses for local datagram transmissions between Terminal Equipment and Mobile Terminal only and are not passed to the SwMI.
Static or Dynamic IP Address Assignment	The terminals support static and dynamic IP address assignment. The dynamic support is requested in the following situations: • **Request a Dynamic IP Address** is set to **Dynamic** and the PD Application Type is the radio internal PD application. • **Request a Dynamic IP Address** is set to **Dynamic** and the PD Application Type is a PEI PD application requesting dynamic IP address.

2.16.3 PD User Authentication

The PD user authentication is a method of authenticating the Terminal Equipment user before allowing the packet data link activation. A PD Authentication server connected to the SwMI performs the actual authentication. The terminal only sends the messages between the Terminal Equipment and the SwMI. In the wide mode, the terminal offers PPP user authentication between Mobile Terminal and Terminal Equipment using Password Authentication Protocol (PAP) or Challenge Handshake Authentication Protocol (CHAP), before the IP link is established. The terminal always attempts to negotiate usage of the CHAP method. However, the radio agrees to use PAP, when the Terminal Equipment application insists. If the terminal does not require PD user authentication, it operates without any user authentication. However, if the terminal requires the PD user authentication, it rejects the Packet Data Protocol (PDP) context activation.

If the SwMI does not agree for the authentication method (for example, PAP), the SwMI can reject it.

2.17 TETRA Network Protocol 1

TETRA Network Protocol type 1 (TNP1) is a bridge protocol based on the TETRA layer 3 over the air protocol. The TNP1 supports all TETRA dispatch functionality.

In the TMO, the TNP1 specifies a protocol for use over the PEI, that allows terminal equipment (TE) to have control over the TETRA services: mobility management, call control, short data service, and supplementary services: send GPS reports, software information and battery state information. In addition, commands to access the radio configuration and storage parameters are available.

The radio supports TETRA standard packet data using the IP network layer protocol.

The radio can operate both on the single slot packet data channel and the multi-slot packet data channel.

Packet data applications reside internally, for example: GPS reports, WAP, or in an external device connected to the 8–wire RS232 data port on the radio. Communication to the external device is initialized using AT commands.

The system provides point to point IP connectivity allowing the following datagram exchanges:

- Radio ←→ External Equipment (TE) (for example PC).
- External Equipment (TE) ←→ Network (through radio).

The radio supports IP version 4 packet.

TNP1 services can use one of two PPP methods to connect from the terminal equipment to the radio, local mode, and wide mode. The TNP1 should be used in wide-mode wherever possible, to allow the parallel operation of TNP1-SDS services and packet data services over a common PPP link.

If the transmit inhibit is entered, the radio drops the wide mode connection, thus the PEI goes back to AT mode. Then the TNP1 client detects this change and reinitiates the PPP session in local mode.

The radio disables the TNP1 session while being in the DMO.

AT commands are used to initiate the PPP service for TNP1 to operate. Once the PPP session is running all AT commands are blocked. When the PPP session is closed, AT commands are available.

2.17.1 TNP1 IP Addressing

Table 2-5 TNP1 IP Addressing

Addressing Mode	Description
Wide Mode	All TNP1 services are available including packet data transfer towards the SwMI. The address used is the dynamic address MS IP or configured statically.
Local Mode	All TNP1 services are available except packet data transfer. The addresses used are the two static addresses TE IP: 10.0.0.101 and MT IP: 10.0.0.100.
Port Addressing	The radio uses a fixed port address for reception and transmission of TNP1 packets. The port number is 4024.

2.18 Mobility Services

Following is the description of the Mobility Services.

2.18.1 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.

2.18.2 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.

This is a selling feature.

2.18.3 Multi-System Operation

Multi-system operation is supported as follows:

- List of Allowed Networks — The radio holds a list of up to 100 allowed network identities (MCC/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.

- Home-Only Mode — 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.
- Selected Network Mode — In this mode the radio recognizes only the system in the allowed list that you selected. As the result, the radio registers only on this selected network, even if another network is in range and is found first.
- Services — 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.

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.

2.18.4 Registration

2.18.5 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. Security Class
3. Subscriber Class
4. Location Area (Home Location area)
5. 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.

2.18.6 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.

2.18.7 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. The AIM is also not supported when the MS is in a foreign SwMI.

This is a selling feature.

2.18.8 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 three 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 will automatically migrate to this network (in this feature it is possible to assign network to particular talkgroup in 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 no service state as the radio will attempt 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.

Dynamic Air Interface Migration and Auto Full Registration (Any Networks) features are mutually exclusive.

2.18.9 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.

2.18.10 Subscriber Class

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

When the radio registers on a cell that does not support any of its SCs, it participates only in services that have the emergency priority.

Whenever the radio SC does not match the cell SC, the radio uses normal ranking procedures or does not roam to the cell at all.

2.18.11 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 traffic roaming.

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. Subscriber Class received over the air is maintained after powering down the radio. On powering, the radio on the default Subscriber Class or Subscriber Class assigned to an attached talkgroup is set.

Favorite folders cannot be assigned to any Subscriber Class.

None DGNA talkgroup can be assigned to Subscriber Class. Any activity (assignment, changing, and so on) on Talkgroups from DGNA range (GSSI above 13999999) does not cause Subscriber Class change.

Subscriber Class by Group is a selling feature.

2.18.12 Auto Full Registration (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 Auto Full Registration (Any Networks) features are mutually exclusive.

This is a selling feature.

2.19 Supplementary Services

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

2.19.1 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 in the first available spot in the talkgroup list in the codeplug. Then you can scroll to the talkgroup to select the group. The codeplug determines which DGNA operations are allowed for a group.

Depending on the group type the following is allowed.

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

The groups can be assigned as not attached, attached as scanned or attached as selected. Assignment of the group through DGNA with attached as selected makes it the selected group of the radio. If the group is assigned with attached as scanned, if it is not already in the currently active scan list, the radio adds this group to a SwMI Controlled scan list and begins monitoring downlink signaling addressed to this group. The SwMI controlled list holds up to ten groups, and the radio monitors these groups as well as groups in the user scan list.

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

When a talkgroup de-assignment is received, depending on the codeplug settings (DGNA Operations field in the Talkgroup List) the radio behavior is as follows.

- If the DGNA Operations field is set to Static or Semi-Static, the radio.
  - leaves the talkgroup and the parameters assignments to folders unchanged.
  - sends an acknowledgment PDU with notification the group definition has been removed.
- If the DGNA Operations field is set to Dynamic or if the group is not in the talkgroup list, the radio.
  - removes the talkgroup from the talkgroup list (if the talkgroup is in the list).
  - removes all the occurrences of the talkgroup from the folder list.
  - sends an acknowledgment PDU with notification the group definition has been removed (also if the talkgroup has been deleted, or the talkgroup does not exist in the radio).

In all the cases, the talkgroup is removed from all the scan lists as no matter if they are active or inactive.

If the de-assignment is for the selected group, the radio notifies that there is no group attached (when in the group mode), and does not attach to another talkgroup automatically.

If the de-assignment is for an announcement group, the talkgroup is removed from the talkgroup list. Additionally, all the groups that are associated with this announcement group do not have an associated announcement group. If the currently selected talkgroup is associated with this announcement group, the radio stops scanning the associated announcement group.

When the DGNA operation is successful, if the radio is provisioned for DGNA user notification, you are notified about the operation. For example group added, group deleted. The notification is displayed until you confirm the operation. In case you receive a call, the message continues displaying until you confirm it.

On viewing an assigned talkgroup notification, the radio provides the ability for the user to make that the group is the selected group.

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 functionality is not supported.

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

2.19.2 Ambience Listening

The Ambience Listening (AL) 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 T311 is disabled). The radio continues to transmit until the SwMI ends the call or you perform an action that releases the call.

If you attempt to start a service while the SS-AL call is in progress, the radio disconnects the call and initiates the service you requested. The radio allows performing all actions that can be performed without releasing the SS-AL call. These actions include access of most menu items, changing modes, activating, deactivating scan lists, and changing talkgroups. When change 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 SS-AL call terminates. When performing the attachment after the call, no indication will be shown to the user unless the attachment fails.

2.19.3 Pseudo Power-Down

If you attempt to power down the radio, the radio appears to turn off. However, it remains fully operational from Layer–3 and below. The radio has a blank screen, and all LEDs are turned off.

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

If you attempt to power up the radio from the pseudo power-down state, the radio acts as if it is really powering up.

2.19.4 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.

2.19.5 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.

To activate, select **MENU → More . . . → Networks → TXI Mode → Activate**.

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, sending SDS messages, or pressing the PTT button are disabled. Any transmission trial causes the radio to display **Not Allowed In TXI Mode** notification and to play a tone.

Your radio can still receive:

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

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 selecting **MENU → More . . . → Networks → TXI Mode → Deactivate**, pressing One-Touch button, or implicitly when initiating an Emergency Call.

NOTE

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

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

2.19.5.1 Transmit Inhibit Mode (Operation)

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.

In transmit inhibit mode the radio is prevented from initiating any non-emergency call or service. The radio does not send any low layer initiated transmission. All the menu entries and buttons, which cause the radio to transmit, are disabled. 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 attempt to start the emergency call if the radio is in service.

2.19.6 Calling Line Identification Presentation

If the radio is provisioned with the calling line identification presentation (CLIP), the calling party number is transported as part of the incoming call setup signaling. Also the calling party number is shown on the radio display. If the calling party ID is programmed in the radio with a corresponding name, the name is displayed in addition to the number.

NOTE

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

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

2.19.7 Late Entry

The user can join the groupcall 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 control channel automatically 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

This feature must be configured on SwMI. Acknowledged late entry, and late entry paging are not supported.

2.19.8 Talking Party Identification

The PDUs and facility elements for these TETRA Supplementary Services are not supported. However, identification presentation functionality is supported in most cases using the information found in the call setup messages.

2.19.9 DTMF Overdial

This supplementary service allows the radio to send DTMF tones to both internal and the external network during the call (conversation).

2.19.10 Universal Time Display

The radio can present time information to the user. The time is derived from an internal clock. The radio maintains the clock both when the radio is powered on and powered off.

NOTE

If the power is lost the internal clock is not maintained.

If the maximal deviation between this time and the internal clock time is less than a value set in the codeplug, the time received from the SwMI is updated.

In order to ensure the time displayed is accurate, the time is displayed only if within the last 48 hours either of the following events have occurred.

- The radio has received a network time update from the system.
- You have manually updated the time.

If neither of the events have occurred within a 48 hour period the time is no longer displayed.

As the internal clock is not maintained after a power loss event, the time is not displayed until either of the following events occur.

- The radio has received a network time update from the system.
- You have manually updated the time.

The feature is enabled or disabled and the default configuration set for the radio using the CPS.

The radio display supports the following.

- Twenty-four-hour and twelve-hour formats.
- DD/MM/YY, MM/DD/YY and DD-MON-YY date formats.
- Adjustable time offset.

You can change the time information through the MMI (depending on the codeplug settings). System broadcast information has higher priority than data entered manually. Thus time, date, and offset information entered from the MMI is overwritten, when data is received from the SwMI. The radio provides user indications upon crossing to another time zone, when a new MCC broadcast received.

2.20 General Purpose Input Output

In total there are three General Purpose Input Output (GPIO) ports on the transceiver device and four GPIOs on the New Generation Control Head (NGCH). The GPIOs on the NGCH are accessible in remote mount configuration only. The following default functionality is available through the transceiver GPIOs.

- Transceiver GPIO1 is associated with **External Alarm**.
- Transceiver GPIO2 is associated with **Audio PA Enable**.
- Transceiver GPIO3 is associated with **Hook**.

The following default functionality is available through the GPIOs located on the NGCH device.

- NGCH GPIO1 is disabled.
- NGCH GPIO2 is disabled.
- NGCH GPIO3 is associated with **PTT CH Rear**.
- NGCH GPIO4 is disabled.

The General Purpose Input ports can be associated with the following functions.

- Send Predefined Message.
- Send Status.

If the send status is selected, then on triggering of GPIO1/GPIO2 the radio sends a status message to the GISSI on which the radio is currently attached.

If you are sending SDS using the MMI and SDS through GPIO at the same time, the SDS sent over GPIO shall be rejected without any notification.

The General Purpose Output ports can be associated with the following functions.

- Specific Message Received Indication.
- Rx/Tx Indication.

NOTE

The GPIO1/GPIO2 is activated when any SDS is received on selected Protocol Identifier (PI), except the SDS and the long SDS PI.

If the Rx/Tx indication function is selected, whenever the radio is opening up a microphone/speaker for voice, independent of the call type NGCH GPIO1/GPIO2 is activated.

2.21 Data Box Radio

This feature allows transceiver to work without NGCH in a special data box mode. In this mode, the data box radio is controlled through PEI with AT commands or TNP1 commands.

The data box radio is a feature supporting users who want to use the transceiver with third-party control radios.

The data box radio feature allows setting CH mode for transceiver operations using the CPS.

NOTE

The data box radio is a fully functional mobile radio without a control head connected. Depending on the CPS settings, when the NGCH is connected, the radio switches from the data box radio to standard radio.

To power the radio on use the Accessory Connector and Expansion Head Enhanced connector pins dedicated either to Ignition (high level) or Emergency (low level). To power off the radio use the Ignition available on the Accessory Connector and Expansion Head Enhanced connector.

The radio operating in data box mode supports all the features which apply to the radio with an NGCH except for these features which require interface interactions.

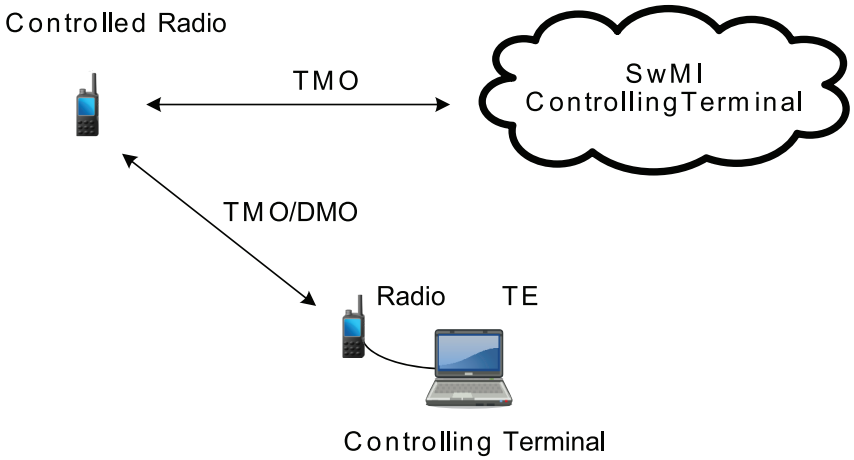
The radio in data box mode supports the following software selling features.

- GPS
- Multi-Slot Packet Data
- Enhanced Security
- Permanent Disable
- Permanent Disable v2
- SCCH

2.22 SDS Remote Control

The SDS remote control feature enables controlling a radio through Air Interface using SDS-TL bearer service. A controlling terminal (for instance, a controlling radio or SwMI controlling terminal) sends the SDS remote control messages.

Figure 2-5 SDS remote Control Overview



The SDS remote control functionality works in both TMO and DMO and the remote control PDUs are sent using TE.

You can use the feature only after a successful authorization, which requires entering a valid remote control PIN number.

The remote control messages can be sent to a group or individual radios.

A controlled radio receives over the air control information using SDS type 4 with TL on the specific PID number defined in the codeplug. If the received control message is originated from one of ISSIs present on the radio authorized ISSI list, the radio executes received command and sends a response.

The SDS remote control enables the following:

- Switching between TMO/DMO modes (read, change, notify) for individual radio and group (using +CTOM AT command).
- Selecting a talkgroup (read, change, notify) for individual radio and group (using +CTGS AT command).
- Reading and setting the scanning state (using +CTSCAN AT command).
- Collecting Network Information from individual radio (Network Registration Status and Cell Signal Quality using respectively the +CREG and +CSQ AT commands).
- Setting volume level for individual MT (using +CLVL AT command).
- Rebooting the radio (using R AT command).
- Terminating a call (using H AT command).
- Call forwarding (using +MCCFWD AT command).

NOTE

The available commands configured in the codeplug:

- Audio Control
- Group & Mode Management
- Network Information

The remote control protocol used for sending the remote control commands is based on the existing AT commands protocol.

This is a selling feature.

2.23 Call-Out

A call-out is an alert sent to one or many recipients when an incident requires immediate attention. The call-out message can include an instruction to use a different talkgroup for the duration of the call-out or remain on the attached talkgroup.

There are four types of Call-Out alerts:

- Normal
- Storm Plan
- Fallback Mode
- Test Call-Out

Only the emergency mode has higher priority than the call-out. When you receive the alert, the following responses are available.

- **Accept** — additional information from the dispatcher is displayed.
- **Stand by** — voice and message communication is the same as for **Accept**.
- **Reject** — display returns to the home display and the talkgroup is set to the one before the call-out.

Call-out alert can be addressed as follows:

- ISSI — an individual.
- GSSI — a group of recipients.

All incoming and outgoing call-out messages are stored in **CO Box** (Call-Out Box) and can be managed through the MMI. There is a two-level structure for the alerts. First level is the main alert list, and the second one are all the messages associated with the alerts. Both lists are displayed chronologically with the newest on top. The capacity of the **CO Box** is ten call-out alerts and 100 messages (incoming/outgoing). It has also the overwrite policy which deletes the oldest one upon receipt of a new call-out message. When a new call-out arrives, the new call-out overrides the old call-out (even if it has not been responded). An ongoing call-out overrides the old one in any phase of the call-out alert.

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

The call-out service function in two main phases:

1. Alert Phase — you receive the alert with the associated messages that you can respond to. These messages provide all the important information about an incident. A special tone is played when the alert is coming in. The tone volume range is configured in the codeplug and cannot be adjusted through the MMI. The conditions for stopping this tone are configured in the codeplug (for example, upon pressing any key). Additionally, an ongoing alert tone is paused on incoming call-out group call. This alert is resumed once the call ends (if not stopped before).
2. Information Phase — you are in the call-out mode and you may receive more messages about the incident with the text or voice. You can also query for more information using the voice group call or the call-out text function which enables to send a text message to the dispatcher host application. The voice message can be sent with the high priority as a group call. You can answer back to the group or to the dispatcher using the voice group call. You may receive more info about the incident via either via subsequent text or voice messages

This is a selling feature.

2.23.1 Call-Out Interactions

When you received a call-out alert while being in the emergency mode, the message is ignored.

In the transmit inhibit mode, you can receive call-out messages. However, you cannot respond until the transmit inhibit mode is deactivated. When you decide to leave the transmit inhibit mode after viewing the message, the radio prompts to accept, standby, or reject the call-out.

The call-out feature is not supported in DMO.

In the fallback mode (that is, when you are in the local site trunking) you can receive a call-out call. The receiving radio enters the call-out fallback mode, which includes only voice communication, on receiving the call-out call. You may clear the fallback mode only manually.

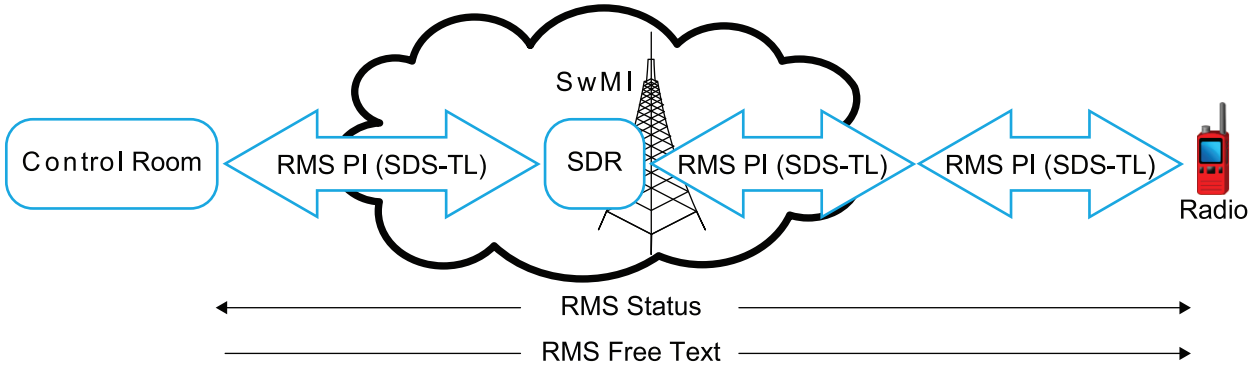
The dispatcher can test the feature by using the call-out test. The radio displays then **Call-Out Test** and generates the alert tone. Only one soft key is available through the MMI with the label **Test OK**. After responding the display return to the previous mode.

Storm plan alert is a special case of call-out. This alert is sent out to the larger group of people. You can respond with any key stroke and afterwards you proceed to the information phase. The storm plan alert is sent several times to raise reliability.

2.24 Radio Messaging System

The Radio Messaging System (RMS) feature enables radios to receive and send RMS messages through the TETRA network using the Short Data Service (SDS) Transport Layer (TL).

Figure 2-6 Radio Messaging System Flow Model



A Short Data Router (SDR) provides TETRA short data services between host applications connected to Dimetra Mobile Stations or between a host application connected to a Dimetra Mobile Station and a host application connected through the Dimetra Master Site. Furthermore the SDR provides TETRA short data services directly between two Dimetra Mobile Stations or directly between a Dimetra Mobile Station and a host application connected through the Dimetra Master Site.

To receive and send RMS messages, ensure that the RMS feature is enabled in the codeplug. The radio accepts received RMS messages only from the calling party address defined in the codeplug. Any outgoing RMS status is sent to the RMS status target address defined in the codeplug.

The RMS status is a bidirectional messaging (from the control room to a radio and conversely). Sending an RMS status is possible, where the RMS mode is enabled in the radio. In such case, the radio user can send one of ten predefined RMS statuses to an address predefined in the codeplug. You can select the particular RMS status using assigned one-touch buttons. A received RMS status is displayed in blue color on the idle display. The latest received or sent RMS status is kept on the idle display until the next power cycle.

The RMS free text is a unidirectional message (from the control room to a radio). Received RMS free texts are displayed in blue color on the idle display. The latest RMS free text is kept on the display (idle display) until the next power cycle.

Upon receiving the request, the radio sends the latest sent RMS status to the control room without any user interaction or notification.

Incoming and outgoing RMS statuses and RMS free text messages (with the exception for RMS status sent) are stored in the **RMS Box**. The **RMS Box** capacity is maximum ten entries for incoming and outgoing RMS messages. If the **RMS Box** is full, storing any new incoming or outgoing RMS message overwrites the oldest message (received or sent) in the **RMS Box**.

This is a selling feature.

2.25 GPS Location Service

The GPS Location Service feature uses information from Global Positioning System (GPS) satellites orbiting the Earth to determine the approximate geographical location of your radio.

The GPS Location Service availability, accuracy, and the position calculation time vary depending on the environment in which you use the radio. The GPS Location Service can assist your dispatcher or colleagues in many ways such as more efficient deployment of resources or locating your radio when you trigger your emergency service.

The radio can display the location information directly on the screen or send it over the air to your Dispatcher to display it in the control center. Check your radio configuration details with your service provider.

IMPORTANT

Where the signals from satellites are not available, the GPS Location Service does not work. This situation usually happens when your radio cannot establish a view of a wide area of open sky, for example, when your GPS antenna is covered or facing the ground. Such situations include being:

- In underground locations
- Inside buildings, trains, or other covered vehicles
- Under any other metal or concrete roof or structure
- Near a powerful radio or television tower
- In extreme temperature outside the operating limits of your radio

Even if your location information can be calculated in such situations, it may take longer to do so. Therefore, in any emergency situation, always report your location to your dispatcher. Where adequate signals from multiple satellites are available, your GPS Location Service feature provides a location, most probably near to your actual location. For GPS feature performance, under ideal test conditions see Table “GPS Specification”

The radio can be triggered to send Location Reports in various circumstances, for example:

- Upon a request
- Entering Emergency Mode

- At specified time intervals
- At specified distance intervals

The Location Reports can be sent in two ways using:

- SDS
- Packet Data

If the Location Reports are sent over the Packet Data, a Packet Data icon is displayed when the message is being sent.

If the Location Reports are sent via SDS with User Defined Data Type-4 as a transport layer, either the ETSI Location Information Protocol (LIP) or Motorola Location Request/Response Protocol (LRRP) GPS Location Protocol is used. The LRRP GPS protocol either use SDS-TL (for added reliability) or Simple GPS with no SDS-TL (for saving air interface resources). GPS Protocol Identifiers are:

- LRRP SDS TL = 131
- LRRP Simple GPS = 3
- LIP GPS = 10

Location reports are sent in TMO and can also be provisioned to be sent in DMO. If the radio is provisioned to provide user indications, the feature operational status is indicated on the radio display.

Depending on the radio configuration, viewing the radio position and the status of the visible satellites is available. The position may consist of longitude and latitude, UK, or Irish grid coordinates. The GPS Location Service feature can be enabled or disabled as a whole using the CPS. It is possible to configure the feature parameters using the CPS, or over the air. The CPS configuration provides a default profile. The commands received over the air may overwrite the default profile configuration. The profile assigned to the radio determines when to send location data, what data to send with what accuracy and to what address. All data requests and configuration commands received over the air are checked to confirm they have come from a trusted source. Location reports are accepted only from authorized ISSIs or IPs, depending on the configured transport layer (SDS, Packet Data).

NOTE

Ensure the application receiving location messages and the radio are configured in a corresponding way. Otherwise the radio will reject all system GPS requests.

The radio supports GPS triggers functionalities (using LIP or LRRP) to report GPS positions when the radio meets a set of criteria. The following triggers, together with their specific parameters, can be set up by service provider:

Table 2-6 GPS Triggers

Trigger Type	Trigger Event
Power-up	Radio powers up in TMO.
Power-down	Radio powers down in TMO.
Emergency condition	Radio enters emergency operations.
Periodic	Given time interval after the last location report expires.
Moved	Radio position has changed by at least the distance defined (the radio checks the movement from the last known position at an interval).
TMO ON	Successful registration on entering TMO from DMO.
DMO ON	Before TMO deregistration, and before entering DMO.

Table 2-6 GPS Triggers (cont'd.)

Trigger Type	Trigger Event
Transmit Inhibit Mode ON	Radio is about to enter TXI.
Transmit Inhibit Mode OFF	Radio has successfully registered after leaving TXI.
Low battery	Radio detects its battery level has reached or fallen below the level specified by service provider.
Loss of GPS	Radio detects a loss of GPS for a minimum duration defined by service provider.
Recovery of GPS	Radio detects a recovery of GPS signal for a minimum duration defined by service provider.
Status entered	Radio sends a status defined in the CP for location reporting by pre-programming.
DCK Connected	Radio detects that a Car Kit has been connected.
DCK Disconnected	Radio detects that a connected Car Kit has now been disconnected.
GPS ON	Positioning device has been switched ON.
GPS OFF	Positioning device in the radio is about to be switched OFF.
Emergency Periodic Profile (LRRP only)	Radio is in emergency operation and given time interval after the last location report expires.

This is a selling feature.

2.25.1 GPS Accuracy

The GPS Location Service accuracy depends on the GPS coverage and the selected accuracy mode. In good GPS coverage (at least -137 dBm or in open sky), the location accuracy presents as follows:

NOTE

The presented values depend on variety of factors, for example the view on the sky. In order to optimize the GPS performance the radio should have the clearest possible view of the open sky.

2.25.2 GPS Military Grid Reference System

The Military Grid Reference System (MGRS) is the geocoordinate standard used by the military for locating points on Earth. The MGRS attempts to represent the entire surface of Earth on a worldwide grid. The grid is based on the UTM (Universe Transverse Mercator) between 80°S and 84°N latitudes and UPS (Universal Polar Stereographic) systems.

The UTM area is divided into 60 longitudinal strips, each 6° wide. The strips are numbered 1-60 beginning at the 180°-174° W (Zone 1) and increase to the East. Each strip (or Zone) is then divided (horizontally) into 8° latitude bands.

NOTE

An example of an MGRS coordinate would be **19TDJ3858897366**, which consists of:

- **19** is the UTM Zone Number
- **T** is the corresponding UTM latitude band letter
- **DJ** is the MGRS Grid Reference used to define the 100 km square within the UTM/UPS block. The columns A-Z (excluding "I" and "O"), like UTM, start at 180° and increase towards the East. Every three columns, the pattern repeats. Letters designating rows, increase towards the North. The letters cycle backwards through the alphabet in the southern hemisphere (towards the South):
  - **D** is the MGRS column letter
  - **J** is the MGRS row letter
- **38588** is the 5–digit MGRS Easting value. It represents the number of meters East of the origin (that is, southwest corner) of the 100 km square in which it is contained.
- **97366** is the 5–digit MGRS Northing value. It represents the number of meters North of the origin (that is, southwest corner) of the 100 km square in which it is contained.

MGRS Support feature can be programmed in CPS. The user can choose to display the GPS coordinates in MGRS format.

This is a selling feature.

2.25.3 GPS Different Location Displays

Table 2-7 Different Location Displays

Latitude / Longitude	UK Coordinates	Irish Coordinates	UTM Coordinates	MGRS Coordinates
Time	Time	Time	Time	Time
Latitude	2–Letter Code	1–Letter Code	3–Letter Code	3–Letter Code and 2–Letter Code
Longitude	Easting and Northing Coordinate	Easting and Northing Coordinate	Easting and Northing Coordinate	Easting and Northing Coordinate
Altitude	Altitude	Altitude	Altitude	Altitude
Satellites	Satellites	Satellites	Satellites	Satellites

- Time — indicates when the last time the location was calculated. The time is provided in Universal Time Coordinated.
- Letter Code — grid zone or square on the map for different coordinate standard
- Latitude — expressed in degrees, minutes, and seconds.
- Longitude — expressed in degrees, minutes, and seconds.
- Number of satellites — used to calculate the location. In general, more satellites make for better accuracy. The maximum is 12 satellites.
- Easting — refers to the eastward-measured distance expressed in meters.
- Northing — refers to the northward-measured distance expressed in meters.

NOTE

Skipping each digit of easting and northing coordinates decreases the accuracy by the factor of 10.

2.26 WAP

Wireless Application Protocol (WAP) is a standard for application layer network communications in a wireless communication environment such as TETRA network. The protocol is used to access the mobile web from a radio through a WAP browser.

This is a selling feature.

2.26.1 WAP Browser

The Openwave Mobile Browser is a WAP-complaint user agent. The WAP browser provides all of the basic services of a computer-based web browser. Whenever any preemptive display interrupts the browser session, the browser needs manual reactivating to return. The WAP browser does not support right-to-left languages (as Arabic and Hebrew); English is used instead. For the content in these languages, the characters are not displayed.

2.26.2 WAP Push

WAP push allows WAP content to be pushed to a radio. This push is carried out by sending a specially formatted (Push Access Protocol) XML document to the Push Proxy Gateway, that in turn forwards the document to the radio.

A WAP push message is an encoded message including a link to a WAP address. On receiving a WAP push, a WAP enabled radio automatically gives the option to access the WAP content. The implemented WAP push is compliant to WAP 2.0 standard.

The radio supports WAP 2.0 through a proxy only. Proxy-less connections are not supported.

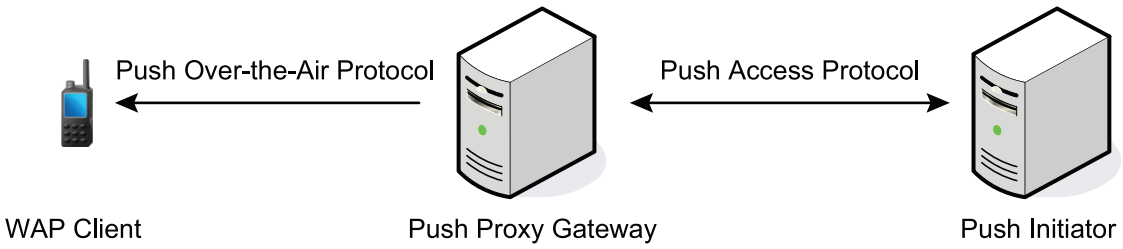
This is a selling feature.

2.26.2.1 WAP Push Framework

A push operation in WAP is carried out by allowing a Push Initiator (PI) to transmit push content and delivery instructions to a Push Proxy Gateway (PPG). The PPG delivers the push content to the radio as per to the delivery instructions.

The PI is an application running on a web server and communicating with the PPG using the Push Access Protocol (PAP). The PPG uses the Push Over-The-Air (OTA) Protocol to deliver the push content to the radio.

Figure 2-7 Push Framework



2.26.2.2 WAP Push Service Indication

The service indication (SI) presents a notification and an associated URL with a prompt to enter the URL on the radio display. The notification is then stored in the WAP box for subsequent presentation.

The SI can be valid only for a certain amount of time. After the specified time elapses the SI indicates void content. The author of an SI can set the expiration date and time, that is, when the SI is automatically deleted from a radio.

The service provider can remotely delete SIs that became invalid. The removal is carried out through sending a special SI to delete the invalid entity.

A new SI is indicated with a respective status icon, tone, and a pop-up. The pop-up occurrence depends on the SI priority (high and medium) and the radio conditions (for instance, if the radio is in a call the pop-up does not appear). Depending on the periodic alert feature availability, a notification of an unread SI can be indicated with periodic notification, similarly to an SDS message.

2.26.2.3 WAP Push Service Load

Service Loads (SL) differ from the Service Indications (SI) by the fact they do not prompt to enter the URL. Instead, the browser is automatically activated. The SL contains an URL indicating what service to load.

A new SL is indicated with a respective status icon, tone, and browser activation. The browser activation depends on the SL priority (high) and the radio conditions (for instance, if the radio is in a call, the browser does not display).

SL messages sent with urgency cache can be not indicated directly to the user. Such SL messages load content and store it in the cache (the process works in the background, only the PD icon is visible to the user).

2.27 Radio User Assignment and Radio User Identity

Radio User Assignment (RUA) and Radio User Identity (RUI) enables authentication for providing full access to the infrastructure and the physical radio.

Where the RUI feature is enabled, on logging on to the radio you enter your User ID with the PIN to check your identity. Only the successful logon provides the full access. A logon failure results in limited service.

Where also the RUA feature is enabled, after successful RUA/RUI authentication you are logged on to the physical radio. Thus, you can still be reached at your radio number.

You can differentiate the RUA/RUI state by the interface color. Blue for logged on and gray for logged off. No additional icon indicates whether you are logged on.

Besides the logged on off states, the radio can also be in the pseudo log on state indicated by the relevant icon.

The User ID is stored in the RUI List. To verify who is logged on to the radio, see the second line in the RUI list (the first line is **New User ID**).

RUA/RUI is a selling feature.

2.27.1 RUA/RUI Logging On

You can log on yourself or the dispatcher can log you on. The feature must be enabled in the codeplug, by your service provider.

After turning on the radio, the infrastructure verifies a request from the radio and checks if it supports the RUA/RUI. When the infrastructure accepts RUA request, you are asked for RUI and RU-PIN. After providing correct information, a successful logon occurs and full access is granted for specified time.

When a RUI and/or RU-PIN are incorrect, a logon failure occurs. The infrastructure sends the RUA reject signal to the radio. If enabled in the codeplug, limited service access is granted.

When the dispatcher is sending the RUA accept signal to the radio with the time period that the full service is granted, then the successful book on occurs.

2.27.2 RUA/RUI Radio Behavior

When the radio is logged off and receives RUA accept from the infrastructure without sending logon information, it indicates book on with assigned logon period timer. The radio sends automatically book on response according to the terminal settings: **Book on Reject** — the radio rejects all the book on, **Book on Accept** — the radio accepts all the book on.

To log off, use the radio menu. The dispatcher has also the option to log you off using **Force Off** setting.

The pseudo log on is a state which occurs when the RUA/RUI authenticated radio goes to LST, or infrastructure accepts the logon with the empty granted assignment period. In this state, the radio has the full functionality available except some services as forwarding calls. This state is signalized with a specific icon.

The RUA/RUI feature is specified with the following timers:

- Logon Process Timer — defines the amount of time during which the radio awaits log on response from infrastructure.
- Time Out Warning Timer — defines the amount of time after which the radio displays the warning.
- Logon Period Timer — defines the amount of time during which the radio is logged on.

2.27.3 RUA/RUI Interactions

When you switch from TMO to DMO, the terminal logs off (depending on the codeplug settings). When you switch from DMO to TMO, the radio initiates the log on process.

You may be RUI-authenticated when out of coverage. In this situation, the radio is in pseudo logged on status. All the timers are the same as for the logged on user with the coverage. You may also be logged off when out of coverage. In this situation, the radio is provided with the limited service access. In both cases, if the radio is back in the coverage area and receives RUA request from SwMI, it prompts you to log on.

If during the emergency operations you receive the force-off, it logs you off without exiting the emergency operations. As long as the radio is in the emergency operations, the radio display does not indicate any change.

When the radio turns on in the LST, it prompts for the PIN. If the correct PIN is entered, the radio switches to the pseudo logged on state. When you move to the LST, the radio switches to pseudo logged on state. However, no prompt for the PIN occurs.

When you change to a different physical terminal, the store and forward report is routed to the radio where you are currently logged on. When the radio receives store and forward report, it does not display the report, as the reports have to match the sent SDS. If an SDS consumer report is requested, it is recommended that the receiver sends an explicit separate SDS message to confirm the message has been received and read. The report is stored together with the sent SDS in the **Outbox**, because of that when you log off, delete the messages from the **Outbox**. When you change to different physical radio, the previous permanent radio does not receive the report. The status of store and forward message in the **Outbox** cannot be updated.

2.28 Picture DMS

Picture DMS is a unique signature generated and ascribed to each picture upon its capturing. It allows authenticating pictures captured by Motorola radios so that they can be used as supporting evidence, for example, in a court of law. An existing picture DMS cannot be modified or overwritten by another one. Any alteration attempt invalidates the picture DMS.

Since DMS signatures are stored in the internal radio memory, they cannot be viewed by end users and only the service provider can access them.

The radio can contain up to 1000 items. If no space for signatures is left, the pictures are still captured and stored, but without generating DMSes.

Upon Terminal Permanent Disable all picture DMSes are erased and cannot be recovered.

This is a selling feature.

2.29 EXIF Data

EXIF data (EXchangeable Image File Format) is additional technical information about the picture and the radio that is saved within special tags inside JPEG files. Except for standard EXIF tags, Motorola radios support the following TETRA-specific tags:

- Full time and date
- GPS position
- Radio ISSI
- Talkgroup
- Site ID

EXIF tags cannot be viewed on the radio. To manage them, you need to use an appropriate application capable of reading EXIF data.

3 Man-Machine Interface

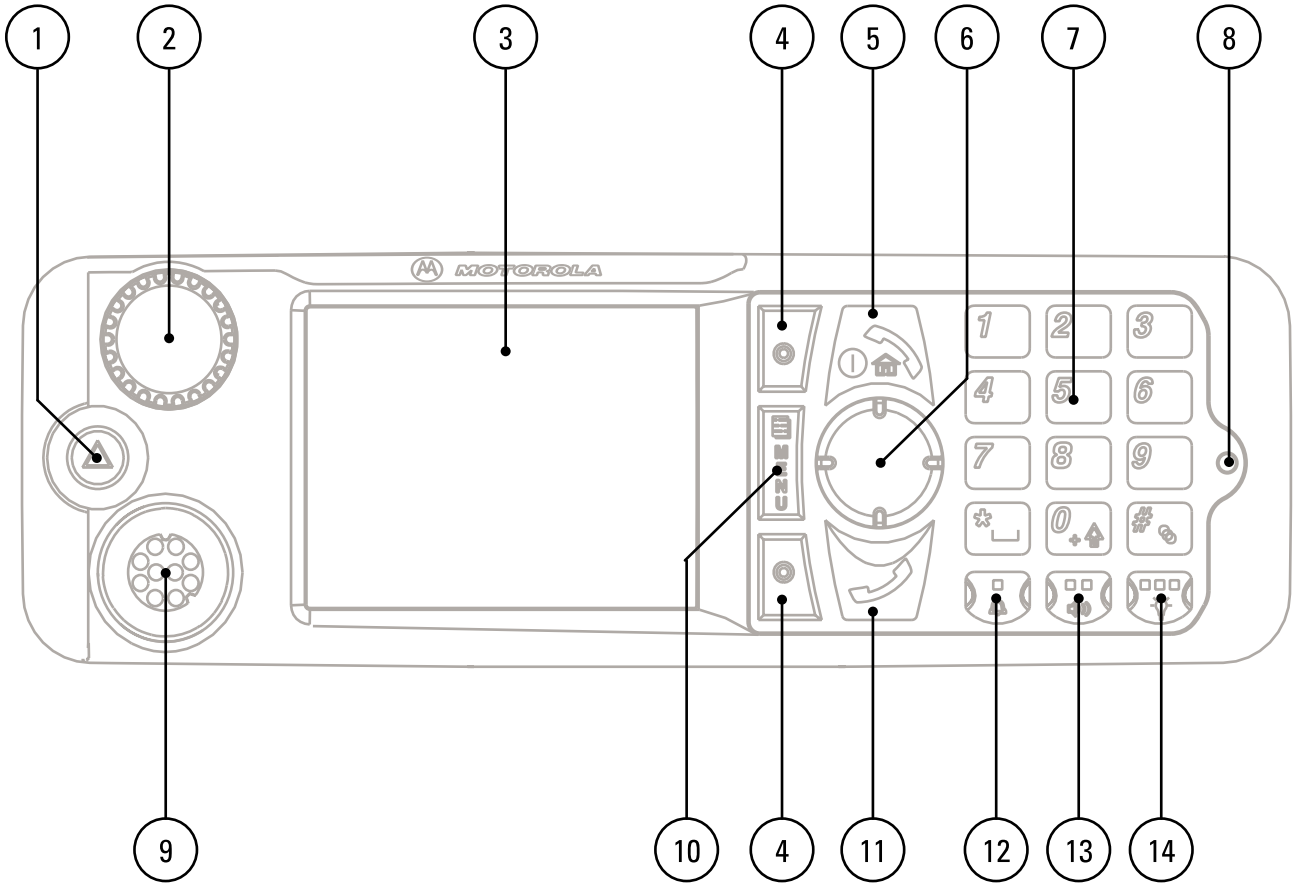
3.1 Controls, Indicators and Related Features

3.1.1 LED Indications

Table 3-1 LED Indications

Indication	Status
Solid green	In use
Blinking green	In service
Solid red	Out of service
Blinking red	Connecting to the network
	Entering DMO
Solid orange	Transmit inhibit in service
	Channel busy in DMO
Blinking orange	Incoming call
No indication	Idle
	Radio powered down

3.1.2 Controls and Indicators



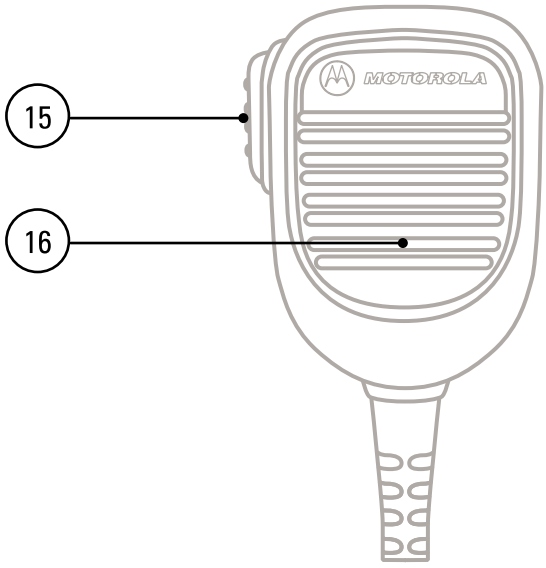


Table 3-2 Controls and Indicators

Annotation	Description
1	EMERGENCY button Press and hold EMERGENCY button to enter Emergency operation. By default, when your radio is off, press and hold to power on in Emergency Mode.
2	ROTARY KNOB • Press and hold to turn your radio on. • Rotate to set the volume. • Press and rotate to select a different talkgroup. • Press and hold the ROTARY KNOB to lock/unlock it. Powering off also unlocks a locked ROTARY KNOB.
3	DISPLAY Provides alphanumeric text and images within 65,536 colors and 640 x 480 pixels with backlighting and scalable fonts.  Before using your radio for the first time, remove the plastic lens protector from the display.
4	SOFT key Press upper or lower SOFT key, to select the option that appears on the screen next to it.
5	ON/OFF/END/HOME key • Press and hold to turn on/off your radio. • Press to end calls. • Press to return to the home screen.
6	NAVIGATION key Press up, down, left or right NAVIGATION key for list scrolling, while moving around the menu hierarchy, or for alphanumeric text editing. From the home screen, press to activate one of the following: • down NAVIGATION key — enters **Recent Calls** menu item. • up NAVIGATION key — changes **My Groups** talkgroup folder. • left and right NAVIGATION key — toggles through the talkgroups.
7	KEYPAD Use the keypad to enter alphanumeric characters for dialing, contact entries, and text messages.
8	LED

Table 3-2 Controls and Indicators (cont'd.)

Annotation	Description
9	MOBILE MICROPHONE PORT Provides connection for accessories such as fist microphone with PTT.
10	MENU key Press to enter the main menu and the context-sensitive menu.
11	SEND key Press to initiate or answer duplex calls, or send messages.
12	EXTERNAL ALARM key Press to activate One-Touch Button feature (activates/deactivates the horn and lights by default).
13	SPEAKER CONTROL key Press to activate One-Touch Button feature (turns the speaker on/off by default).
14	BACKLIGHT key Press to activate One-Touch Button feature (dims the backlight by default).
15	PTT (Push-To-Talk) • Press and hold to talk in simplex calls or to initiate a group call, release it to listen. • Press to send status and text messages.
16	MICROPHONE

NOTE

- It is recommended to turn off the terminal before connecting any of the accessories.
- A detailed list of compatible accessories is included in *Accessory Leaflet*, part number: 6866539D39. To obtain the document, contact your service provider.

3.1.3 Keypad Lock

You can lock the keypad to prevent accidental pressing of keys. The keypad lock can be invoked using the menu or predefined menu shortcut (by default).

By default, while the keypad is locked, all front and side keys (including PTT) are inoperative except for the ON-OFF and EMERGENCY buttons. The PTT button behavior can be set in the codeplug.

When an incoming emergency call is received, the PTT button automatically unlocks for the call duration.

When the keypad is locked one of the following is displayed:

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

The displayed option can be set in the codeplug. By default it is set to **Notification and Instruction**.

3.1.4 Automatic Keypad Lock

The automatic keypad lock is a feature enabling the radio to lock its keypad automatically after a defined period. The radio allows activating or deactivating the feature using the MMI. If the feature is enabled, after a defined time of inactivity the keypad locks automatically. Any user activity restarts the **Automatic Keypad Lock** timer. When the keypad locks automatically, the following notification is displayed **Keypad auto locked.** You can change the time value required for the automatic lock through the MMI.

3.1.5 One-Touch Button Feature

To use One-Touch Button feature press and hold an assigned key to activate one of the following features:

Table 3-3 One-Touch Button Features

Feature	Description
Backlight	Switches backlight settings.
TMO Talkgroup Scan	Turns on/off the Talkgroup Scan feature in TMO Mode.
DMO / TMO Switch	Switches between TMO and DMO Mode.
Sending Status	Sends a dedicated status message to a dedicated address.
Change Talkgroup	Changes the talkgroup to the predefined by your service provider.
Hi/Low Audio	Activates high/low audio.
Sending User Defined Message	Sends a predefined/user defined template to a dedicated address.
Transmit Inhibit (TXI)	Turns on/off TXI Mode.
Private Call	Initiates a private call to a predefined entry in the contact list.
Phone Call	Initiates a phone call to a predefined entry in the contact list.
PABX Call	Initiates a PABX call to a predefined entry in the contact list.
Screen Saver	Turns on/off the Screen Saver feature.
Display Time	Shows time and date on a display.
Covert Mode	Turns on/off the Covert Mode.
Horn and Lights	Turns on/off the Horn and Lights.
Initiate Call-Out Fallback Alert	Sends Fallback Alert.
RUA / RUI	Logs you in/out.
Previous Talkgroup	Switches the radio to the previously used talkgroup.
RMS Mode (applicable only for * and #)	Toggles on/off RMS feature.
GPS Status Message	Sends your GPS location in a message to a dedicated address.
Speaker Enable / Disable Per Call	Enables speaker during the call.

Table 3-3 One-Touch Button Features (cont'd.)

Feature	Description
Timed Talkgroup Change	Initiates the Timed Talkgroup Change feature. While in the predefined talkgroup, it can be assigned to the second press function.
Double Push PTT	Sends the D- PTT tone to the talkgroup you are currently using.

NOTE

If the One-Touch Button feature is enabled, the One-Touch Dial is disabled. If no feature is assigned to a button, your radio displays an **Unassigned Button** message.

3.2 Display

This section presents the radio's home screen elements.

Table 3-4 Display

Annotation	Description
1	Status icon area
2	Text display area
3	SOFT key area
4	MENU/Context sensitive icon

The color of the SOFT keys informs you about the mode or state that your radio is in.

Table 3-5 Colors of the SOFT Keys

Color	Mode or State
Light blue	Normal TMO and DMO Mode
Light red	Emergency Mode or Disaster Alert Call
Olive	Local Site Trunking Mode
Yellow	Call Out — Standby

Table 3-5 Colors of the SOFT Keys (cont'd.)

Color	Mode or State
Red	Call Out — Alert
Green	Call Out — Accepted
Blue	Radio Message Service (RMS). RMS is a mode which allows you to send and receive predefined short messages without entering **Messages** in the menu structure.
Grey	Radio User Assignment (RUA) — Limited service

3.2.1 Status Icons

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

Table 3-6 Status Icons

Icon	Description
Trunked Mode Operation	
	In Service (Signal Strength) — Allows you to check signal strength. More bars indicate a stronger signal.
	No Service
	Migration — Displayed when your radio is registered to the foreign network.
	Broadcast Call — Displayed when the radio is in the Broadcast Call.
	Scan — Indicates talkgroup scanning is activated in the radio.
	Priority Scan — Indicates that priority scanning is activated in the radio.
	Data Connected — Displayed when the Packet Data feature is activated and the external device sets up data connection with the radio.
	Data Transmit/Receive — Displayed when the Packet Data feature is activated and the external device sets up data connection with the radio. • No number — standby data session. • Number 1, 2, 3, or 4 — indicates active data session with 25%, 50%, 75%, or 100% bandwidth.
Direct Mode Operation	
	Direct Mode Call – Displayed during a Direct Mode call; more bars indicate a stronger signal.
	Direct Mode — Displayed when the radio is in Direct Mode.

Table 3-6 Status Icons (cont'd.)

Icon	Description
	DMO Gateway Communication Mode — Indicates that gateway is selected. The icon has the following states: • Solid — while the radio is synchronized with the gateway. • Blinking — while the radio is not synchronized or during attachment. • No icon — during a radio to radio and repeater call.
	DMO Repeater Communication Mode — Displayed when the **Repeater** or **GW + Rep** option in DMO Mode is selected. This icon has the following states: • Solid — while the radio has detected the repeater (for example when the radio receives a presence signal). • Blinking — while the radio has not detected the repeater or during attachment. • No icon — during a radio to radio and gateway call.
General Icons	
	All Tones Off and Duplex and Simplex Ring Muted — Indicates that all alert tones are off and both duplex an simplex ring volume is set to 0.
	Simplex Ring Muted — Indicates that simplex ring volume is set to 0 and duplex ring volume is set to more than 0.
	Duplex Ring Muted — Indicates that duplex ring volume is set to 0 and simplex ring volume is set to more than 0.
	Speaker Off (Low Audio) — Indicates that audio will not sound through the speaker.
	Earpiece Connected — Indicates that the earpiece is connected.
	Horn and Lights — Indicates that an external alarm (for example, horn and lights) is activated.
	GPS — Indicates that a valid location coordinates are received.
	RUI Logged on — Indicates that you are logged on into the radio.
	RUI Pseudo Log On — Indicates that you are in pseudo logged on state.
	RUI Packet Data — Indicates Pseudo Log On state when the Packet Data feature is activated and the external device sets up data connection with the radio. • No number — standby data session. • Number 1, 2, 3, or 4 — indicates active data session with 25%, 50%, 75%, or 100% bandwidth.
	RUI Packet Data — Indicates Pseudo Log On state when the Packet Data feature is activated and the external device sets up data connection with the radio.
	Emergency — Appears while the radio is in Emergency Operation.
	Disaster Alert Call — Appears while the radio is in the Disaster Alert Call.

Table 3-6 Status Icons (cont'd.)

Icon	Description
	List Scrolling — Displayed to indicate that the ROTARY KNOB is in list scrolling mode.
	New Message Has Arrived — Indicates a new message just arrived.
	New Message(s) in Inbox — Indicates that you have unread messages in your **Inbox**.
	Unread (New) WAP Message — Indicates that new page was loaded to the browser.
	Call-Out — Indicates Call-Out alert.
	Call-Out Alert Arrived — Indicates a receipt of a new Call-Out message.
	Call-Out Alert Unread — Indicates unread alert in the **CO Box**.
	End-to-End Encryption (E2EE) Solid, when the E2EE is enabled • for the selected talkgroup, • for the highlighted private number, • for the manually entered private number, • when transmitting voice in Group Calls, • when transmitting voice in Simplex Private Calls. Blinking, when the End-to-End Encryption is enabled • when receiving voice in Group Calls, • when receiving voice in Simplex Private Calls, • during encrypted Duplex Private Calls.
	SDS End-to-End Encryption Solid, when the E2E status of an SDS message, or the E2E status of a message recipient address. In High Security mode, when your radio processes only the encrypted information, this icon is always visible in when you are in the messages menu (for example, **Inbox**).
	Unread (New) WAP Message — Indicates that you have not entered **WAP Box** since last WAP message was received (Blinks when the priority is high).
	WAP Message Icon — Displayed next to the priority in the message list view.
	WAP Message Time — Displayed next to the create date in the message list view.
	WAP Message Expiration — Displayed next to the expiry date in the message list view.
	WAP Message Title Icon — Displayed next to the title along with the text in the message list view.
	Keys Locked — Indicates that keys are locked.

Table 3-6 Status Icons (cont'd.)

Icon	Description
	Non Secured Call — Air Encryption Unavailable Blinking, indicates that Air Encryption is not available when the radio: • Is in the Local Site Trunking Mode. • Attempts to connect to a gateway.
	Not Secured Call — Air Encryption Unavailable Alternately blinking, indicates that Air Encryption is not available when the radio: • Is in TMO Mode. • Communicates through a gateway.
	Not Secured Call — Air Encryption Unavailable Blinking, indicates that Air Encryption is not available in DMO Mode. The icon appears after the PTT button is pressed.

3.2.2 Idle Display

The terminals provide access to all services from the main idle display. There is no need to select a mode before calling.

The idle display shows the following content:

- Icons on the top line.
  - Status icons.
  - Signal level icon.
    - Displayed in TMO at all times.
    - Displayed in DMO only when receiving a voice in a group call.
  - Up to five lines of text.
- Softkey labels and optional menu icon.
- An optional wallpaper background.

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

- Pressing the UP key accesses the favorite talkgroups list.
- Pressing the DOWN key accesses the recent calls lists.
- Pressing the SEND key accesses the last dialed numbers list.
- Pressing the **Contacts** softkey accesses the address book.

3.2.3 Configurable Idle Screen

Configurable Idle Screen is a feature that allows your service provider to determine what additional information is displayed below the status icon area on the idle screen . The following information can be selected:

- Network
- Range
- Talkgroup name
- Time and date
- Home mode display
- RMS/FMS
- ISSI

3.2.4 Display Features

The radio utilizes colors to highlight certain special situations.

- When the battery is low.
- When the signal strength is low.
- When the radio is in an emergency mode/call.

The radio has enlarged zoom fonts that you can choose using the menu (Zoom and Extra Zoom, where available).

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

- Disabled — The backlight does not operate at all.
- Semi-Auto — Pressing a provisioned one-touch button toggles the on/off state of the backlight. The backlight is also turned off automatically when the backlight timer runs out.
- Auto — Pressing any key automatically turns on the backlight.

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

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

3.2.5 Languages Supported

Table 3-7 Languages Supported

Language	MTM800 Enhanced
English	Yes
Arabic	Yes
Chinese (simplified)	Yes
Chinese (traditional)	Yes

Table 3-7 Languages Supported (cont'd.)

Language	MTM800 Enhanced
Croatian	Yes
Danish	Yes
Dutch	Yes
French	Yes
German	Yes
Greek	Yes
Hebrew	Yes
Hungarian	Yes
Italian	Yes
Japanese	Yes
Korean	Yes
Lithuanian	Yes
Macedonian	Yes
Mongolian	Yes
Norwegian	Yes
Portuguese	Yes
Polish	Yes
Russian	Yes
Spanish	Yes
Swedish	Yes
User defined	Yes

3.3 Audio

3.3.1 Tones

Table 3-8 Radio Tones

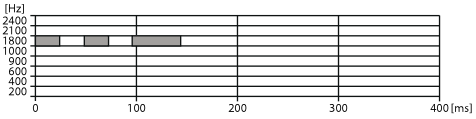
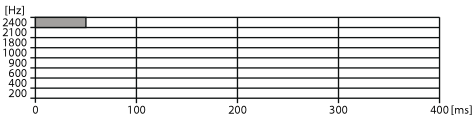
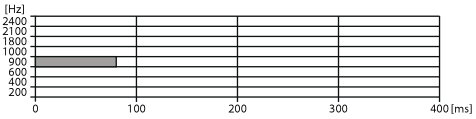
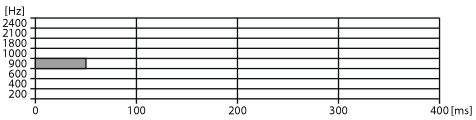
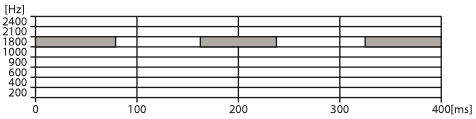
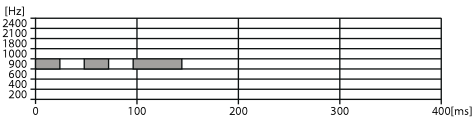
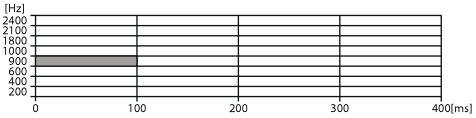
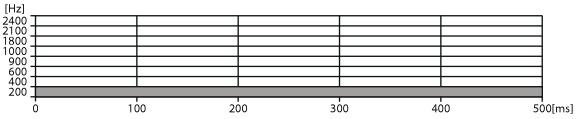
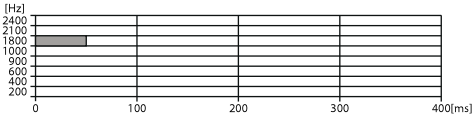
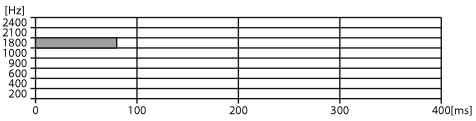
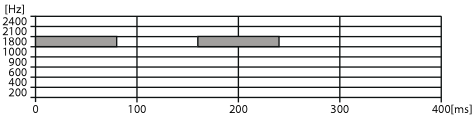
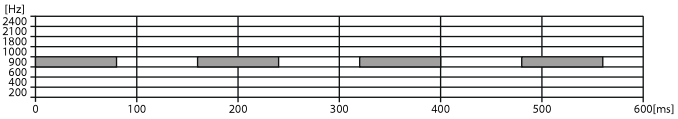
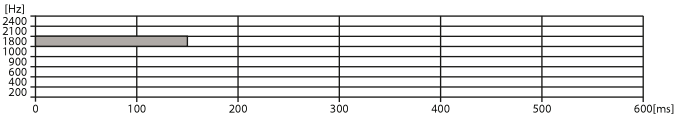
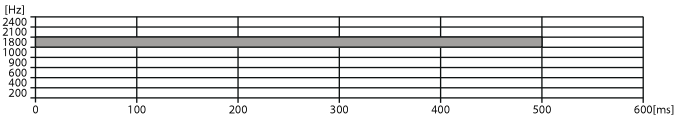
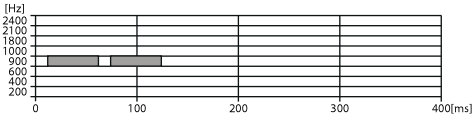
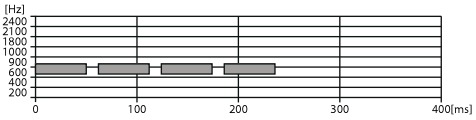
Tone Name	Default Tone Diagram
Back to Coverage Back to Full Service	
Clear-to-send	
Bad Key Pressed	
From Out-of-Service to In Service	
In Emergency	
Talk Permit	
• Talk prohibit • System busy • Time-out timer expire • Called radio not available or busy	
Call Disconnected or Failed Due to Network	
Toggling Betwen DMO and TMO	

Table 3-8 Radio Tones (cont'd.)

Tone Name	Default Tone Diagram
Entering/Exiting Local Site Trunking	
Receiving/Sending Emergency Alarm	
Emergency Alarm Failed	
Entering Emergency	
Exiting Emergency	
Entering TXI	
Exiting TXI	

NOTE

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

3.3.2 Volume Control

If the volume control mode is set to **Individually Controlled**, you can adjust the following volumes individually.

- Duplex (alerting volume at incoming phone/PABX or duplex private call).
- Simplex (alerting volume at incoming simplex private call).
- Earpiece (voice audio volume in the internal or external earpiece).
- Speaker (voice audio volume in the speaker).
- Keypad (keypad tones volume).

The adjustments are made for the volumes within the ranges defined in the audio mode. Simplex and duplex calls use the same range. All other volumes are fixed for each audio mode.

If the volume control mode is set to **Commonly Controlled**, you can adjust only all volumes at the same time.

When the rotary knob is in the volume mode the radio adjusts the value of the commonly controlled volume along with the audio volume.

3.3.3 Volume Adjustment Mode

You can set the volume to **Individual** or **Common**. When it is set to **Individual**, the volume level for **Voice**, **Duplex**, **Simplex**, **Earpiece**, **Speaker** and **Keypad** can be set per user preferences. When set to **Common**, the audio have one setting for all items.

3.3.4 Voice Operating Transmission (VOX) Control

Voice Operating Transmission (VOX) allows transmitting voice in a hands-free condition. The feature enables the radio to automatically key-up upon detecting audio and automatically de-key when audio is no longer present. The VOX control of audio is used when a duplex private call or telephone call uses the fist microphone.

On the MTM800E radio, VOX can be enabled or disabled using CPS.

3.4 Testing

3.4.1 Test Page/Test Mode

NOTE

The Test Mode option must be enabled in the codeplug. The test mode is only for use by authorized persons. When using KVL 3000 (a portable device used to load encryption keys to a secure entity), set the baud rate on it to 19200 bits/second.

Use the following key sequence to access the test mode: .

NOTE

If the test mode option is not enabled in the codeplug, you have only access to the KVL mode options **KVL On** or **KVL Off**.

The following information is available in the test mode.

- **Ver Info** – Version Information – displays software/hardware version information.
  - **Build Date** – software build (a compiled version of software)
  - **CP Ver** – CodePlug version
  - **DSP Ver** – Signalling Processor Software version
  - **Host Ver** – Application Software version

  - **HardwareID**– hardware identification number
  - **EquipID** – TEI (Tetra Equipment Identity)
  - **LLS version**– Local Language Package version
  - NGCH Software Version – software version of the control head
- **Addresses**;
  - **Home MNI** – country identification code, network code
  - **Group ID** – number of the currently selected talkgroup
  - **Own ISSI** – Own Individual Short Subscriber Identity
  - **ASSI**– Alias Short Subscriber Identity
- **Err Logs** – Error Logs – displays information about software errors.
- **Cells Info** – Cell Information – displays information about the foreground and background cells (BTS sites). This menu displays the RSSI levels of the cells.
- **Cell Lists** – Displays frequency lists.
  - Frequency **List1** (32 variable frequencies)
  - Frequency **List2** (32 fixed frequencies)
  - Frequency **List3** (comprehensive hunt)
  - Frequency **List4** (comprehensive hunt)
- **Data Svc** – Data Services – allows access to the air tracer enable, the conformance tests, and the KVL mode.
  - **Air Tracer**
  - **Conf Test** – Conform test
  - **KVL Mode**

    NOTE

    In the KVL mode, the display is immediately dark and empty. However, the green LED is on. During data exchange with the AIE KVL, the orange LED is on. On successful key exchange, the green LED is on again. In any error situation, the red LED is on. You can leave the KVL mode by pressing the power button.

  - **E2E KVL Mode**
  - **MS Logging**
- **CE Monitor**– Crypto Engine Monitor
- **Key Info** – Key Information — allows displaying the security information for the following conditions:
  - For the serving cell:
    - **Curr Cell SC** – Security class of the serving cell, that is Security Class 1, Security Class 2, Security Class 3, Security Class 3 with GCK.
  - For the group OTAR:
    - **CMG GSSI** – Crypto Management Group (CMG) group of MSs with common key material
  - For SDMO and TM-SCK OTAR:
    - **SCK SubsGrType** – SDMO SCK Subset Grouping Type.
    - **Curr Subs Info** – current SDMO SCK Subset Number and SCK-VN.

- ♦ **Fallback TMSCK** – current Fallback TMO SCK, that is SCKN and SCK-VN attributes.
- ♦ **SCK List** – list all SCKs stored in the MS, that is SCKN and SCK-VN attributes (SCK version number).

When checking that the SDMO key information in the radio, be advised that the SDMO KAG (SDMO Key Association Group) range in the AuC (Authentication Centre) is from 0 to 9 and the range in the radio is from 1 to 10.

– For the GCK (Group Cipher Key):

- ♦ **Full GCK-VN** – current Full GCK-VN.(GCK version number).
- ♦ **GCK List** – list all GCKs stored in the MS, that is GCKN and GCK-VN attributes.

- **DMO info**– Direct Mode Operation information

3.4.2 Service Page

Depending on the codeplug configuration the manufacturer, type, and serial number information is available. The information is available through the service page accessible from the MMI.

The service page provides the following data.

- Manufacturer
- Product Type

The manufacturer and product type information is displayed only on radios distributed under Motorola trademark.

- ISSI — the ISSI which is currently in use. If a SIM Card is present the ISSI is read from the card, otherwise it is taken from the codeplug.
- TEI — the TEI is displayed as a hexadecimal number.
- Serial number — Motorola serial number is displayed only on radios distributed under Motorola trademark.
- OPTA — if the BSI SIM support is disabled no OPTA information is displayed.

3.4.3 Hardware Test

This mode allows performing basic hardware tests and share the results immediately on the display.

The hardware test mode is only for use by authorized persons.

4 Customer Programming Software

4.1 CPS Plus Overview

Customer Programming Software (CPS) Plus provides a programming interface between a PC and TETRA radios.

CPS Plus allows you to program radios with configuration files called **codeplugs**. A codeplug is a repository of configuration data for a radio. It includes features (also the **selling features**) and adjustable parameters.

Codeplugs can be modified using CPS Plus.

CPS Plus enables you to easily manage radio software updates. A typical software package contains platform-specific software components: firmware, codeplugs, language packs, and selling features (licenses required). Such packages, for all available platforms, are bundled in **release packets** and delivered on a disk or online. You can import release packets directly to CPS Plus and use the bundled software to **upgrade** radios.

Figure 4-1 CPS Plus — Overview

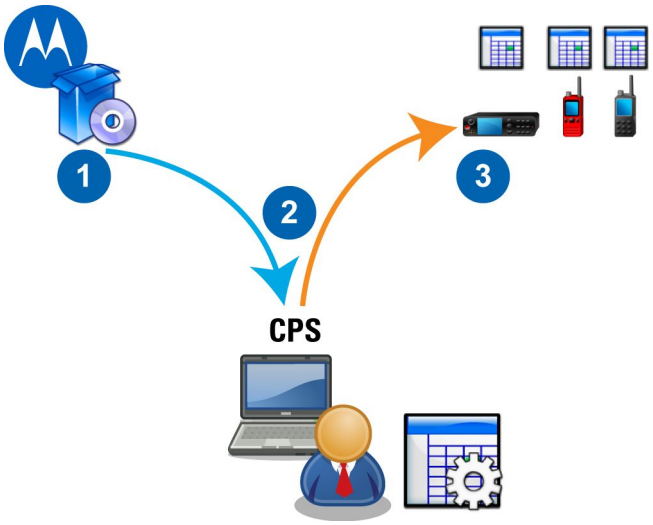


Table 4-1 CPS Plus — Overview

Annotation	Description
1	Motorola Solutions supplies its customers with radio software release packets and Customer Programming Software (CPS) Plus.
2	CPS Plus User can modify radio codeplugs, apply audio templates, and manage radio software upgrades.
3	CPS Plus is compatible with assorted models of Motorola Solutions TETRA radios and can read and write radio configuration from up to 16 devices through the USB port on a PC or a laptop.

The most common tasks using CPS Plus include:

- Reading codeplugs from radios.
- Writing codeplugs to radios.

- Editing codeplugs.
- Upgrading radios with newer software.
- Enabling standard features.
- Enabling selling features.
- and many more.

4.1.1 Using CPS Plus Online Help

When and where to use:
To learn about the application and to search content.

Procedure Steps

1 For information about changes in radio software releases (Release Packets), click **Help → What's New in CPS Plus**.

2 To open the help file, press F1 or click **Help → CPS Help Index** .

3 To find the content, browse the table of contents or use the **Search** tab.

SUGGESTION

To narrow your search criteria, enter the keyword in quotation marks, for example **"keyword"**.

4 To go back and forth between the viewed pages, press LEFT/RIGHT ARROW + ALT.

5 To browse up and down and preview the pages from the table of content, press UP/DOWN ARROW + ALT.

6 To increase the font size, in the CHM browser click **Options → Internet Options → Accessibility**. Select the check box **Ignore font sizes specified on Web pages**. Click **OK**.

4.1.2 What is New in CPS Plus

- **Graphical User Interface** (GUI) has been refreshed but the intuitive interface and functionality remains familiar to users who used previous versions of CPS. See 4.2 User Interface, page 4-6.
- Software updates for radios are combined in **release packets** that can be easily imported without upgrading the CPS application. See 4.4.2 Importing Release Packets to CPS Plus, page 4-39.
- Radios can **automatically switch in to flashing mode**. See 4.3.3 Turning On Radios in Flashing Mode — Automatically, page 4-21.
- Choose a subset of parameters, edit, and write to radios. See 4.4.8 Modifying Configuration Using Profiles, page 4-46.
- A **new fly-out GUI element** displays radios status and provides a right-click menu with common options. See 4.2.9 Radio Icons List, page 4-15.
- **Identify the differences** in configuration between radios. 4.4.5 Comparing Codeplugs, page 4-44.

- Keep codeplugs up-to-date without compromising settings. See 4.4.7 Upgrading a Codeplug, page 4-45.
- Choose **a default language pack** for your radios. See 4.4.9 Adding Languages to Radios, page 4-50.
- Identify the invalid codeplug parameters at glance. See 4.2.8 Codeplug Panes, page 4-14.
- You can edit codeplugs and program radios at the same time with **no performance disruptions**.
- Importing Audio Device Descriptors. See 4.4.11 Importing Audio Device Descriptors to CPS Plus, page 4-52.
- Removing Audio Device Descriptors. See 4.4.12 Removing Audio Device Descriptors From CPS Plus, page 4-53.
- Enabling/disabling feedback tones and Windows Visual Style. See 4.2.3.1 Options, page 4-10.
- Upgrade or downgrade a radio's codeplug version. See 4.3.13 Upgrading a Radio, page 4-35.
- Limited support for programming **Zeon Radios**.
- Convert codeplugs and profiles from a master file to a specific radio model. See 4.4.3 Converting Codeplug/Profile Radio Model, page 4-40.
- Verify a codeplug/profile for errors before programming a radio. See 4.4.6 Verifying Codeplug/Profile for Copy, page 4-45.
- Report issues with CPS Plus. See 4.5.8 Report Issue, page 4-59.

4.1.3 Migrating Between CPS Versions

After installing the CPS Plus application, you can still retain previous versions of CPS. Legacy CPS may be needed if you support radios running on legacy software platforms, not supported by the new CPS Plus (**lower than MR5.9**). The new CPS Plus supports multiple radio software versions (release packets). Therefore you do not need to upgrade CPS Plus for every new radio software release.

Replacing Legacy CPS with CPS Plus

You have decided to replace the legacy CPS with the latest CPS Plus. It is possible only if your radios run on the software platforms **MR5.9 and higher**. If not, first upgrade the radios using the legacy CPS and then you may uninstall the legacy CPS.

Maintaining Legacy CPS and CPS Plus

You have decided to use CPS Plus for newer radios and retain your legacy CPS to use it with radios running on legacy platforms, not supported by CPS Plus (**lower than MR5.9**). Always install CPS Plus as the last one, to make sure that you have installed the latest USB drivers. The legacy CPS versions lower than **R6x.575.01** (also known as lower than **MR5.10** radio software) require older USB drivers. Therefore remember to use the **USB Driver Tool** before connecting the legacy radios and the other way around.

Check marks indicate in what cases, when switching between the two instances of CPS, you use the USB Driver Tool. For example, you currently use CPS Plus but want to program older radios. The old legacy CPS version that you have on your PC reads **D6x.509.02**. It is older version than the **R6x.575.01**, therefore use the USB Driver Tool and install old drivers. In the table, this case is under the first row **CPS Plus** and the third column **Legacy CPS Preceding R6x.575.01**.

Table 4-2 CPS Plus — The Use of USB Driver Tool for Switching Between Different CPS Versions

	CPS Plus	Legacy CPS Preceding R6x.575.01	Legacy CPS R6x.575.01 or Newer
CPS Plus		✓	
Legacy CPS Preceding R6x.575.01	✓		✓
Legacy CPS R6x.575.01 or Newer		✓	

4.1.4 Supported File Formats

Table 4-3 CPS Plus — Supported File Formats

File Extension	Description	Create	Edit	Import	Export
.add	Audio Device Descriptors file format.			✓	
.cpd	Old codeplug file format. Use **File → Save As** to save to the new .cpe format.		✓		
.cpe	Codeplug file format.		✓		
.dbf	Old codeplug file format. Use **File → Save As** to save to the new .cpe format.		✓		
.gif	A screen saver graphic file format.			✓	
.mou	TETRA key distribution file format.			✓	
.prl	Profile file format.	✓	✓		
.rpk	Radio software release packets file format.				
.z19	Old radio software file format.	✓		✓ Only as .rpk software release packet files.	

4.1.5 Motorola TETRA Radios Supported by CPS Plus

Table 4-4 CPS Plus — Supported Radios

Radio Type	Radio Model	Radio Icon in CPS Plus
Portable	MTP810Ex, MTP830, MTP830FuG, MTP830S, MTP850, MTP850FuG, MTP850S	
	MTP850Ex	
	MTH800	
	CEP400	
	MTP3100, MTP3200 SIM, MTP3200FuG	
	MTP3150, MTP3250, MTP3250 SIM, MTP3250FuG	
Mobile	MTM800	
	Transceiver and Control Head for: MTM800E, MTM5400, MTM800FuG	 

Table 4-4 CPS Plus — Supported Radios (cont'd.)

Radio Type	Radio Model	Radio Icon in CPS Plus
Covert	TCR1000	
PDA	MTC100	

4.2 User Interface

CPS Plus content is arranged in a classic tri-pane design with the menu on top and the work-spaces split with adjustable bars.

Figure 4-2 CPS Plus — Main Window

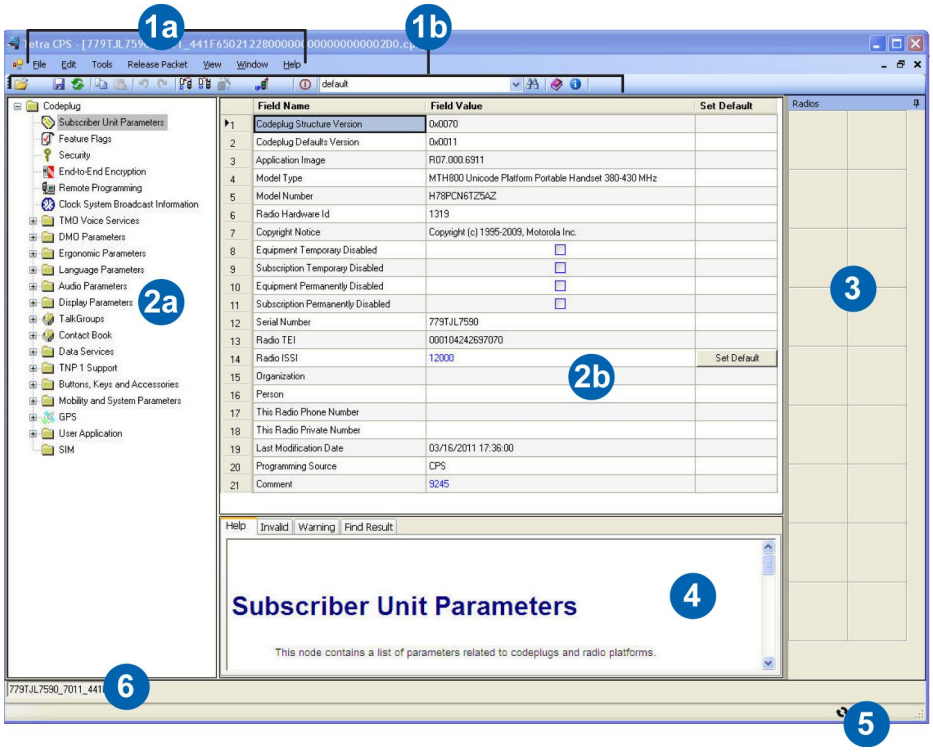


Table 4-5 CPS Plus — Graphical User Interface

Annotation	GUI Item	Description
1a	Menu bar	An area that groups all the menus.
1b	Toolbar	An area that groups icons for basic tasks.
2a	Codeplug pane — Codeplug tree	Represents a hierarchical data structure of a codeplug.
2b	Codeplug pane — Codeplug fields	A table with data-entry points for features and values.
3	Radio Icons List	A fly-out area that visually represents connected radios and status of programming operations.
4	Information pane	An area that provides a dialog interface between the application and the user. It contains the following tabs: • **Help** — displays context-sensitive topics. • **Invalid** — displays invalid parameters, for example when the parameter you have entered is out of range. • **Warning** — displays cautionary messages.
5	Progress bar	Conveys the progress of a programming task.
6	Codeplug file name tab	Allows you switch between the opened codeplugs. Click to bring the preferred codeplug to front.

4.2.1 File Menu

Table 4-6 CPS Plus — File Menu Items

Menu Item	Description
Open Codeplug	Use to open a configuration file.
Open Profile	Use to open a profile.
Open Codeplug with Upgrade	Use to create a newer version of an existing codeplug and open it in CPS Plus. You can use your already configured codeplugs with the newer radio software, but first upgrade the device to the relevant radio software version.  NOTE Upgraded codeplugs preserve all the user data settings.
Open Profile with Upgrade	Use to create a newer profile. In order to support newer radio software versions the profiles must be up-to-date.  NOTE The upgraded profile preserves all the settings from the baseline profile.
Convert Model	Use to convert a codeplug from one radio model to another.

Table 4-6 CPS Plus — File Menu Items (cont'd.)

Menu Item	Description
Close	Use to close the active codeplug.
Save	Use to save changes to the active codeplug.
Save As	Use to save as a new codeplug.
Read Radio	Use to transfer a codeplug from a radio to CPS Plus.
Write Radio	Use to transfer an active codeplug from CPS Plus to a radio.
Radio Copy Wizard	Use to copy and write a subset of specified codeplug parameters from an active codeplug to the selected radio.
Codeplug Copy Wizard	Use to copy and replicate a subset of specified codeplug parameters from an active codeplug to the selected codeplug.
Verify Codeplug/Profile for Copy	Use to verify the codeplug for errors before copying it to a radio.
Generate Profile	Use to create a file with a subset of specified codeplug parameters. This function is like **Copy Wizard**, but you can save the profile on a disk and reuse it in the future.
Apply Profile to Radio	Use to program configuration from a profile to the selected radio.
Apply Profile to Codeplug	Use to copy values from a profile and replicate them on to an active codeplug. This function is like **Codeplug Copy Wizard**.
Compare Codeplug	Use to examine configuration differences between two codeplugs.
Import	Use to import a file to CPS Plus.
Export	Use to export a file from CPS Plus.
Change Codeplug Password	Use to protect a codeplug with a password.
Exit	Use to close CPS Plus.

4.2.2 Edit Menu

The **Edit** menu contains commands used while editing codeplugs.

Table 4-7 CPS Plus — Edit Menu Items

Menu Item	Description
Copy	Use to copy text content from the selected codeplug field so you can paste it in another location.
Paste	Use to paste the text content you have copied from another codeplug field.
Find	Use to search an active codeplug to find a specific field.

Table 4-7 CPS Plus — Edit Menu Items (cont'd.)

Menu Item	Description
Undo	Use to reverse changes that you have done to the active codeplug. This function does not work after you save the changes to the codeplug.
Redo	Use to remake changes done by the **Undo** command.

4.2.3 Tools Menu

Table 4-8 CPS Plus — Tools Menu Items

Menu Item	Description
Turn Off Radio	Use to turn off the radio safely.
Upgrade Radio	Use to upgrade a post-MR5.9 version radio without loosing all the user data.
Up/Downgrade Radio Lite	Upgrade Lite only allows to upgrade radios that are version pre-MR5.9 to a version that is MR 5.9 or newer. Downgrade Lite only allows to downgrade a radio to MR5.9 or newer. SUGGESTION When using the dowgrade option, all the user data is lost. Only the factory and the sensitivity data remains unchanged. It is not recommended to downgrade codeplugs and then downgrade radios. Use the **Restore Radio** option instead.
Write Software	Use to write a selected firmware to a radio. Verify that you perform this operation to the correct unit. The software version must match the codeplug version that resides on the radio. The software version can be found in the **Codeplug → Subscriber Unit Parameters → Application Image**.
Restore Radio	Use to write a previous version of software to a radio. CPS Plus uses radio software from the release packet repository and copies of compatible codeplugs. Each time after reading a radio, CPS Plus automatically backs up each codeplug and stores in the directory chosen during the installation, by default: `C:\Program Files\MotorolaSolutions\Tetra CPS Plus\BackupCodeplugs`. NOTE After this operation, the user data values remain unchanged.
Erase Memory	Use to delete entire radio flash memory. That is to delete the radio software, codeplug with all settings, and security keys.

Table 4-8 CPS Plus — Tools Menu Items (cont'd.)

Menu Item	Description
Restore Permanent Disable V2 Radio	Use to reactivate a disabled radio (only for PDV2). CPS Plus automatically selects the appropriate software version and uses codeplugs from the backup folder to restore the radio.  Plug in the dongle with Selling Feature licenses to the PC.
Radio Languages Settings	Use to write a selected language pack to a radio.
Enable Selling Feature	Use to add a selling feature to the radio.  Close all codeplugs.Plug in the dongle with Selling Feature licenses to the PC.
Import/Remove Audio Template Files	By default, audio template files are included in release packets. If you removed the default audio templates or received a set of customized templates, use this option to import the files to the CPS Plus repository.
Options	Use to change CPS Plus general settings.

4.2.3.1 Options

Table 4-9 CPS Plus — Description of the Options

Menu Item	Description
General	Use to set the user interface language and to protect codeplugs with a password before saving.
Filename	Use to define a filename pattern for codeplugs that you have read from radios and want to store on a hard drive, for example *SN[999ABC9999]_TEI[F8F9FAFBFCFD-FEF]_ISSI[100]_CP[7014]_SW[Unknown].cpe*.  Consistent filenames help you control a codeplug inventory.

Table 4-9 CPS Plus — Description of the Options (cont'd.)

Menu Item	Description
Display	Use to control graphical elements of the interface. **Hide splash window** — do not show the splash screen while loading the application (launch faster). **Show tooltips for codeplug fields (range for parameters)** — display a small box with range values when hovering a mouse cursor over a codeplug field. **Minimize the icon to the system tray (conserver space on the taskbar)** — minimize to an icon in the system tray (next to the system clock icon) — conserve space on the taskbar for other applications. **Remember USB ports location in the Radio Icon List** — boxes in the **Radio Icon List** can remember the USB port assignments. Therefore you can organize and keep the same array of connected radios and manage the programming almost intuitively. For example, you connect four radios to four separate USB ports for the first time. CPS Plus remembers the port assignment and next time you connect a single radio to the USB port 2, the radio appears in the box 2 in **Radio Icon List**. **Enable feedback tones (Note: this option will impact Internet Explorer as well))** — allows you to enable or disable feedback tones (clicking sound). These tones are played while you click on codeplug fields. When the flag is checked, feedback tones are enabled. You may uncheck this option to mute the feedback tones. **Enable Windows Visual Style** — allows CPS to adopt Windows Visual style. Windows XP and later operating systems support a feature called **Visual Styles** that enables the appearance of common controls to change based on the theme chosen by you. When the flag is checked, the CPS is configured to use Windows Visual Styles and if left unchecked, the CPS uses Windows Classic style.
Communica-tions	Use to toggle data compression and enable faster programming.
Directories	Use to define the default locations for codeplugs.  **IMPORTANT** Do not change the default directory for the backup codeplugs.
Default Selling Features	Use to define which selling features are selected by default in the **Tools → Enable Feature** dialog box.
Default Language Packs	Use to define which languages appear as default radio languages in the **Tool → Languages** option.

Table 4-9 CPS Plus — Description of the Options (cont'd.)

Menu Item	Description
Log	Use to define the default location and the format for log files.
Recovery	Use to define the recovery mode. If you accidentally disconnect and turn off the radio during programming (corrupted software, codeplug or a language pack), this function can recover radio. • **Recovery** **Auto** — after you connect the corrupted radio, CPS Plus detects the software version, and starts the recovery process automatically. If no suitable software or a codeplug is stored in the default location on the hard drive, CPS Plus switches to the manual recovery. **Manual** — after you connect the corrupted radio, CPS Plus detects the software version but lets you start the recovery process manually. • **Software Version Strategy** **Latest First** — CPS Plus uses the most recent, available on the hard drive (release repository and backup folder) radio software and codeplug. **Oldest First** — CPS Plus uses the earliest, available on the hard drive (release repository and backup folder) radio software and codeplug.

4.2.4 Release Packet Menu

A delivery method for release packets may vary (on a disk or online). Ask your local customer representative for details.

Table 4-10 CPS Plus — Release Packet Menu Items

Menu Item	Description
Import Release Packet	Use to import release packets to the local CPS Plus repository.
Import Software	Use to import release packets that contain specific radio software.
Release Packet Manager	Use to explore and manage (import, view, and remove content) software files stored in the CPS Plus repository.
Reset All Release Packets	Use to restore the packet repository to its default contents (packets shipped and installed with CPS Plus). CPS Plus deletes all the release packets imported manually after the installation and preserves only the default packets. You can also use this option to restore the default release packets if you accidentally removed them from the repository. The default location of the release packets is: **`c:\Program Files\MotorolaSolutions\Tetra CPS Plus\Bin\repository_link_folder\`**

4.2.4.1 Release Packet Manager

Table 4-11 CPS Plus — Description of the Packet Browser Window

Window Element	Description
Imported Packets	Lists the release packets stored in the CPS Plus repository. To add a new packet to the repository, click **Import New Packets** and select the file. To remove a packet from the repository, select the item from the list and click **Remove Packets**. CPS Plus restarts after each operation.
Content Manifest	Lists all the components of the selected release packet. You can only view the content but cannot add or remove the packet elements.
Import New Packets	Use to import a packet or packets to the CPS Plus repository.
Remove Packets	Use to remove a packet or packets from the CPS Plus repository.

4.2.5 View Menu

The **View** menu contains commands to toggle the CPS Plus panes.

Table 4-12 CPS Plus — View Menu

Menu Item	Description
Hide Tree View	Use to toggle the codeplug tree view pane.
Hide Bottom View	Use to toggle the bottom information pane.
Task Window	Use to verify programming operations history.

4.2.6 Window Menu

The **Window** menu contains commands that allow you to arrange codeplug windows that are currently opened on the desktop.

4.2.7 Help Menu

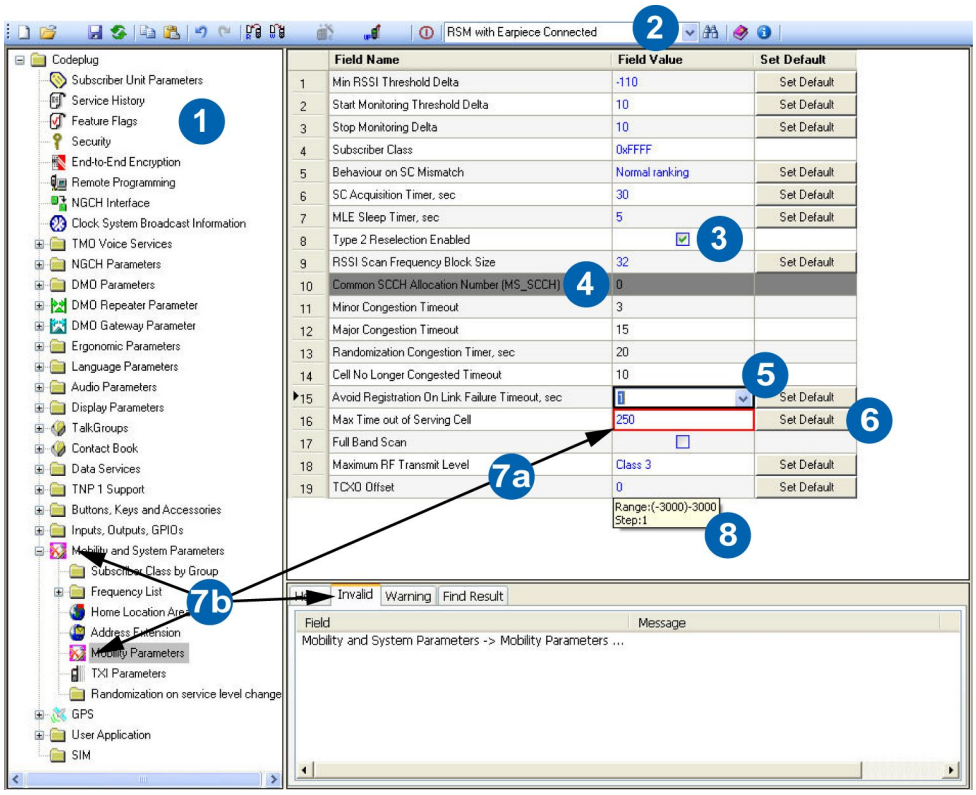
The **Help** menu contains commands that allow you access the online help browser and information about the CPS Plus version. You can also report CPS Plus related issues by using the **Reporting Issue** option.

NOTE

For information about supported radio models, click **Help → About**.

4.2.8 Codeplug Panes

Figure 4-3 CPS Plus — Codeplug Panes GUI Elements



NOTE

A number of codeplug nodes and fields varies according to a radio model.

Table 4-13 CPS Plus — Codeplug Panes GUI Elements

Annotation	GUI Item	Description
1	Codeplug tree	Represents a hierarchical data structure of all codeplug nodes (features).
2	Codeplug fields search bar	Allows you to search the active codeplug and find a codeplug field.
3	Check boxes	Select to enable codeplug features and options.
4	Selling Feature indicator	The grey bar indicates that it is a selling feature.
5	Drop-down list	Contains multiple values to choose from.
6	**Set Default** button	Allows to reset the field to its default value.

Table 4-13 CPS Plus — Codeplug Panes GUI Elements (cont'd.)

Annotation	GUI Item	Description
7a	Invalid parameter indicator	Indicates that the parameter value is incorrect.
7b		Indicates that some parameters in this node have incorrect values.
8	Range tooltip	Indicates a range for numerical parameters.

SEE ALSO

Enabling a Selling Feature on a Radio

Invalid Codeplug Parameters

4.2.9 Radio Icons List

Radio Icons List provides monitoring and operational functions to manage radios. It is a fly-out element so it can automatically appear and hide out from the working area (useful to save space). Icons and color codes help you to identify radios and a programming operations status. The context-menu, in other words the right-click menu, provides access to the most frequently used functions.

Figure 4-4 CPS Plus — Radios Icons List

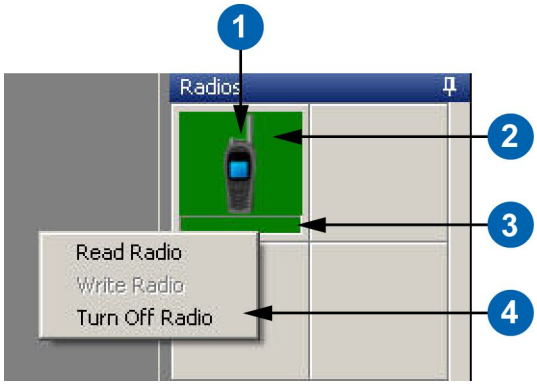


Table 4-14 CPS Plus — Radios Icons List

Annotation	GUI Item	Description
1		Assorted radio model icons.
		The radio needs a recovery.

Table 4-14 CPS Plus — Radios Icons List (cont'd.)

Annotation	GUI Item	Description
2		Radio is connected and ready for programming.
		Programming operation finished. Radio is ready for programming.
		Programming operation is pending.
		An operation error has occurred.
3	Progress bar	Conveys a progress of a programming operation.
4	Context-menu	Available when the radio is ready for programming.

SEE ALSO

Motorola TETRA Radios Supported by CPS Plus

4.2.10 Keyboard Shortcuts

Table 4-15 CPS Plus — Keyboard Shortcuts

Description	Keyboard Shortcut
Open Help	F1
Open Codeplug	CTRL + O
Save	CTRL + S
Read Radio	CTRL + R
Write Radio	CTRL + W
Copy	CTRL + C
Paste	CTRL + V
Undo	CTRL + Z
Redo	CTRL + Y
Find	CTRL + F
Options	CTRL + K
Switch focus to the next/previous opened codeplug	CTRL + TAB
Exit	ALT + F4

4.3 Getting Started

Whether you are a new user or have used earlier versions of the application, the following topics are designed to help you get up and running.

4.3.1 Connecting Radios to a PC

Prerequisites:

- You have the USB programming cable.
- If portable radios: The battery must not be discharged (CPS Plus detects the required battery level before triggering the flashing mode)
- If mobile radios: DC power source is attached— a car battery or a DC power supply.
- CPS Plus is running.

When and where to use:
Always before using a radio with CPS Plus. Some of the CPS Plus options are unavailable until you attach a radio and turn it on in flashing mode.

Procedure Steps

1 Connect the radio to the PC using the USB programming cable.

Figure 4-5 CPS Plus — Connecting Portable Radios

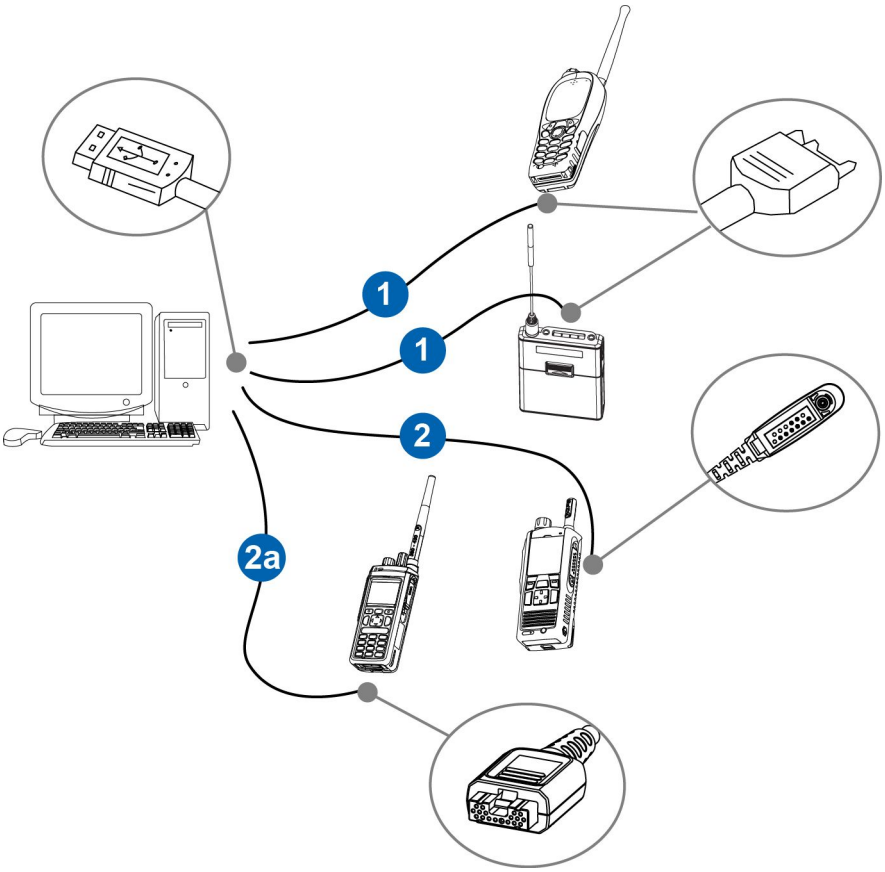
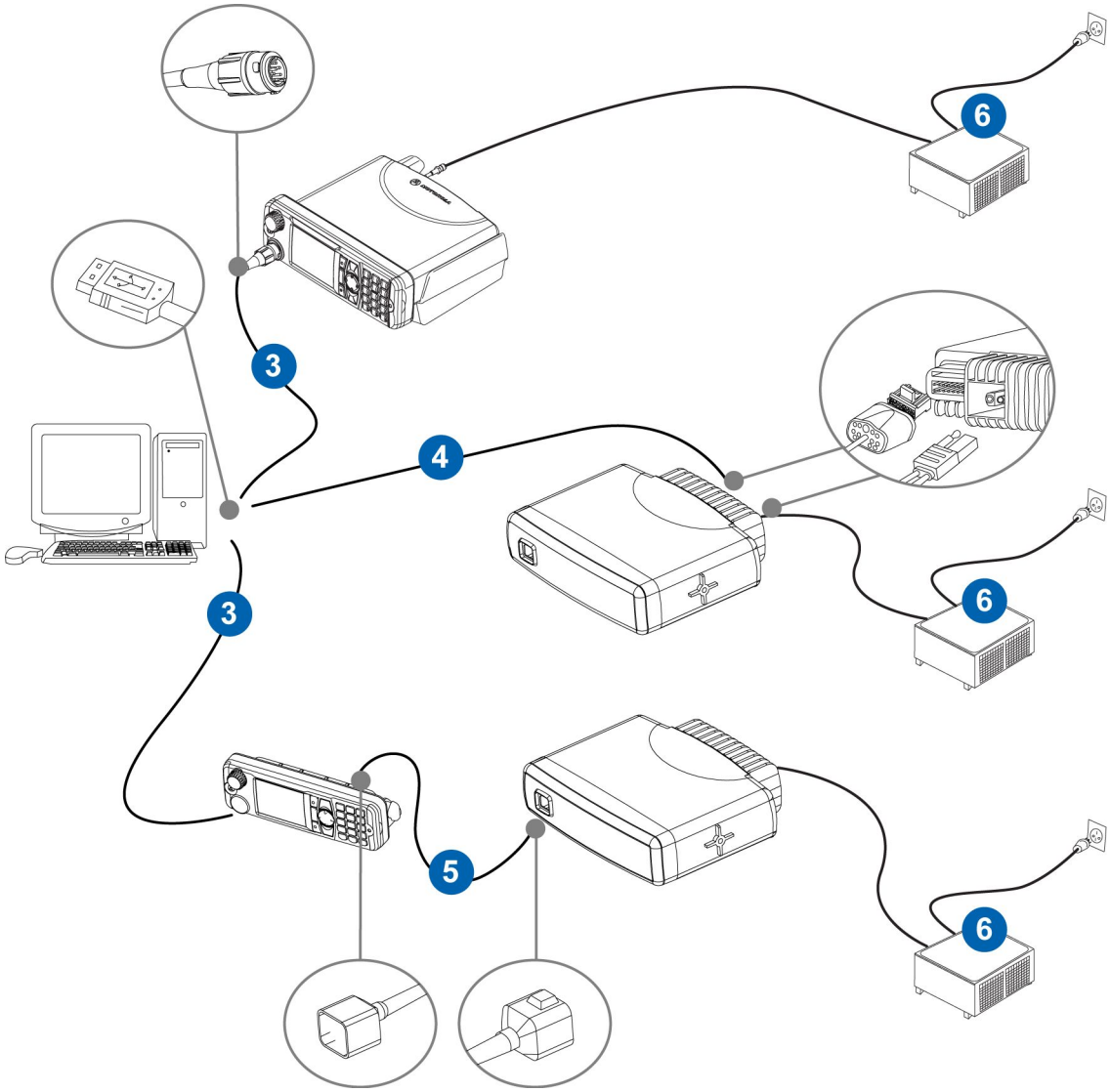


Figure 4-6 CPS Plus — Connecting Mobile Radios



NOTE

MR10.6.5 control heads and transceivers can only be programmed separately. For earlier mobile radio models it is possible to program the transceiver via the control head cable while the devices are paired.

Table 4-16 CPS Plus — Radio Cables

Annotation	Description	Part Number	Radio Model
1	Programming Cable	PMKN4026_	MTH800, MTP850 series, CEP400, MTP830, TCR1000
2	Programming Cable	PMLN5235A	MTP810 Ex, MTP850 Ex

Table 4-16 CPS Plus — Radio Cables (cont'd.)

Annotation	Description	Part Number	Radio Model
2a	Programming Cable	PMKN4129A	MTP3100, MTP3150, MTP3200, MTP3250
3	Programming Cable	HKN6184_	MTM800E, MTM5x00, MTM800 FuG, MTM800 FuG ET
4	Programming Cable	PMKN4110A	MTM800, MTM5x00 Transceiver, MTM800E Transceiver, MTM800 FuG, MTM800 FuG ET Transceiver
5	2.3 metre or 4 metre accessory expansion cable	PMKN4029_ or PMKN4056_	MTM800E, MTM5x00, MTM800 FuG, MTM800 FuG ET
6	Desktop power supply	GPN6145_	MTM800, MTM800E, MTM5x00, MTM800 FuG, MTM800 FuG ET

Step result: Mobile transceivers connected through the rear connector as well as fully charged portable radios with a charger attached automatically turn on in flashing mode. It takes approximately 15 seconds, after the USB notification tone, to auto-start in flashing mode.

2 Turn on the radio in flashing mode.

Step result: The radio is ready for programming when the radio icon appears on the list.

Result:
You can begin programming operations.

4.3.2 Turning On Radios in Flashing Mode — Manually

Prerequisites:

- The radio is turned off.
- The radio is connected to the PC.
- For mobile radios, make sure that the desktop power supply (12 V DC power source) is connected.

When and where to use:
Always before using a radio with CPS Plus. Some of the CPS Plus options are unavailable until you attach a radio and turn it on in flashing mode. Entering in to flashing mode varies for different radios.

A radio in flashing mode will revert to charging mode after a time-out period of 5 minutes. Follow the procedure below to set the radio back into flashing mode.

Procedure Steps

1 **Portable radios with a full, numeric keypad and mobile radios with the controlhead:** press and hold for about three seconds the **1+9+POWER** keys.

2 **Portable radios with a limited keypad:** press and hold for about three seconds the **FUN1+FUN2+POWER** keys.

3 The application can detect **mobile transceivers**, connected through the rear connector, and automatically turn on in flashing mode.

Result:
The USB alert sound is heard. The radio is ready for programming when the radio icon appears in CPS Plus.

Postrequisites:
To turn off the radio from the flashing mode, right-click the radios icon and select **Turn Off Radio**.

4.3.3 Turning On Radios in Flashing Mode — Automatically

Prerequisites:

- The radio is connected to the PC.
- A radio battery charged to more than 15% capacity.
- The radio is in a charging dock or a charger is attached.
- For mobile radios, make sure that the desktop power supply (12 V DC power source) is connected.
- A portable radio can be turned on or off.

When and where to use:
Before programming, each radio must be turned on in flashing mode. If you insert a fully charged portable radio in to a charging dock, that is connected to the PC through a programming cable, CPS Plus automatically detects the radio and turns it on in flashing mode. You do not have to manually turn on the radio in flashing mode, which is useful if you connect and program multiple radios. The mechanism also works with a single radio connected to CPS Plus through a programming cable with a charger attached.

Procedure Steps

1 The application can detect a connected **portable radio** and automatically turn it on in flashing mode.

It takes approximately 15 seconds after the USB notification tone to auto-start in flashing mode.

Step result: The USB alert sound is heard. The radio display turns red and blinks. The radio is ready for programming when the radio icon appears in CPS Plus.

2 The application can detect a **mobile transceiver** , connected through the rear connector, and automatically turn it on in flashing mode.

It takes approximately 15 seconds after the USB notification tone to auto-start in flashing mode.

Step result: The USB alert sound is heard. The radio display blinks. The radio is ready for programming when the radio icon appears in CPS Plus.

SEE ALSO

Turning On Radios in Flashing Mode — Manually

Connecting Radios to a PC

Radio Icons List

4.3.4 Opening a Codeplug

Prerequisites:
You have a codeplug on a disk or connected a radio to PC and turned on in flashing mode.

When and where to use:
Always before viewing or modifying a codeplug in CPS Plus.

Procedure Steps

1 **To open a codeplug from a disk**, click **File → Open Codeplug**.

Step result: The **Open** dialog box appears.

2 Choose a location, select the file, and click **Open**.

3 **To read a codeplug from a radio**, in the **Radio Icons List**, right-click the radio icon.

Step result: The context menu appears.

4 Click **Read**.

Step result: Once the reading operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

5 **To read codeplugs from multiple radios**, click **File → Read Radio**.

Step result: The **Read Radio** dialog box appears.

6 Select the radio or radios and click **Start Operation**.

Step result: Once the reading operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4.3.5 Reading Codeplugs from Radios

Prerequisites:
Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.

When and where to use:
You want to view a current configuration of a connected radio or radios.

Procedure Steps

1 To read a codeplug from a single radio, right-click the radios icon and select **Read**.

Step result: Once the reading operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green. A codeplug displays.

2 To read codeplugs from multiple radios, click **File → Read Codeplug**

Step result: The **Read Radio** dialog box appears.

3 Select the radios.

4 Click **Start Operation**.

Step result: Once the reading operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green. Codeplugs for each selected radio display.

4.3.6 Writing a Codeplug to a Single Radio

Prerequisites:
Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.

When and where to use:
You want to write a codeplug to a single radio.

IMPORTANT

Hardware calibration values are tuned individually, that means that each radio has its unique codeplug.

SUGGESTION

To apply changes to multiple, compatible radios, use a profile or the **Copy Wizard** option with a master codeplug.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 Modify the codeplug accordingly.

3 Save the codeplug.

4 To write the codeplug to the radio, click **File → Write Radio**.

5 Select the radio and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4.3.7 Writing a Master Codeplug to Multiple Radios

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- The codeplug must be compatible with the targeted radio or radios.
- All the programmed radios are of the exact same model.

When and where to use:
You want to apply common settings to multiple, identical radios. Instead of writing individual codeplugs to each radio, you can prepare a single, **master codeplug** or a **profile**. Either one allows you to replicate common settings (user data) to another radio or radios.

IMPORTANT

Using **Copy Wizard** or a **profile** you overwrite user data (adjustable parameters) on the selected radio. Hardware calibration values (so important for each individual device) remain unchanged.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 Modify the codeplug accordingly.

Step result: The modified codeplug becomes a master codeplug for multiple radios.

3 Save the master codeplug.

4 Click **File → Copy Wizard**.

Step result: The **Copy Wizard — Select Groups** dialog box appears.

5 Click **Select All**.

6 Click **Next**.

Step result: The **Copy Wizard** dialog box appears.

7 Select the radio or radios and click **Start Operation**..

- **Auto ISSI Assignment** — to make CPS Plus automatically assign consecutive ISSI numbers (each radio must have a unique ISSI), select the check box and enter the starting number. Otherwise, after applying the master codeplug to the radios, manually assign ISSI to each device.
- **Enable Selling Feature** — to activate the selected selling features on each radio, plug in the selling feature dongle and select the check box.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

8 To manually change ISSI, read the codeplug from the radio. Go to **Codeplug → Subscriber Unit Parameters → Radio ISSI** and enter the value. Write the codeplug to the radio.

Must match enabled ISSI on the network.

4.3.8 Adding a First, New Radio to the System

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- This task requires a thorough knowledge about the system and network.

It is a long task. Read all the steps before configuring the radio.

When and where to use:
You want to configure a radio to at least make and receive calls on the network.

Procedure Steps

1 Read a codeplug from the new radio.

2 Assign ISSI. Go to **Codeplug → Subscriber Unit Parameters → Radio ISSI** and enter the value.

IMPORTANT

Must match enabled ISSI on the network.

3 If configured, users can preview the radio ISSI from the menu or as a home screen information, or a welcome screen. Copy the ISSI number and paste to the following fields accordingly:

a. **Codeplug → Subscriber Unit Parameters → This Radio Private Number** — ISSI displays on a radio when the user navigates to **Menu → My Info → My Private Num**.

b. **Codeplug → Display Parameters → Home Mode Display → Home Mode Display Text** — ISSI displays on a radio in the idle mode.

c. **Codeplug → Display Parameters → Home Mode Display → Welcome Screen** — ISSI displays as a radio welcome screen; only if a screen saver is disabled.

4 Assign GSSI to talkgroups.

All Motorola radios support a folder structure for talkgroups. There can be a single level or dual level folder structure. Before you add GSSI to talkgroups, create the folders and the talkgroups.

a. To create a folder, go to **Codeplug → Talkgroups → TMO → TMO Folders List** and name each folder.

b. To make the folder visible and allow users to enter talkgroups, select the **Status** check box.

SUGGESTION

To fill out multiple fields with the same value or to select multiple check boxes in the same column, highlight the fields, right-click, and select **Fill Down**.

c. To define the capacity of the folder, enter the value for the **Number of Talkgroups in the Range**.

NOTE

The total number of talkgroups for all folders determines the number of rows in the **Talkgroups in Folder** node.

d. To organize folders into a structure with subfolders nested underneath the parent folders, from the **Parent Folder**, select the primary one.

e. To prevent users from transmitting voice, select the **Receive Only** check box.

f. To create a talkgroup, go to **Codeplug → Talkgroups → TMO → TMO Talkgroup Lists**, name each talkgroup and enter the GSSI in to the **ID** field.

g. To set visibility properties for talkgroups, go to **Codeplug → Talkgroups → TMO → Talkgroups in Folder**, click a field under the **Name** column and select the talkgroup.

The following statuses are available:

- **Programmed** — users can see and select this talkgroup. Leave as the default status.
- **Not Programmed** — users cannot see nor select this talkgroup. It is also unreachable by Call Out messages.
- **Invisible** — users cannot see nor select this talkgroup but it is reachable by Call Out messages.

SUGGESTION

To quickly select a talkgroup, enter the first character of the name before scrolling down the talkgroup list.

h. Go back to **Codeplug → Talkgroups → TMO → TMO Talkgroup List** and if needed, from the **Default Folder**, select the primary folder for each talkgroup.

i. If Announcement Talkgroups (ATG) are enabled on the network then each talkgroup can have one ATG assigned to it. To make the talkgroup ATG, select the **Announce Group** check box. You can allow users to start announcement calls. To assign to ATG, from the **Associated Announce Group** drop-down list, select the value.

j. Select a group priority if the network supports this feature.

5 Verify Group Cipher Key (GCK). Go to **Codeplug → Talkgroups → TMO Talkgroup Lists → GCK Number**.

GCK allows the radio to operate on networks that have this level of security.

a. To import the keys, click **File → Import → KARs and KAGs**.

b. Select the appropriate files and click **Import**.

c. For many talkgroups, more than one KAR or KAG file may be required. Make sure that you import all files.

Step result: Once the keys are imported, the **GCK Number** column displays the values. If no KAGs have been imported, it shows the default number **65536**.

---

6 Adjust the security settings. Go to **Codeplug → Security**.

IMPORTANT

Consult your network provider to ensure the correct setup.

---

7 Set the start scan frequency and a number of frequencies to scan. Go to **Codeplug → Mobility and System Parameters → Frequency List → Frequency List 1–4** and enter the values.

- **Frequency List 1** — the radio populates this list once it has registered on a network and so the CPS Plus cannot load frequencies.
- **Frequency List 2** — a list of permanent frequencies used on a network that can be used to enable faster initial registration.
- **Frequency List 3** and **Frequency List 4** — use to force the radio to scan two sub bands. It can speed up the first registration of a radio on a network.
  - **First Frequency to Scan** must match the lowest frequency used on the network.

NOTE

It is not always a round number, such as **`490.00000 MHz`**. For example a network that uses 12.5 kHz offsets may start at **`490.0125 MHz`**.

  - **Number of Frequencies** is normally set to **`400`**.

---

8 Set Country Code and Network Code of the system to register on. Go to **Codeplug → Mobility and System Parameters → Address Extension → Country Code | Network Code** and enter the values.

---

9 Save the changes.

---

10 Write the codeplug to the radio.

SUGGESTION

Each radio must have unique ISSI. If you write the codeplug to multiple radios, you can use the **Copy Wizard** option and assign consecutive numbers of ISSI to each device.

Postrequisites:
Test the radio on the network.

4.3.9 Adding Another, New Radio to the System

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- You have a master codeplug that you use for existing radios or you have a properly configured radio to read the codeplug from.
- The codeplug must be compatible with the targeted radio or radios.

When and where to use:
You want to add another radio or radios to an existing fleet. You want the new radio to have the same configuration as the existing devices (master codeplug).

IMPORTANT

Using **Copy Wizard** or a **profile** you overwrite user data (adjustable parameters) on the selected radio. Hardware calibration values (so important for each individual device) remain unchanged.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

The new and the existing radios must be of the exact same model.

2 Click **File → Copy Wizard**.

Step result: The **Copy Wizard Select Groups** dialog box appears.

3 Click **Select All**.

4 Click **Next**.

Step result: The **Copy Wizard** dialog box appears.

5 Select the radio or radios and click **Start Operation**.

- **Auto ISSI Assignment** — to make CPS Plus automatically assign consecutive ISSI numbers (each radio must have a unique ISSI), select the check box and enter the starting number. Otherwise, after applying the codeplug to the radios, you must assign ISSI to each device.
- **Enable Selling Feature** — to activate the selected selling features on each radio, plug in the selling feature dongle and select the check box.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

6 To manually change ISSI, read the codeplug from the radio. Go to **Codeplug → Subscriber Unit Parameters → Radio ISSI** and enter the value. Write the codeplug to the radio.

Must match enabled ISSI on the network.

4.3.10 Enabling a Standard Feature on a Radio

Prerequisites:
Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.

When and where to use:
You want to enable a feature on a radio or radios.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 Go to **Codeplug → Feature Flags** and select the check box for the appropriate feature.

3 To write the codeplug to a radio, click **File → Write Radio** or use the right-click menu from the **Radio Icons List**.

To apply changes to multiple, compatible radios, use a profile or the **Copy Wizard** option with a master codeplug.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4.3.11 Enabling a Selling Feature on a Radio

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- Plug in the dongle with Selling Feature licenses to the PC.
- Close all codeplugs.

When and where to use:
You want to update radios configuration and add a selling feature, for example the WAP feature. Licences for the paid features are stored on the Selling Feature dongle (USB stick).

Procedure Steps

1 Click **Tools → Enable Selling Feature**.

Step result: The **Enable Selling Feature** dialog box appears with all the connected radios listed.

2 From the **Feature** list, select the items.

3 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4 To verify that the proper features are enabled on the radio, read the codeplug from the radio and go to .

5 Go to **Codeplug → Feature Flags** and select the check box for the appropriate feature.

6 To write the codeplug to a radio, click **File → Write Radio**.

Result:
You have added and enabled the selling feature to the radio.

4.3.12 Modifying a Codeplug Using an XML File

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- You have MS Excel 2003® or higher or other XML editor.

When and where to use:
You want to modify radio configurations using an external XML file. It is especially useful when you want to change and apply the same configuration to multiple radios of the same type by creating a template (a master codeplug). For example, in a special event you want to configure a fleet of radios with the same operational talkgroups. An XML file can be prepared outside CPS Plus (use MS Excel 2003® or higher), then imported and applied to a master codeplug.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

Step result: The codeplug opens.

2 **To export an XML file from CPS Plus:** click **File → Export → User Data**

Step result: The **Feature List** dialog box appears.

3 Select user data and click **OK**.

Step result: The **Save As** window appears.

4 Choose a location, enter the file name and click **Save**.

Step result: After a confirmation message appears, you can switch from CPS Plus to an external XML editor to modify user data values.

5 **To modify the XML file:** launch the XML editor, open the XML file that you exported from CPS Plus, modify the values, and save the file as the XML format.

Step result: You have modified the XML file. You can switch to CPS Plus and import the **User Data** file.

6 In CPS Plus, verify that the codeplug you want to modify using the XML file is opened.

7 **To import the XML file to CPS Plus**, click **File → Import → User Data**.

Step result: The **Open** dialog box appears.

8 Choose a location, select the file, and click **Open**..

Step result: The importing operation begins. Wait until a confirmation message appears.

9 Save the codeplug.

Result:
You modified the codeplug using data from the XML file. You can use the modified codeplug as a master codeplug.

SUGGESTION

To apply changes to multiple, compatible radios, use a profile or the **Copy Wizard** option with a master codeplug.

4.3.13 Upgrading a Radio

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- You have the proper software release pack.
- If you are upgrading a mobile radio version along with languages, it is necessary for the transceiver to have the desired languages enabled its codeplug. See 4.4.9 Adding Languages to Radios, page 4-50.

When and where to use:
You want to load newer software to a radio.

Due to USB limitations, you can upgrade **up to 16 radios** at the same time.

Procedure Steps

1 Click one of the following:

- **Tools → Upgrade Radio**
    - To roll back a radio to it's previous version without loosing user data, use the **Restore Radio** function
    - To upgrade a radio between MR5.6 and MR5.9 or post-MR5.9 version use the **Up/Downgrade Radio Lite** function.
- **Tools → Up/Downgrade Radio Lite**
    - Upgrade Lite only allows to upgrade radios that are version pre-MR5.9 to a version that is MR 5.9 or newer.
    - Downgrade Lite only allows to downgrade a radio to MR5.9 or newer.

This will get rid of all user data and only keep the selling feature, factory and sensitivity data after up/downgrade. If you want to keep the user data during upgrade use the **Upgrade Radio** function instead.

2 From the **Up/Downgrade to** drop-down list, select the software version.

3 From the **Languages** drop-down list, select the language(s) that are to be used on the radio.

For mobile radios, select matching languages for both transceiver and control head.

4 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

Postrequisites:
To verify that the operation has been successful and to find logs from other operations, click **Window → Task Window**.

SEE ALSO

Turning On Radios in Flashing Mode — Automatically

Turning On Radios in Flashing Mode — Manually

Connecting Radios to a PC

Radio Icons List

4.3.14 Changing a Radio Screen Saver

Prerequisites:

- Applies only to radios with a color display.
- You have a **GIF** image (maximum **256 colors**) on a disk (an animated GIF file also supported).
- The graphic file size does not exceed **18 kB**.
- The maximum image dimensions are **130x130 pixels** for portable radios and **640x480 pixels**, **240x320** or **320x240** for mobile radios depending on your mobile radio model..

When and where to use:
You want to replace a default radio screen saver image with a custom picture, for example the department logo. The screen saver image is a decorative, background element for the radio display (it does not save the screen or a battery).

SUGGESTION

To apply changes to multiple, compatible radios, use a profile or the **Copy Wizard** option with a master codeplug.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 To import the image to CPS Plus, click **File → Import → Screen Saver**.

Step result: The **Import Screen Saver** dialog box appears.

3 Click **Load**.

Step result: The **Open** dialog box appears.

4 Choose a location, select the file, and click **Open**.

Step result: The **Import Screen Saver** dialog box appears. You can preview the selected image.

5 Click **Import**.

Step result: The `Operation completed successfully` message appears.

6 To adjust the screen saver parameters, go to **Codeplug → Display Parameters → Screen Saver** and modify accordingly.

7 To verify that the screen saver option is available from the radio menu, go to **Codeplug → Display Parameters → Menu Configuration → Setup → Display → Screen Saver**..

Postrequisites:
Write the codeplug to the radio.

SUGGESTION

You can assign **One-Touch Button** to this function.

4.4 Using CPS Plus

The following topics are designed to help you perform specific tasks using the CPS Plus application.

4.4.1 Using the USB Driver Tool

Prerequisites:

- CPS is installed on the computer.
- You know your CPS version.
- You understand the concept of switching between the new and old USB drivers.

When and where to use:
After installing the CPS Plus application, you can still retain previous versions of CPS. Legacy CPS may be needed if you support radios running on legacy software platforms, not supported by the new CPS Plus (lower than MR5.9). The USB Driver Tool ensures that you always install the proper USB drivers for relevant CPS. If you want to use the legacy CPS (versions older than R6x.575.01) with old radios (MR5.9 and older), use **Install Old Driver**. Each time when you install the drivers, you overwrite the existing USB drivers (newer or older). Therefore, to program radios using CPS Plus after using the legacy, old CPS and radios, use **Install New Driver**. CPS Plus always works with the new USB drivers.

Procedure Steps

1 Click **Start → Programs → Motorola → USB Driver Tool**

Step result: The **CPS Driver Tool** window appears.

2 Click either button to install the relevant driver.

NOTE

If the **Software Installation** window appears, click **Continue Anyway**.

Step result: The installation begins. Wait until the following message appears: `Installation finished! Press any key to continue....`

4.4.1.1 Radio Software Release Versions Matrix

CPS Plus supports radio software from MR5.9 onwards. For older radio software, use the legacy CPS.

Table 4-17 CPS Plus — Samples of Radio Software Versions

Radio Model	MR5.9	MR5.10	MR5.11	MR5.12
MTP850, 800MHz	R10.xxx.6511	R10.xxx.6911	R10.xxx.7108	R10.xxx.7412
MTM800E Control Head/ Transceiver	R14.xxx.6511 / R17.xxx.6511	R14.xxx.6911 / R17.xxx.6911	R14.xxx.7108 / R17.xxx.7108	R14.xxx.7412 / R17.xxx.7412

4.4.2 Importing Release Packets to CPS Plus

Prerequisites:
You have the release packet on the disk.

When and where to use:
You have received new release packets and you want to use CPS Plus to upgrade radios. Also, when you had your CPS Plus repository folder removed from the disk (for example after a disk failure).

Procedure Steps

1 Click **Packet → Import Packet**.

Step result: The **Open** window appears.

2 Select the release packet file and click **Open**.

SUGGESTION

To select multiple files, press and hold the CTRL key. To select a block of files, press and hold the SHIFT key.

Step result: Importing begins. It takes approximately 20 seconds to import a single packet.

3 After the operation is complete, click **OK**.

Step result: CPS Plus restarts.

Result:
CPS Plus stores the packet in the default repository folder. The content of the packet (software files, codeplugs, and audio profiles) is ready to use with your radios.

4.4.3 Converting Codeplug/Profile Radio Model

Prerequisites:

- Make sure that the release packet supporting the target radio model is imported into the CPS.
- The source codeplug or profile is opened in the CPS.

When and where to use:
Use to convert a codeplug or profile for use with other radios.

Procedure Steps

1 Click **File → Convert Model**.

Step result: The **Convert Model** window appears.

2 Select the target radio models for which you want to convert the codeplug or profile to.

3 In the **Target Version** column, select the target version the codeplug or profile will be converted to.

4 Press **Convert** and allow the operation to finish.

Step result: The new converted codeplug or profile window appear.

Postrequisites:
After converting the codeplug or profile for a radio it is necessary to save the results for each new window.

4.4.4 Copying Configuration Between Radios and Codeplugs

Prerequisites:

- The codeplug parameters must be valid.
- The codeplug must be compatible with the targeted codeplug or codeplugs.
- The codeplug must be compatible with the targeted radio or radios.

When and where to use:
You want to copy parameter values from one codeplug to other codeplug or codeplugs, or directly to other radio or radios. CPS Plus provides multiple ways to replicate configuration between codeplugs or radios.

1. You can copy configuration (whole nodes) between two codeplugs, for example all values for the **Security** node from a codeplug A to a codeplug B.
2. You can copy configuration (entire or only selected user data) from a master codeplug to other codeplugs or radios using the **Copy Codeplug Wizard** and **Copy Wizard** options.
3. You can create a profile with a subset of specified codeplug parameters. You can store the profiles on the disk and apply to codeplugs or radios anytime (the **Copy Wizard** is a real-time option) or even share with other CPS Plus users.

NOTE

If you copy **Subscriber User Parameters** to multiple radios, verify that each radio has a unique **ISSI**.

IMPORTANT

Using **Copy Wizard** or a **profile** you overwrite user data (adjustable parameters) on the selected radio. Hardware calibration values (so important for each individual device) remain unchanged.

Procedure Steps

1 To copy parameters between a **codeplug A** and a **codeplug B** follow the substeps:

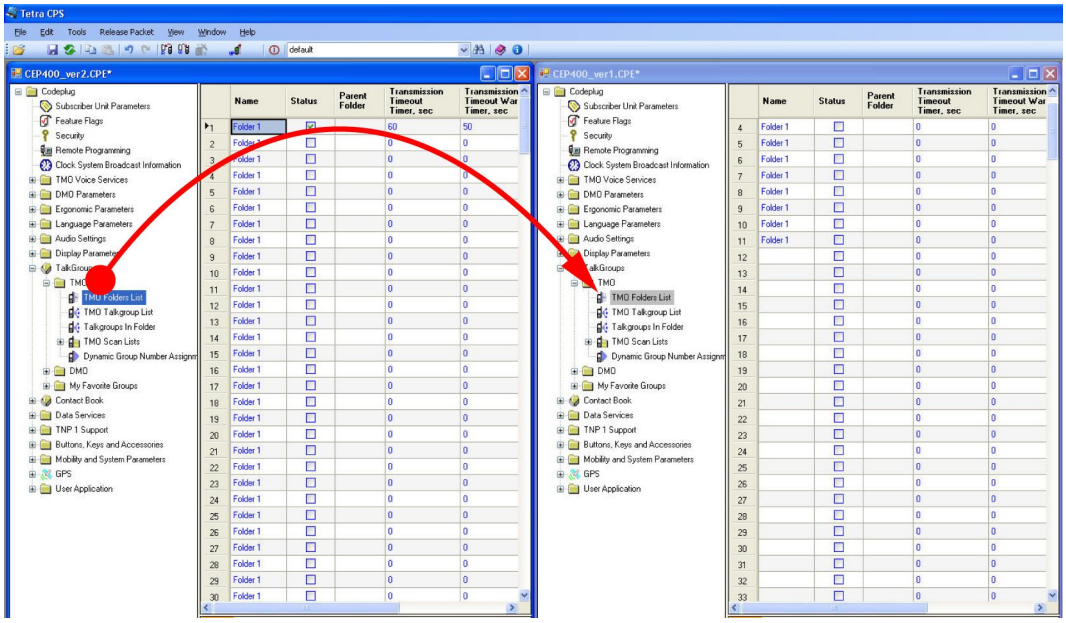
a. Open the two codeplugs or read the codeplugs from radios.

b. To fit the two codeplugs on the screen, click **Window → Tile Vertical**.

c. Click the relevant node in the **codeplug A** to select it.

d. Drag the node from the **codeplug A** to the corresponding node in the **codeplug B**.

Figure 4-7 CPS Plus — Drag-and-Drop Operation Between Codeplugs



Step result: You have copied parameter values from the selected node in the **codeplug A** to the same node in the **codeplug B**.

e. Save changes in the **codeplug B**.

2 To copy parameters from a master codeplug to other codeplugs using the **Copy Codeplug Wizard**, follow the substeps:

a. Open the master codeplug from a disk or read it from the radio.

b. Click **File → Copy Codeplug Wizard**.

Step result: The **Copy Codeplug Wizard — Select Groups** dialog box appears.

c. Select a group or groups with user data parameters and click **Next**.

Dependent, lower level user data gets automatically selected.

Step result: The **Select the Target Codeplug Files** dialog box appears.

d. Select a codeplug or codeplugs and click **Open**.

Step result: The **Target Codeplugs** dialog box appears. The compatible codeplugs are selected.

e. Click **Copy**.

Step result: The operation begins. Wait until it is completed. CPS Plus copies the parameters and saves changes to the updated codeplugs.

f. To change ISSI, open the codeplug, go to **Codeplug → Subscriber Unit Parameters → Radio ISSI** and enter the value.

---

3 To copy parameters from a master codeplug to radios using the **Copy Wizard**, follow the substeps:

a. Open the master codeplug from a disk or read it from the radio.

b. Click **File → Copy Wizard**

Step result: The **Copy Wizard — Select Groups** dialog box appears.

c. Select a group or groups with user data parameters and click **Next**.

Dependent, lower level user data gets automatically selected.

Step result: The **Copy Wizard** dialog box appears.

d. Select the radio or radios and click **Start Operation**.

- **Auto ISSI Assignment** — to make CPS Plus automatically assign consecutive ISSI numbers (each radio must have a unique ISSI), select the check box and enter the starting number. Otherwise, after applying the master codeplug to the radios, you must manually assign ISSI to each device.
- **Enable Selling Feature** — to activate the selected selling features on each radio, plug in the selling feature dongle and select the check box.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4.4.5 Comparing Codeplugs

When and where to use:
You want to examine differences in configuration between two codeplugs and copy the values between the codeplugs.

Procedure Steps

1 Open the two codeplugs.

2 Click **File → Compare Codeplug**.

Step result: The **Select Document** window appears.

3 Select the check boxes and click **OK**.

NOTE

If the **OK** button is inactive it means that the codeplugs are not compatible. Verify the version and the model and open the correct file.

NOTE

Select the **Bypass the User Defined Language comparison** checkbox to bypass the comparison of the User Defined Language Nodes of the two codeplugs.

Step result: The **Compare Codeplug** window with listed differences appears.

4 To filter the codeplug tree and display only the different nodes, click **Diff Features**.

Step result: The codeplug tree shows only the different nodes but all the fields within these nodes.

5 To filter the codeplug tree and display only the different nodes and the particular different fields within these nodes, click **Diff Fields**.

Step result: The codeplug tree shows only the differing nodes and the differing fields within these nodes.

NOTE

Click **Report** to save the comparison results to a `*.txt` file.

6 (Optional) To copy a value from one codeplug to another, highlight the appropriate codeplug path in the **Compare Codeplug** window.

7 (Optional) From the **Compare Codeplug** window toolbar press **<-** or **->** depending on which value you want to copy.

Step result: The changed codeplug value becomes highlighted.

8 Close the window and chose the codeplug(s) to save. Press **Save**.

SEE ALSO

Supported File Formats

4.4.6 Verifying Codeplug/Profile for Copy

Prerequisites:

- The codeplug or profile is opened in the CPS.

When and where to use:
Use to verify if there are any invalid fields in the codeplug or profile before copying them to the radio.

Procedure Steps

1 Select the desired codeplug or profile you would like to verify.

2 Click **File → Verify Codeplug/Profile for Copy**

Step result:

- If passed a message box saying `There is no potential error.` is displayed
- If failed the **Potential Invalid Field** window is displayed. Double-click on each filed displayed in the window and correct the values.

4.4.7 Upgrading a Codeplug

When and where to use:
You have received a new release packet. You can use the new codeplugs (modify if needed) or upgrade your older, already configured codeplugs, and add the latest radio features and parameters. After this operation, the user data values in your old codeplug remain unchanged and only the newly added parameters are set to defaults.

Procedure Steps

1 Click **File → Open with Up/Downgrade**.

2 Select the file and click **Open**.

SUGGESTION

You can select multiple files.

Step result: The **Up/Downgrade Codeplug** window appears.

3 From the **Target Version** drop-down list, select the software version.

4 Click **Start Operation**.

Step result: After the upgrade is complete, the individual codeplugs open.

5 Save the upgraded codeplug.

Postrequisites:
If needed, configure the new parameters.

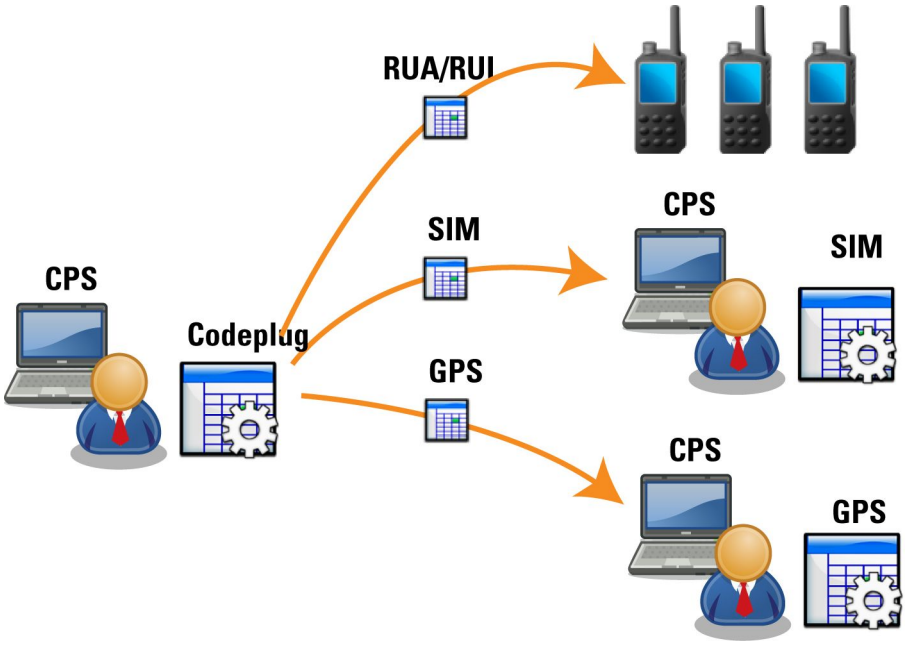
SEE ALSO

Supported File Formats

4.4.8 Modifying Configuration Using Profiles

Profile is a subset of specified parameters. Unlike codeplugs, profiles contain only selected nodes and fields. Profiles are smaller than codeplugs; therefore programming time for a single profile is much shorter than for an entire codeplug.

Figure 4-8 CPS Plus — Using Profiles



Examples for Using Profiles

1. You have a codeplug with default values. You want to have it configured according to operational requirements. You want to delegate the configuration to engineers with specific knowledge domains for example GPS experts, audio experts, and so on. You create separate profiles with specific nodes and send them to the engineers.
2. You received an announcement about an upcoming event and as a result the radios must be reconfigured for a weekend. It turned out that only Audio Settings must be temporarily tuned up. You generate two profiles with Audio Settings. The first profile contains current settings. The second profile is modified according to the new requirements for the weekend event. You program your radios for the event. After the weekend, you revert the changes using the profile with the original audio values.
3. You want to make a minor change to the codeplug and replicate the changed configuration among multiple radios. Creating a profile and writing it to multiple radios is efficient especially when your change involves a single or a few related fields, for example enabling/disabling features.

SEE ALSO

Creating a Profile

Applying Profiles to Codeplugs

Applying Profiles to Radios

4.4.8.1 Creating a Profile

When and where to use:
You want to create a configuration file with a subset of specified parameters from a codeplug. You can use profiles with codeplugs or radios. Profiles are smaller than codeplugs; therefore programming time for a single profile is much shorter than for an entire codeplug.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 To create a profile, click **File → Generate Profile**.

Step result: The **Generate Profile — Select Groups** dialog box appears.

3 Select a group or groups with user data parameters and click **Next**.

NOTE

Dependent, lower level user data gets automatically selected.

Step result: The **Save As** window appears.

4 Save the profile.

Postrequisites:
To modify the profile, click **File → Open Profile** and adjust the parameters accordingly.

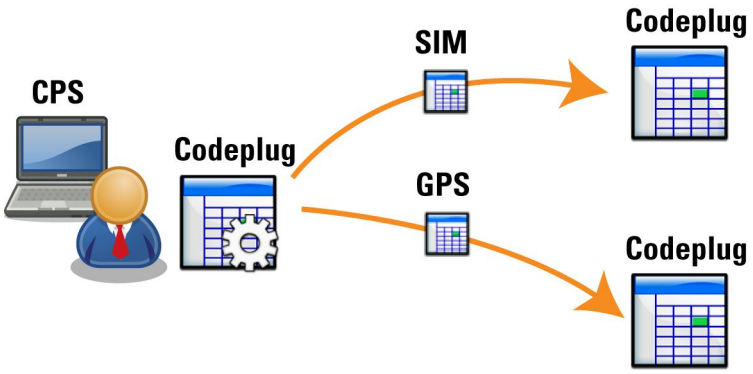
4.4.8.2 Applying Profiles to Codeplugs

Prerequisites:

- The codeplug is opened and active.
- The profile and the codeplug are for the same radio model type.
- The profile version is not higher than the codeplug version.

When and where to use:
To replicate configuration from a profile to a codeplug.

Figure 4-9 CPS Plus — Applying Profiles to Codeplugs



Procedure Steps

1 Click **File → Apply Profile**.

Step result: The **Open** window appears.

2 Select the profile and click **Open**.

Result:
Configuration from the opened profile is applied to the codeplug.

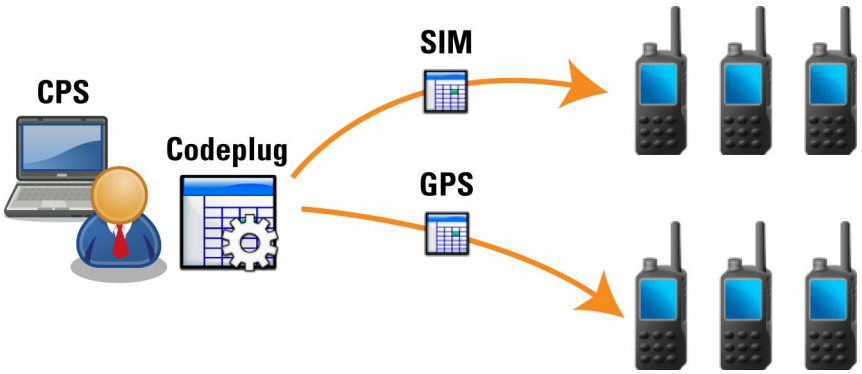
4.4.8.3 Applying Profiles to Radios

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- You have the profile file on the disk.
- The profile is appropriate for the radio model type.
- The profile version is not higher than the radio version.

When and where to use:
To replicate configuration from a profile to a radio.

Figure 4-10 CPS Plus — Applying Profiles to Radios



Procedure Steps

1 Click **File → Apply Profile to Radio**.

Step result: The **Open** window appears.

2 Open the profile.

Step result: The **Apply Profile to Radio** dialog box appears.

3 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4.4.9 Adding Languages to Radios

Prerequisites:

- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.
- The radio software supports the chosen language.
- The radio software ships with default language, it is highly recommended to add local language to the first codeplug.

When and where to use:
You want to localize the radio settings. In other words, after programming multiple language packs to the radio, the radio user can choose a preferred language from the radio menu.

Procedure Steps

1 Click **Tools → Radio Languages Settings**.

Step result: The **Languages** dialog box appears.

2 From the drop-down list, select a language.

SUGGESTION

To define a default language pack (always selected languages), click **Tools → User Options → Default Language Packs** , then select the default language packs and click **OK**.

3 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

4 To activate a specific language on a radio, open or read the codeplug from the radio.

5 Go to the following codeplug node:**Codeplug → Language Parameters → Language Settings**.

6 Select a language.

7 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

Postrequisites:
Radio users can select a local language using the language menu on the radio.

4.4.10 Importing Audio Templates to CPS Plus

Prerequisites:

- Close all codeplugs.
- You have an audio template file (*.stf) or an audio template package (*.sfts).

When and where to use:
Default audio template files are included in release packets. In some cases, engineers can provide you with separate, customized templates. You can import them to the CPS Plus repository and use for radio audio profiles. You cannot create audio templates using CPS Plus.
You cannot create audio templates using CPS Plus.

Procedure Steps

1 Click **Tools → Import/Remove Audio Template Files**.

Step result: The **Import/Remove Audio Template Files** window appears.

2 To import a new audio file or an audio package, click **Import**.

3 To replace an existing audio template, select the file and click **Remove**. Import the new file afterwards.

4.4.11 Importing Audio Device Descriptors to CPS Plus

Prerequisites:

- Your accessory is not listed in the following codeplug table: **Codeplug → Buttons, Keys, and Accessories → Accessory List**
- You have an Audio Device Descriptors (*.add) file. These files are provided separately by Motorola.

When and where to use:
Some radio models (MTP3xxx, MTP8xxx) use Audio Device Descriptors for compatible IMPRES accessories (with an ADS chip). In such cases, a separate ADD file holds information about the hardware and a separate audio template provides audio settings for the accessory. You can import an ADD file and store the relevant data in the CPS repository. That means that you can have your own, custom audio values for the attached accessory, different than those stored by the ADS chip itself. You cannot create an ADD file using CPS Plus.

NOTE

If you are unable to find the **Accessory List** node, that means that your radio model does not support ADD files. All information about accessories hardware is in audio templates. You can skip this procedure.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 To import the ADD file, go to **Codeplug → Buttons, Keys, and Accessories → ADD Import/Remove**.

3 Click **Import**.

Step result: The **Open** dialog box appears.

4 Choose a location, select the file, and click **Open**.

Result:
The codeplug stores information about the accessories specified in the *.add file. After programming, the radio supports the listed accessories.

SEE ALSO

Removing Audio Device Descriptors From CPS Plus

Applying Audio Templates to Radios

Importing Audio Templates to CPS Plus

4.4.12 Removing Audio Device Descriptors From CPS Plus

Prerequisites:
Audio Device Descriptors are already stored by CPS and you can see a list of supported accessories in the following codeplug table:**Codeplug → Buttons, Keys, and Accessories → Accessory List**

When and where to use:
Some radio models (MTP3xxx, MTP8xxx) use Audio Device Descriptors for compatible IMPRES accessories (with an ADS chip). In such cases, a separate ADD file holds information about the hardware and a separate audio template provides audio settings for the accessory. You can import an ADD file and store the relevant data in the CPS repository. That means that you can have your own, custom audio values for the attached accessory, different than those stored by the ADS chip itself. You cannot create an ADD file using CPS Plus.

NOTE

If you are unable to find the **Accessory List** node, that means that your radio model does not support ADD files. All information about accessories hardware is in audio templates. You can skip this procedure.

Procedure Steps

1 Open a codeplug from a disk or read it from a radio.

2 To remove an accessory from the codeplug, go to **Codeplug → Buttons, Keys, and Accessories → ADD Import/Remove**.

3 Click **Remove**.

Step result: The **Remove Accessory** dialog box appears.

4 Select the accessory and click **OK**.

5 Choose a location, select the file, and click **Open**.

Step result: CPS stores on the disk and updates the codeplug with the information about the imported hardware.

Result:
The codeplug no longer stores information about the removed hardware. After programming, the radio no longer supports the removed accessory.

SEE ALSO

Importing Audio Device Descriptors to CPS Plus

Applying Audio Templates to Radios

Importing Audio Templates to CPS Plus

4.4.13 Restoring a Radio

Prerequisites:

- You have a relevant software release packet on a disk.

  NOTE

  After you import a release packet using the **Import Packet** option, CPS Plus stores all the software components in the following directory:**c:\Program Files\Motorola\Tetra CPS Plus\Bin\repository_link_folder**.

- You have copies of the relevant codeplugs in the backup folder.

  NOTE

  Each time after reading a radio, CPS Plus automatically backs up each codeplug and stores in the following directory: **c:\Program Files\Motorola\Tetra CPS Plus\BackupCodeplugs**.

When and where to use:
You want to downgrade a radio. In other words, you want to write a previous version of software to the radio. For example, you wrote a newer beta software to the radio for testing purposes and afterwards, decided to revert the radio to its previous configuration.

NOTE

After this operation, the user data values remain unchanged.

Procedure Steps

1 Click **Tools** → **Restore Radio**.

Step result: The **Restore Radio** window appears.

2 From the **Restore To** drop-down list, select the software version.

Step result: CPS Plus automatically selects the appropriate software for the radio.

3 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

If the radio software version, that you selected, does not match the codeplug version, that resides on the radio, an error message appears. Verify that the radio software used for restoring and the codeplug that resides on the restored radio have the same version.

4.4.14 Recovering a Radio

Prerequisites:

- The **Tools → User Options → Recovery → Recovery Mode** is set to **Manual**.
- You connected the radio to PC and turned it on in flashing mode.
- The radio icon displays a red warning sign and the context-menu in the **Radio Icons List** is not available for the radio.
- You are unable to read the radio.
- You have a relevant software release packet on a disk.

After you import a release packet using the **Import Packet** option, CPS Plus stores all the software components in the following directory:**`c:\Program Files\Motorola\Tetra CPS Plus\Bin\repository_link_folder\`**.

- You have copies of the relevant codeplugs in the backup folder.

Each time after reading a radio, CPS Plus automatically backs up each codeplug and stores in the following directory: **`c:\Program Files\Motorola\Tetra CPS Plus\BackupCodeplugs\`**.

When and where to use:
To manually recover the corrupted areas of the radio flash memory (occurred due to programming errors) and write the correct software components again.

CPS Plus can trigger the recovery automatically. Go to **Tools → User Options → Recovery → Recovery Mode** , set the **Auto** mode and let CPS Plus perform the recovery when needed. CPS Plus uses radio software from the release packet repository and copies of compatible codeplugs. If all software components (release packets, backup codeplugs) are proper and located on the disk, CPS Plus automatically selects the appropriate radio software and starts the process.

Procedure Steps

1 To verify that the radio is corrupted, click **File → Read Radio**.

Step result: The **Read Radio** dialog box appears. You are unable to select the radio and the description line displays: `The radio is corrupted. Please use Recover Radio to repair it and try again.`

2 Click **Tools → Recover Radio**.

Step result: The **Recover Radio** dialog box appears.

3 From the **Recover To** drop-down list, select the software version.

4 Select the radio or radios and click **Start Operation**.

Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

Result:
Once the radio is recovered, the radio icon turns green. You can read the radio.

4.4.15 Applying a Hotfix File

Prerequisites:

- You have the appropriate .hfx hotfix file.
- Connect a radio or radios to the PC, turn on in flashing mode, and wait until the radio icon appears on the list.

When and where to use:
You received a hotfix file that contains customized values of codeplug parameters. You want to fix radios configuration using the hotfix file.

Procedure Steps

1. Locate the hotfix file on the disk, using the Windows® Explorer.
2. Double-click the hotfix file.

   Step result: CPS Plus is brought to front and the **Select Radio** dialog box appear.
3. Select the radio or radios and click **Start Operation**.

   Step result: Once the programming operation begins, do not disconnect or turn off the radio. The radio icon turns orange and the progress bar displays the operation status. Wait until the operation is complete, the radio icon turns green.

Postrequisites:
Verify that the radio settings are correct.

4.5 Troubleshooting

The following topics are designed to help you identify and overcome possible problems or unexpected situations.

4.5.1 Unable to Launch CPS

1. Only one CPS instance (process) can run at the time.
2. CPS may already be running and its window minimized.

3. Terminate the CPS process manually and try launching CPS again. To shut down the process, press CTRL+ALT+DELETE keys, click **Task Manager**, select the **CPSPlus.exe** instance and click **End Process**.

4.5.2 Unable to Exit CPS Plus

Terminate the CPS process manually. To shut down the process, press CTRL+ALT+DELETE, click **Task Manager**, select the **CPSPlus.exe** instance and click **End Process**.

4.5.3 A Radio is not Functioning

1. Charge the battery.
2. Remove the battery, wait for 10 seconds and reinstall the battery.
3. Contact customer support.

4.5.4 Programming Mode Cannot Initiate

You connected the radio to the PC but failed to turn it on in flashing mode.

1. Charge the battery.
2. Verify that the radio functions properly. Turn the radio on and off. If you cannot turn it on, remove the battery, wait for 10 seconds and reinstall the battery.
3. Connect the radio to a different USB port.
4. Verify that the hardware is properly installed in Windows. Go to **Device Manager → Universal Serial Bus controllers**. If the TETRA hardware is not on the list, scan for new USB devices and reinstall the USB drivers.
5. Verify that you use proper USB drivers dedicated to the software release.
6. Do not disconnect the radio and restart the PC. If new hardware is found, reinstall the USB drivers manually.
7. Contact customer support.

4.5.5 I Disconnected a Radio During Programming

1. Do not turn off the radio.
2. Do not exit CPS Plus.
3. Reconnect the radio to the PC.
4. Wait until CPS Plus discovers the radio (it appears in Radios Icons List).
5. Repeat the programming operation.

To verify the programming operations history, click **Window → Task Window**.

4.5.6 Programming Interrupted or Failed

Connect the radio to the PC as for programming. If needed, CPS Plus automatically recovers the radio using its previous configuration, (CPS Plus backs up the proper configuration on a disk).

To verify the programming operations history, click **Window → Task Window**.

The radio codeplug must have been read at least once by the CPS in order to take backup.

4.5.7 Invalid Codeplug Parameters

You are unable to save the codeplug or perform certain operations.

1. To find the invalid parameters, go to the **Information pane**, click the **Invalid** tab, and double-click the path.

Alternatively, you can use the **Compare Codeplug** to find the differences (including the invalid parameters) between two files.

2. Correct the values and try again.

4.5.8 Report Issue

Prerequisites:

- Active internet connection.
- Configured e-mail client.

When and where to use:
When an application or codeplug error occurs, you may send a report to inform Motorola Solutions about the issue.

Procedure Steps

1 Click **Help → Issue Report**

Step result: The **Report Issue** window appears.

2 Enter optional information such as **User Name** and **Issue Description**. Check-mark the boxes to select information that will be included in the report.

3 Check-mark **Open Mail Application to Review Report Before Sending** if you wish to add additional information or reports to the e-mail. Otherwise an issue report is sent after pressing **Send Report**.

4 Press **Send Report**.

- Optionally you can press **Create Report Archive**. A pop-up window appears that allows you to save the issue report to a ZIP file.

Step result: A new e-mail message window appears from your default e-mail client.

5 Add additional information about the issue and manually send the e-mail.

Step result: A message window saying **The report archive has been sent successfully** is displayed.

Appendix A: Glossary

Item	Description
10/100Base-T	A method of connecting Ethernet devices directly to an Ethernet switch/hub. Max transfer rate is 10 or 100 Mbps
A-ISSI	Assigned ISSI
A/V	Antivirus
AAA	Authentication, Authorization, and Accounting
ABO	Automatic Busy Override
ACC	Adjacent Control Channel
Accounting Management	Involves the reporting of the activities of radio users on the system. The system provides several accounting management facilities
ACCH	Associated Control Channel
ACELP	Algebraic Code Excited Linear Prediction
Acknowledged Data Transfer	A service provided by the layer below which gives an acknowledgement back over the air interface from the lower layer peer entity. This service is used by the layer 3 entities to get a secure transmission including retransmissions.
Acknowledgement	A message sent in response to another message to indicate status.
AD	Active Directory
ADM	See *Alias Database Manager*
Admin	See *CENTRACOM Elite Admin*
Advanced Lights Out Management (ALOM)	ALOM functions allow for monitoring, logging, alerting and for basic control of the system. ALOM is particularly useful for remotely managing a server in a typical "lights out" environment. It is the next generation strategic solution, replacing the functionality of Remote System Control (RSC) used on VSP servers and Lights Out Management (LOM & LOMlite) used on Sun Netra servers
Advanced Link	An Advanced Link (AL) is a bidirectional connection between one Mobile Station (MS) and a Base Station (BS) with provision of acknowledged and unacknowledged services including windowing, segmentation, extended error protection and choice among several throughputs. The data transfer via the advanced link requires a set-up phase
AEB	See *Ambassador Electronics Bank*
AEB slot	For E1, one of 960 possible slots on the Ambassador Electronics Bank (AEB) Time Division Multiplexing (TDM) backplane busses (32 busses x 30 AEB slots/bus). For T1, one of 768 possible slots (32 busses X 24 slots/bus)
AEB System Timer	Ambassador Electronics Bank System Timer Module. An AEB module that provides system clocking and data bus arbitration. Each Audio Switch uses two AEB System Timer Modules in a redundant configuration
AEI	See *Audio Expansion Interface*
Affiliated Zone	The zone to which a radio is currently registered
Affiliation	The process by which a Mobile Station identifies its location and talkgroup affiliation to the system as it moves through the coverage area

Item	Description
Affiliation Display	A Motorola software application that tracks mobility characteristics of radio users by monitoring current affiliations and deaffiliations on the system
Affiliation Group	The talkgroup to which a Mobile Station is currently attached
AGC	Automatic Gain Control
AI	Air Interface Additional Identity
AIE	See *Air Interface Encryption*
AIE KVL	See *Air Interface Encryption Key Variable Loader*
AIMI	See *Ambassador Interface Multiplex Interface*
Air Interface Encryption (AIE)	The Dimetra IP System supports Over the Air Standard Encryption of Mobile Stations and Base Stations using the standard TETRA algorithms TEA1, TEA2 and TEA3
Air Interface Encryption Key Variable Loader (AIE KVL)	This AIE KVL is used for transporting AIE keys (k and SCK) and for keys used in the infrastructure (ki) used for distribution of AIE keys. It connects to the AUC, MS, ZC, TSC and BRC and is used by the network operator
Air Traffic Information Access (ATIA)	An option that provides raw data on air traffic activity that can be used to drive a customer-supplied billing package
Air Traffic Router (ATR)	The Radio Applications Programming Interface (RAPI) is located on the ATR server that is colocated on the same LAN as the ZC. The ATR manages all non-call processing processes for the Zone Controller and relies on the ZC to provide aliases and security group information. The ZC and the ATR are connected with a TCP link
AIS	1. See *Alias Integrated Solution* 2. See *Archiving Interface Server*
AKD	Authentication Key Distribution
AL	See *Ambience Listening*
ALGID	Algorithm Identification
Alias	An alphanumeric name used to identify for example a mobile station, a talkgroup or a site. Aliases can be assigned to represent something more meaningful to a console operator than the six digit ID number
Alias Database Manager (ADM)	A software tool for managing the alias database, which is the database that stores all radio, console, talkgroup, and multigroup aliases used in the system (part of CENTRACOM Gold Server)
ALOM	See *Advanced Lights Out Management*
AllStart	A talkgroup setting which requires resources on all involved sites to be available before the call can begin
Alias Integrated Solution	The Alias Integrated Solution (AIS) provides the means for dynamically assigning a user alias to a radio upon user logon to the radio. The dynamically assigned user alias is made available to 3rd party via the MultiCADI API
Alphanumeric Text Service (ATS)	A Motorola application used to send short data messages from a PC operating under Windows to a display on a Mobile Station
AMB	See *Ambassador Board*

Item	Description
Ambassador Board (AMB)	A board that processes the audio coming from and going to its links. Each board supports two independent, full duplex E1 and T1 links. Used in the Ambassador Electronics Bank (AEB) to interface CEBs or MGEGs to the AEB
Ambassador Electronics Bank (AEB)	Also Embassy Switch. Dimetra master site equipment consisting of a Time Division Multiplexing (TDM) audio switch capable of simultaneously routing audio from multiple sources to one or more destinations. In a Dimetra system, each Zone Controller controls the audio routing for its associated AEB
Ambassador Interface Multiplex Interface (AIMI)	A Central Electronics Bank (CEB) module that provides the interface between the AEB and CEB, and provides CEB timing and data bus arbitration
Ambience listening (AL)	The ability to listen remotely to audio in the vicinity of a Mobile Station
AMS	Alert Management System
Announced Cell Reselection	Cell reselection where Mobile Station (MS) 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. There can be three types of announced cell reselection: - type 1: the MS-MLE knows the new cell and the traffic channel allocations on the cell before deciding to leave its serving cell; - type 2: the MS-MLE knows the new cell before changing to it, but does not know the channel allocation on the new cell in advance; - type 3: the MS-MLE need not to know the new cell before changing to it. The serving cell is only informed by the MS-MLE that it wants to change cell
Announcement Call	An announcement call is a point to multipoint group call that provides the capability to communicate with multiple talkgroups simultaneously
Announcement group	A special group which is used to address a number of normal groups which are associated to the announcement group
API	Application Programming Interface
APN	Access Point Name
Application Launcher	Application Launcher enables you to access one or more management applications without going through the process of logging on to each application separately
Archiving Interface Server (AIS)	The AIS provides flexible, high-quality archiving services for audio and data associated with various types of calls and various events associated with radio resources. Together with a logging recorder and a replay station, AIS makes up the logging system
ARP	Address Resolution Protocol
AS	Alias Server
ASC	Automatic Synchronization Configuration
ASIC	Application Specific Integrated Circuit
ASSI	Alias Short Subscriber Identity
ATCC	See *Auto Tune Cavity Combiner*
ATG	Announcement Talkgroup
ATIA	See *Air Traffic Information Access*
ATM	Asynchronous Transfer Mode

Item	Description
ATR	See *Air Traffic Router*
ATS	See *Alphanumeric Text Service*
AuC	See *Authentication Centre*
Audio Expansion Interface	An interface module that receives audio from the CEB backplane for console position speakers and recording devices
Audio Interrupt	Capability that allows users of a talkgroup to interrupt the audio of the current transmitting talkgroup member
Authentication	MS authentication in the radio system infrastructure: A function which allows the radio system infrastructure to validate that a mobile station is genuine before granting access to system services. Upon receiving an authentication request, the mobile station may also perform a mutual validation of the infrastructure to ensure it is safe to operate. The use of authentication establishes a level of trust between the radio system's infrastructure and subscriber mobile stations. User authentication in the network infrastructure (optional feature): The System Core Security Management Server functions as a user authentication server, controlling access through dial-in terminal servers by maintaining individual user accounts and passwords for each authorized remote user. The RSA ACE/Server product installed on the System CSMS is used for authentication. Access to the network is denied if users do not provide appropriate credentials
Authentication Centre (AuC)	A Motorola software application that allows system managers to manage encryption keys for Dimetra
Authentication Key (K)	A secret key used to validate a mobile station's ability to operate on the radio system. Each MS is assigned a unique authentication key at the factory or a secure facility. The authentication key is imported or typed into the Authentication Centre along with its associated reference (REF)
Authentication Material	A set of session keys used to perform explicit authentication. Each MS is assigned a set of unique authentication material based on its authentication key (K). The authentication material is generated and sent from the Authentication Centre (AuC) to thezone controllers of the system using the system Key Encryption Key (KEKm)
Auto Tune Cavity Combiner (ATCC)	The ATCC receives signals from several base radios and sends a combined signal to the site sending antenna
Automatic site selection	The Mobile Station will choose the best site
AVC	Aggregated Virtual Circuit
B-CEN	Black CEN (not trusted)
Base Interface Module (BIM)	This CEB module links conventional base station/repeaters and CEB for audio communications-
Base Radio (BR)	Dimetra remote BTS site equipment. Each base radio (BR) provides one TETRA carrier, comprising four TETRA time slots. The BR is equipped with three receivers for diversity reception which increases the coverage area and reception quality
Base Radio Controller (BRC)	The Base Radio is made up from a number of replaceable units. A Base Radio Controller is used to communicate with the Site Controller and to control the other units within the Base Radio
Base Station	Term used to identify the installation including the BTS, antenna and ancillary equipment

Item	Description
Basic Link	A Basic Link (BL) bidirectional connectionless path between one or several Mobile Stations and a Base Station, with a provision of both unacknowledged and acknowledged services on a single message basis
Basic logging	This feature collects radio system traffic and generates the collected data in a report format
BCCH	Broadcast Control Channel
Bearer Service	A type of telecommunications service that provides the capability for the transmission of signals between user network interfaces
BER	See *Bit Error Rate*
BERT	Bit Error Rate Test
BIC	Barring of Incoming Calls
Billing System (BS)	A Billing System is a feature that collects, stores and displays subscriber accounting data
BIM	See *Base Interface Module*
Bit Error Rate (BER)	Bit Error Rate characterizes the quality of a digital channel for all traffic on the channel
Black Key	An encryption key that is encrypted by another key
BLT	Bulk Loader Tool
BNC Connector	Bayonet-Neill-Concelman connector. A standardized coaxial cable connector, used for Thin Ethernet cables, ARCnet networks and for the transmission of audio and RF signals
BNCH	Broadcast Network Channel
BOC	Barring of Outgoing Calls
Border Router	The Border Router is a router residing between Customer Enterprise Network (CEN) and DMZ network, on master site as well as on remote sites connected to the CEN. The Border Router interposes a protective firewall to prevent access to the Dimetra system from unauthorized external devices
bps	Bits per second
BR	See *Base Radio* and *Border Router*
BRC	See *Base Radio Controller*
Broadcast	A message to all Mobile Stations currently listening. Broadcast information can be of a variety of types including adjacent channel information and current system access control information. A Broadcast message needs no acknowledgment
BS	See *Billing System*
BSCH	Broadcast Synchronisation Channel
BTS	Base Transceiver System. BTS is the common acronym for: • Enhanced Base Transceiver System (EBTS) • Mini Base Transceiver System (MBTS) • Motorola Transceiver System (MTS)

Item	Description
BTS Site	A remote segment within the Dimetra IP system responsible for call processing and mobility services within a local geographical area. A Dimetra IP BTS site (also known as a base site) contains equipment such as TETRA Site Controller (TSC), Base Radio Controller (BRC), Environment Alarm System (EAS), and RF distribution equipment. The BTS site functions as the termination point for air interface encryption services. A static cipher key-trunked mode operation (SCK-TMO) key is stored and used by BTS site equipment and subscriber mobile stations (MS) to encrypt/decrypt voice and data communications. To receive future SCK-TMO key updates, BTS site equipment must also store and utilize a unique infrastructure key (Ki) and zone key encryption key (KEKz)
Bundle	A collection of Inter TETRA Connections (ITCs) which utilizes the same scenario over the inter system interface
Busy handling	When channel resources are not available, the controller generates a busy indication over the control channel. This busy indication in form of a tone is given to the MS user indicating it is in queue for the next available resource
Busy queue	A memory storage in the central controller to hold Mobile Station information and requests until a channel is assigned after a busy condition
Busy Queuing	A method of queuing a call when resources are not available to grant the call
C-SCCH	Common Secondary Control Channel
CAD	Computer Aided Dispatch
CADI	See *Computer Aided Dispatch Interface*
CAI	Common Air Interface
Call Continuation	The capability of passing active calls or busy queue designations across zone boundaries. Also termed "Call Handoff" “Call Coordination” or “Call Reconnect”
Call Detail Record	The Call Detail Record contains information aboutusage of Packet Data service
Call handoff	The automatic assignment of an available channel when a radio user roams from one site to another with continuous communications
Call Set-up Time	Group Call: the call set-up time is a measure of the time between the initiating PTT and the first audio slot to be transmitted by the initiating Mobile Station. Private Call: the call set-up time is a measure of time between the initiating PTT and the alert indication that the receiving unit is ringing. Interconnect Call (MS initiated): the call set-up time is a measure of time between the initiating PTT and the alert indication that the PSTN Gateway has initiated the call. Interconnect Call (PSTN initiated): the call set-up time is a measure of time between the reception of the QSIG_SETUP from the external network to the transmission of the QSIG_ALERT to the external network
Call Back	A message sent to the radio indicating a busy condition is over and to initiate the channel request again
Camped	A Mobile Station (MS) is said to be camped on a cell when the MS is synchronized on the cell Base Station (BS) and has decoded the Broadcast Network Channel (BNCH) of the cell. The synchronization procedure is performed by the Media Access Control (MAC) and the interpretation of the network information from the BNCH (Voice+Data) is performed by a procedure in the Mobile Link Entity (MLE). It is the MLE which decides when an MS is said to be camped on a cell

Item	Description
CAS	1. Channel Associated Signalling 2. Child AntiVirus Server
CAT	Coverage Acceptance Test
CATP	Coverage Acceptance Test Procedure
CBR	Constant Bit Rate
C&C	Command & Control
CC	See *Crypto Card*
CCC	See *Crypto Communications Controller*
CCGW	See *Conventional Channel Gateway*
CCH	Control Channel
CCCH	Common Control Channel
CCI	Command & Control Interface
CCITT	Consultative Committee for International Telegraph and Telephone
CCK	Common Cipher Key
CCM	Channel Control Module. A CENTRACOM console module that is a direct interface for the dispatcher to make calls and to indicate received calls.
CCMS	See *Customer Configuration Management System*
CDM	See *Console Database Manager*
CDR	See *Call Detail Record*
CE	Crypto Engine
CEB	See *Central Electronics Bank*
Cell	A geographical area which is covered by a BTS site. Note that at the edge of the cell the Mobile Station can begin to receive signals from adjacent cells and will use its stored reselection criteria to determine at what point it should retune to a better signal
Cell Reselection	TETRA defines five types of cell reselection for a Mobile Station (MS) involved in a circuit mode call; these definitions are given in this list. *See also Announced Cell Reselection, Unannounced Cell Reselection, Undeclared Cell Reselection*
Cell ID	A relative identification number of a cell. Relative to the current serving cell
CEN	See *Customer Enterprise Network*
Center for Internet Security	An organization dedicated to help addressing security of internet-connected systems by providing means to measure, monitor, and compare the security level of systems
CENTRACOM	The Motorola product line of console dispatch equipment, including furniture and programming
CENTRACOM Elite Admin	An application for creating objects on the CENTRACOM Elite operator position desktops
CENTRACOM Gold Elite Subnet	A subnet that consists of a Windows based Console Database Manager/Alias Database Manager (CDM/ADM) file server(s) and a number of Windows based Operator Dispatch workstations

Item	Description
CENTRACOM Gold Series Platform	A platform that supports Classic Gold CRT, Classic Gold Button and LEDs, and Elite operator positions
Central Electronics Bank (CEB)	The CEB is the main processing bank in Dimetra trunking systems and provides an interface between the console positions and the RF equipment and thereby the entire Dimetra system
Central Network Management	This term is used to describe the system control equipment to which the sites are all connected. This is comprised of a number of items including the Zone Controller, Zone Manager, User Consoles, and Site Link Multiplexers (Only R3.x & R4.0)
CEPT	Conference European des Postes et Telecommunications. An association of the 26th European PTTs (Postes (mail), Telephone and Telegraph) that recommends communication specifications to the International Telecommunications Union (ITU)
CES	CENTRACOM Elite Server
CG	1. Charging Gateway 2. Cryptogroup See *Cryptogroup*
CGC	Confirmed Group Call
Channel Control Window (CCW)	The display seen by a console operator when using a CENTRACOM Elite console operator position. Each CCW corresponds to an object monitored by the console
Checkpoint	Check Point Software Technologies, a company producing products for network security
CHS	Cluster Hot Standby. Equivalent to Synchronised Standby
CIE	Console Interface Electronics
Circuit Mode Data	A mode that offers constant data transfer rates of 2.4-28.8 kbps
CIS	See *Center for Internet Security*
CiscoView Device Manager	A Web interface provided with CiscoWorks 2000 that provides real time views of networked Enterprise LAN Switch Systems devices
CiscoWorks2000 (R5.0 & R5.1)	A network management application that includes CiscoView Device Manager and Resource Manager Essentials (RME). CiscoWorks 2000 is used to manage the Cisco Catalyst 6509 Ethernet LAN switch. The CiscoWorks applications reside on the Ethernet Switch Management Server (ESMS) and work together as a LAN management solution
CK	Cipher Key
CKEK	Common Key Encryption Key. An encryption key used solely to encrypt traffic keys targeted for a group of secure entities
Clear MS	A mobile station that is registered on the system with ciphering off
CLIP	Calling Line Identification Presentation
CLIR	Calling/Connected Line Identification Restriction
Cluster	A cluster is defined to be a UCS cluster consisting of one to seven zones served by the same UCS. A system consists of one to sixteen clusters. See *Multicluster System*
CMG	Crypto Management Group
CMS	Cable Management System
CMSU	Central Mass Storage Unit

Item	Description
CNE	Central Network Equipment. The equipment located at the Master Site or Mobile switching Office
CNI	Customer Network Interface
Codeplug	The firmware that holds the unique personality for a system or device. The codeplug is programmable to change system or unit parameters. Codeplugs are found in Mobile Stations, CENTRACOM equipment, as well as in some repeaters and 6809 controllers
COAM	Customer-Owned and Maintained
COIM	See *Console Operator Interface Module*
Collected Data	Collected Data is statistical data, which is used for statistical purposes such as number of calls and types of calls
Colocated	Pertaining to a configuration in which equipment resides in the same physical site
Computer Aided Dispatch Interface (CADI)	The CADI enables the user to do remote network management through an Application Programming Interface (API). Possible functions may be radio check, radio inhibit and Dynamic Group Number Allocation (DGNA)
Configuration Management	Refers to the capabilities which allow the user to configure operational parameters of physical and logical devices used within the system. There are two categories, Subscriber Management performed through the User Configuration System and Infrastructure Management performed through the Zone Manager
Console	The console is the equipment used by dispatchers to interact with the Dimetra system and thus to communicate with system users. The console is the equipment used by dispatchers to interact with the Dimetra system and thus to communicate with system users
Console Administration Terminal	A terminal that is connected directly to the Zone Controller to perform Terminal administrative functions for the system
Console Database Manager (CDM)	A software tool that permits changes to the console database, which stores all features programmed for the console
Console Interface	also known as Elite API. The Dimetra Console Interface runs under Windows. May be used by 3rd party developers
Console Operator Interface Module (COIM)	An interface board in the Central Electronics Bank that has the connections for the console operator positions. The module controls audio flow and data signals to and from the console position
Console Operator Remote Interface (CORI)	An interface board used in a Central Electronics Bank to provide connections between the Console Operator Interface Module and telecom lines to a remote operator position
Console Patch	A unique call type. Some types of console patches can be performed by a console operator to either expand the participant size for the call or to provide interoperation ability between different agencies that do not communicate together. For example, two multigroups would be created if talkgroups 1, 2, 3, and 4 were patched together and if talkgroups 1,2, and 3 are home to zone 1 and talkgroup 4 is home to zone 2
Console Phone Patch	A manual patch of a phone line module to another CCM/CCW. A CCM/CCW may be associated with a trunked talkgroup or a conventional channel at the time of the patch
Console Only Talkgroup Call	A type of call used exclusively for console operators, and does not involve any Mobile Stations. All console operator members can be located within the same zone or in different zones

Item	Description
Constant delay service	A network service (NS) where the transit delay of the NSDUs between the network connection endpoints remains constant for the duration of the connection
Control channel	The first time slot on the TETRA carrier frequency is always used as the main Control Channel. The rest of the slots on the main carrier are used as Traffic Channels
Control Site	A Control Site provides remote dispatch capabilities and remote access to network management functions
Control Message	Term used to describe messages of a controlling nature sent between the BTS and the Mobile Station (MS)
Control Router (R5.0)	The Control Routers allow communication between the Zone Controller (ZC) and the Transitional LANs within the Ethernet/LAN switch
Controlling Zone	The zone that coordinates the resources for a call. For group calls, the designated Home Zone of the group is always the Controlling Zone for the call, regardless of where group members are affiliated. For individual calls, the controlling zone is the zone from which the voice service is being requested
Controlling Zone Controller (CZC)	The Zone Controller responsible for controlling a call throughout its duration
Conventional Channel Gateway (CCGW)	The CCGW provides analog call detection, vocoding and devocoding of audio, station keying and dekeying through Tone Remote Control (TRC) or E&M relay, and tone LOBL (Line Operated Busy Light) detection (for parallel console interoperation). The CCGW may or may not be integrated with the site router. The alternative is to have the CCGW locally on the LAN. This option is available to console sites with a large number of conventional resources
Conventional to Conventional Patch	A console patch that patches multiple conventional resources within the same zone together
Cooperative WAN Routing	CWR interfaces the master site in one zone to Radio Frequency (RF) sites, dispatch sites, system Operations Support System (OSS), and other zones. In multizone systems, core and exit routers are configured in pairs to provide path redundancy for audio and control packets. With CWR, the routers work to control an external relay panel to switch a group of 12 non-redundant T1/E1 links between the two routers
CORBA	Common Object Request Broker Architecture
Core Router	The Core Routers allow communication between the BTS and other subnets
CORI	See *Console Operator Remote Interface*
CoU	Class of Usage
cPCI	compact Peripheral Component Interconnect
CPS	See *Customer Programming Software*
CRAM	Console Remote API Manager Service
CRC	Cyclic Redundancy Check. An error checking technique
CRHN	Control Room Head Number
Critical site	See *critical site assignment*

Item	Description
Critical site assignment	Critical Site Assignment is a Motorola service that supplements the group call service. For each talkgroup, the Network Manager can create a list of ‘Critical Sites'. These are sites that must be included in a group call for it to be set up. Thus, even when Fast Start is in operation, the call will not be set up until channels are available at all the critical sites for the talkgroup
Crypto Card	A PCI-based encryption module installed in the AuC server. The AuC Crypto Card provides encryption services to the AuC such as key generation and database encryption. A master key is stored in the AuC Crypto Card and is utilized to encrypt and decrypt data stored in the AuC database
Crypto Communications Controller	The Crypto Communications Controller establishes the communication between the Host CE. Cuttently implementation uses a Power QUICC II for the CCC
Cryptogroup (CG)	A Cryptogroup is a set of keys which are used with the same communication groups at different times.The KMF supports up to three keys within a Cryptogroup.At any one time, one of these keys is active for communications, and the other two are there to maintain communications when changing over to different active keys
CryptR	Generic name for the hardware device performing the function of either PDEG, SDEG or KMF Cryptr
CSMA/CD	Carrier Sense Multiple Access/Collision Detect. Technique used in Ethernet to manage access to a shared transmission medium
CSMS	Core Security Management Server
CSV	Comma Separated Values
Current Alerts/Alarms	A Fault Management feature which provides the user with a mechanism to view the current alerts and alarms in a zone
Current serving BS	The Base Station (BS) on one of whose channels the Mobile Station (MS) is currently operating
Customer Configuration Management System (CCMS)	Customer Configuration Management System is tools and processes to manage the configuration of a customer system. The system controls data like serial numbers, s/w and h/w versions, parameter settings, license numbers and so on, in a database to provide detailed information about the complex structure of systems
Customer Enterprise Network (CEN)	The Customer Enterprise Network is a customer network that is connected to the Dimetra RNI
Customer Programming Software (CPS)	The software application used for programming Mobile Stations. Formerly called RSS
Customized IP Plan	Provides the possibility to configure the Zone Octet and Cluster Octet in the IP Plan independently from the Zone ID and Cluster ID
Customized IP Plan CD	CD-ROM that contains the complete IP Plan and Shared TLAN (optionally) configurations
CVC	Constituent Virtual Circuit
CVO	Clear Voice Override
CWR	See *Cooperative WAN Routing*
CZC	See *Controlling Zone Controller*

Item	Description
DAOS	Data Add-On Services
DAQ	Delivered Audio Quality
DAT	Digital Audio Tape
Data Gateway	Data gateway. See *SDR and PDG*
Data Link Connection Identifier (DLCI)	A DLCI is a communications channel identifier used in frame relay communications to identify a PVC (permanent virtual circuit) over the link between the BTS and the Central Network Equipment.
Data Prioritization	See *Packet Data Prioritization*
Database Server	A UNIX based computer connected to the Ethernet network, which supports the Zone Manager and contains the database for the Dimetra system.
DBP	Downstream Billing Processor
DC	1. Dispatch Console (D5.5SER and backward) 2. Domain Controller (D6.0SER and forward)
DCE	Data Communication Equipment
DCK	Derived Cipher Key
DDI	Direct Dial In. Also known as DID (Direct Inbound Dialling). Data Distribution Interface
DDP	See *Disabled Dialling Pattern*
Deaffiliation	The process in which the Mobile Station signals to the system, that it is no longer monitoring the system, because it is power down or it is changing mode to another system which is not part of the Dimetra system.
Decryption	The process of unscrambling an encrypted message or information to regain the original information or message.
Delayed Acknowledgment	A message indicating status transmitted after some delay.
DEM	See *Digital Elevation Model*
DeMilitarized Zone (DMZ)	The DeMilitarized Zone is a network interconnecting other networks, namely the Dimetra RNI and the CEN. For routing of traffic between these networks coordinated IP spaces are required.
DGNA	See *Dynamic Group Number Assignment*
Diagnostics	A feature that allows the user to disable a failing device, enable repaired devices, and/or set certain device operational states.
DIB	Data Interface Box
DID	Direct Inbound Dialling. Also known as DDI (Direct Dial In)
Digital Access Cross Connect System (DACS)	A data concentrator and organizer for Tl / El based systems.
Digital Elevation Model (DEM)	Computer readable database with the elevation values (meters above sea level) of a certain area.

Item	Description
Digital Power Meter (DPM)	Device that measures the effect of the site antenna.
Digital Versatile Disc (DVD)	An optical disc storage media format that can be used for data storage, including movies with high video and sound quality.
Dimetra Console	See *Elite Console*
Dimetra™	**DI**gital **M**otorola **E**nhanced **T**runked **RA**dio. The Motorola Dimetra system family is a sophisticated range of digital radio equipment that delivers the full benefits of the TETRA standard. It is designed to meet the needs of the users of both Private Mobile Radio networks (PMR) and Public Access Mobile Radio systems (PAMR). The Dimetra product line includes base stations, switches, operations management control, portables, mobiles, and consoles, all of which are easily reprogrammed as the system is enhanced.
DIN	Deutsche Industrie Normen (German Industrial Standards).
Direct Mode Operation (DMO)	Direct communications between 2 or more mobile stations without using any infrastructure.
Direct set-up signalling	A signalling procedure where immediate communication can take place between the calling and the called users without the alerting process and without an explicit response from the called user that he has answered.
Diagnostic Zone ID	Number of zone with the lowest zone octet within the MSO (Mobile Switching Office).
DIPS	Dimetra IP Scalable
Disabled Dialling Pattern (DDP)	An individual telephone within an ECN.
Disk Controller	This Zone Controller module handles the flow of data to and from the hard drives and the quarter inch tape drive.
Dispatch Console	Dimetra master site equipment consisting of an advanced dispatch system, which provides fixed dispatch capabilities to both the Dimetra trunked system as well as conventional PMR radio systems including the ability to connect calls between these systems. The dispatcher may also connect calls to a telephone system.
Dispatcher	A person logged on to the console terminal or RCM terminal as a Dispatcher who monitors and transmits commands to radio traffic.
DL	Discreet Listening: A feature that allows real-time listing to private calls and telephone interconnect calls made by a radio user. The feature gives no indication to the calling parties that the call is being listened to. The feature keeps an extensive log of call activities of the monitored radios as well as the actions taken by Discreet Listening user. It is possible to connect a third party recorder to the feature for recording purposes.
DLCI	See *Data Link Connection Identifier*
DM	See *Direct Mode Operation*
DM-SCK	Direct Mode Static Cipher Key
DMO	See *Direct Mode Operation*
DMZ	See *DeMilitarized Zone*
DNS	Domain Name System
Downlink	The radio frequency communications path from the BTS to the Mobile Station. Also referred to as the BTS transmit path.

Item	Description
DPM	See *Digital Power Meter*
Driver card	A Zone Controller platform card for conversion of TTL protocol to RS-232 for the Line card.
DS0	The basic unit in the DSn (T1 and up) and E1 transmission applications. A DS0 carries a 64 Kbps data stream. A T1 line has 24 DS0s and an E1 line has 32 DS0s.
DSP	Digital Signal Processing
DSU	Data Service Unit. A device used in digital transmission for connecting data terminal equipment (DTE).
DSC	Digital Service Cross Connect. Cross connection point for DS1 signals.
DTE	1. Data Terminal Equipment 2. Data Traffic Estimator
DTM	Digital Terrain Model
DTMF	Dual Tone Multi Frequency
Dual or external provisioned Radio User	A Radio User is considered external or dual provisioned at the UCS level when its ISSI value falls into the Individual Subscriber Map range (of the last submitted Home Zone Map) of the external zone which does not belong to a home cluster.
Dual or external provisioned Talkgroup (Multigroup)	A Talkgroup or Multigroup is considered external or dual provisioned at the UCS level when the ID of a Talkgroup or Multigroup falls into a Group Map range (of the last submitted Home Zone Map) of the external zone which does not belong to a home cluster.
Dual Watch	Monitoring of both the trunked control channel and selected direct mode channel by a radio operating in direct mode.
Duplex Transmission	Duplex transmission means that both parties in the call can send and receive traffic at the same time. There is generally no need for a PTT to request transmit permission. **Note:** Duplex can be achieved in a TDMA system (such as TETRA) without the need for the Mobile Station (MS) to actually transmit and receive at the same time; this is known as time division duplex. Also note that although the transmission in the air is in duplex mode the MS is simplex, thus the control of the loudspeaker and the microphone may be performed using PTT in a semiduplex fashion as this may be the only accessory which is available.
DVD	See *Digital Versatile Disc*
Dynamic Group Number Assignment (DGNA)	Dynamic Group Number Assignment allows the user to create groups before or during group calls.
Dynamic regroup	A Radio Dispatch Management option allowing a dispatcher to move radios from one talkgroup into another. The radios receive reprogramming of certain parameters using signalling over the control channel.
Dynamic site assignment	This feature allows the Dimetra system to assign voice channels only at the sites where radio users are registered to complete calls.
E&M	Ear and mouth

Item	Description
E1	Digital carrier facility used for transmission of data through the telephone hierarchy. E1 consist of 32 channels, and has a total speed of 2.048Mbit/s. E1 links are used in most countries other than the United States and Japan. T1 links are mostly used in the US and Japan. Both T1 and E1 are composed of DS0s, the basic 64 Kbps path that makes up these links.
E2E	End-to-End
E2EE	*End-to-End Encryption*
E2EE KVL	*End-to-End Encryption Key Variable Loader*
EAS	See *Environmental Alarm System*
EBTS	See *Enhanced Base Transceiver System*
EBTS Service Software	The TETRA EBTS Service Software package used to configure and communicate with the Dimetra BTSs.
EC	1. Electronic Codebook 2. See *Echo Canceller*
Echo Canceller (EC)	The Echo Canceller provides echo cancelling of the echo returned from the telephone system.
ECK	Encryption Cipher Key
ECN	See *Exclusion Class Number*
ECTA	Extended Console Talkgroup Assignment
ECU	Environmental Conditioning Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EIA	Electronic Industries Association
Elite Console	A software based radio dispatch console working under Microsoft Windows® operating system.
Elite Operator Position	Motorola's GUI-based operator position.
Embassy Switch	Ambassador Electronics Bank (AEB). A Time Division Multiplexing (TDM) audio switch capable of simultaneously routing audio from multiple sources to one or more destinations. In a Dimetra system, each Zone Controller controls the audio routing for its associated AEB.
EMC	1) Encryption Module Cartridge. 2) Electromagnetic Compatibility.
Emergency Call	The highest priority service of talkgroup call. When the emergency button of a subscriber unit is pressed and a PTT initiated, an Emergency Call is granted depending on the emergency setup method selected; that is, Top of Queue or Ruthless Pre-emption.
Encrypted MS	A mobile station that is registered on the system to operate with ciphering.
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.
Encryption Algorithm	A method of encrypting and decrypting information.

Item	Description
Encryption Device/Crypto Card	A PCI-based encryption module installed in the PrC server. The PrC Encryption Device (a Crypto Card) provides encryption services to the PrC such as key generation and database encryption. A master key is stored in the PrC Encryption Device and is utilized to encrypt and decrypt data stored in the PrC database.
Encryption Key	A set of 1s and 0s that is used to determine the transformation of plain text to cipher text in a cryptographic algorithm and vice versa.
Encryption Management	The Network Management system is able to switch the use of encryption at a site on or off. This is a site wide function for all control and traffic channels, except where users may be individually provisioned to operate without encryption. These units will always operate with encryption switched off. The Network Management system is able to remotely download new SCK to all BTSs in the network using the remote Software Download facility.
End-to-End Encryption (E2EE)	The Dimetra IP System supports End-to-End Encryption using the AES algorithm.
End-to-End encryption Key Variable Loader (E2EE KVL)	The E2EE KVL is used for End-to-End encryption. It provisions the KEK (Key Encryption Key used for OTAK) and some other OTAK related parameters. The E2EE KVL can also be used for store-and-forward between the KMF and the MS. The E2EE KVL connects to the KMF and MS.
Enhanced Base Transceiver System	A site connected to a Dimetra master site via a site link. A Dimetra remote EBTS site consists of a base radio (BR), and a site controller. Contains up to 8 base radios, TETRA Site Controller, Environmental Alarm System, RF Distribution System, antennas, power supply and the telephone company supplied X.21 or E1 line termination equipment.
Environmental Alarm System (EAS)	EAS. Remote Base Transceiver System (BTS) site component that provides monitoring of internal and external site alarms and controlling functions such as redundancy control and so on
EOL	End Of Life
EPROM	Erasable Programmable Read Only Memory. A non-volatile, read only chip with a quartz window on the top. The chip requires erasing with UV light before reprogramming.
ESD	Electrostatic Discharge
ESMS (R5.0 & R5.1)	See *Ethernet Switch Management Server (ESMS)*.
ESP	Enhanced Services Platform
ETG	Enhanced Telephone Gateway.
Ethernet	A method used for connecting computer systems together using local area network (LAN) technology.
Ethernet Hub	A device that acts as a multiport repeater in allowing multiple devices to be connected together into a single Ethernet LAN. All the devices connected to the hub share the available bandwidth as all packets are repeated at all ports.
Ethernet Switch	A device that acts as a multiport bridge allowing multiple devices to be connected together into a single Ethernet LAN. Each of the devices connected to the switch have the full bandwidth available as a switch learns which devices are connected to which ports. Router: A device that routes IP packets between IP subnets.

Item	Description
Ethernet Switch Management Server (ESMS) (R5.0 & R5.1)	The Compact PCI server where the CiscoWorks2000 suite of applications resides.
Ethernet Virtual Connection (EVC)	An association of two or more UNIs that limits the exchange of Service Frames to UNIs.
ETS	ETSI Technical Specification. A technical specification produced by ETSI to define a communications standard.
ETSI	See *European Telecommunications Standards Institute*
European Telecommunications Standards Institute (ETSI)	The European standards organization responsible for the TETRA standard.
Exclusion Class Number (ECN)	A set of telephone numbers or Disabled Dialling Patterns (DDPs) defined in the Telephone Interconnect database that radios cannot access.
Exit Router	The Exit Routers allow communication between different SMSO (LAN SHARED MSO).
Explicit Authentication	This term is used to describe a successful challenge-response-result authentication procedure based on knowledge of the secret key K.
External calls	A call where only one of the parties (either the source or the destination) is in a TETRA network. The other party is in a non-TETRA network.
FACCH	Fast Associated Control Channel
FAS	Frame Alignment Signal
Fast Start	A feature that allows a talkgroup call to start as long as resources programmed as critical are available. Non-critical resources are added to a call in progress as they become available.
FAT	Factory Acceptance Test.
Fault Management	A feature that allows the user to monitor operation status, display fault information, perform diagnostics on the system, and provide notification of managed object malfunctions.
Fault Tolerant (FT)	A redundant equipment design that withstands a single point of failure without disruption of call processing or isolation of the failure with only partial loss of call capabilities.
FIFO	See *First in, first out*
FIP	Feature Implementation Proposal
FIPS	Federal Information Processing Standards
FIPS-140-1	This Federal standard assures that cryptographic modules are effectively designed to meet specific security objectives.
Firewall	Device that protects the Dimetra System against intrusion and other attacks from outside Dimetra.
First in, first out (FIFO)	In a busy trunked system, radio service requests are handled in the order received.
Fixed Network Equipment (FNE)	All the system components excluding the mobile equipment that is the CNE and all the remote site equipment.

Item	Description
Fleetcall	See *Announcement group*
Fleetmap	A document listing configuration information for all users in the system.
FLM	Formatted Logical Message
FNE	See *Fixed Network Equipment*
FRAD	Frame Relay Access Device.
Frame	TETRA term used to describe a period of time on a channel. A frame is further divided into timeslots, and a number of frames may be grouped into a multiframe.
Frame Relay	A form of packet switching that uses smaller packets and requires less error checking than traditional forms of packet switching. Communications protocol used for multiplexing and routing data over the site link.
FRE	Field Replaceable Entity
Frequency Reuse Planning	A complex method of maximizing coverage with the same set of RF channels. With proper planning, a given set of RF frequencies can be reused a number of times throughout a very large service area.
FRU	Field Replaceable Unit
FSSN	Fleet Specific Subscriber Number
FSU	Fault Sense Unit
FT	See *Fault Tolerant*
FTP	File Transfer Protocol
FullVision ® (FV)	Subsystem of the Dimetra network manager. This uses Hewlett-Packard OpenView Network Node Manager to provide a industry standards-based fault management platform.
FullVision ® Integrated Network Manager (INM)	A Dimetra IP network management application used for reporting system fault conditions. Using the SNMP protocol, the FullVision® INM application displays alarms reported by all devices.
FV	See *FullVision ®*
FVS	FullVision® Server
FW	See *Firewall*
G-HLR	See *Group Home Location Register*
GAS	General Application Server
Gateway Router	The Gateway Router allows communication between all VLANs and the Transitional LANs within the Ethernet/LAN switch.
GBN	See *Ground Based Network*
GCK	Group Cipher Key
GCKN	Group Cipher Key Number
GCTC	Group Call to Control Room

Item	Description
General Purpose Input/Output Module (GPIOM)	The purpose of the GPIOM is to interface audio and auxiliary devices (for example, microphones, speakers, and recorders) to the voice card located in the dispatch console. The GPIOM can support 16 audio input paths and 16 audio output paths simultaneously and independently, depending on which devices are connected to the GPIOM
GGSN	Gateway GPRS Support Node. This is the only node, that Dimetra IP implements and that allows mobile users to access the customer network or specified private IP networks.
GHLR	Group Home Location Register
Global Positioning System (GPS)	A global positioning system which uses satellites to provide a continuous time and positioning system. The EBTS and NTS uses this system to maintain system synchronization.
GMS	Group Message Server
GOS	See *Grade Of Service*
GPIOM	See *General Purpose Input/Output Module*
GPRS	General Packet Radio Service
GPRS Tunneling Protocol (GTP)	The GPRS Tunneling Protocol is used to establish a Packet Data session through the Dimetra infrastructure.
GPS	See *Global Positioning System*
Grade Of Service (GOS)	A specification which determines how often a radio or console user will receive a busy. This is typically rated as a percentage of the total calls being processed by the system.
Graphical User Interface (GUI)	An icon-based user interface.
Ground Based Network (GBN)	The entire E1 based network that make up the site links and inter MSO links.
Group Home Location Register (G-HLR)	The HLR that stores information for talkgroups that are home to that zone.
Group Home Zone	The controlling zone for calls originated by a zone's talkgroup members, regardless of where they are located in the system at the time they originate the call.
Group-Based Service	Talkgroup voice-based services, includes Talkgroup Calls, Multigroup Calls, Emergency Calls, and Group Regrouping.
GSKO	Group Session Key for OTAR
GSSI	Group Short Subscriber Identity. TETRA term, in Dimetra called Group ID or Talkgroup ID.
GTP	See *GPRS Tunneling Protocol*
GTSI	Group TETRA Subscriber Identity
GUI	See *Graphical User Interface*
GW	Gateway

Item	Description
Half duplex Transmission	Half duplex transmission means that only one Mobile Station (MS) can send traffic in a call at any time. All other MSs in the call will receive traffic. In the case of a voice call, for example, traffic transmission is generally initiated by an MS user pressing the PTT at which time the MS speaker is muted. The MS user releases the PTT at the end of the traffic transmission in order to hear the response from another MS in the call.
HDD	Hard Disc Drive
HDLC	High level Data Link Control
HLA	Home Location Area
HLR	See *Home Location Register*
Home Location Register (HLR)	The entity that is used to receive (from the UCS) a master copy of individual and talkgroup Mobile Station information for call processing. It will also contain mobility information for individuals and talkgroup on a per zone level.
Home network	A network where a Mobile Station (MS) has a direct subscription. This means that an MS identity has been allocated in advance of any network access.
Home Zone	A designation made for each talkgroup and individual in the system that helps determine what Zone Controller will coordinate the call process.
Host	A computer which provides services to other computers, such as database access.
Hot pull	Modules or boards that can be pulled out and replaced without powering down the equipment that contains them.
HPOV	Hewlett-Packard OpenView
HSRP	High Speed Redundancy Protocol
HSSI	High Speed Serial Interface
HZM	Home Zone Map
I&DC	Initialization & Default Configuration
I-HLR	Individual subscriber unit HLR
I/F Router	The Interface Routers provide access to the Wide Area Network (WAN) links.
IA	See *Information Assurance*
ICCS	Integrated Command and Control System
ICMP	Internet Control Message Protocol.
ID	Identification
Identity (Group or Individual)	A number which uniquely identifies an individual Mobile Station or group of mobile stations on a system.
IDSS	See *Intrusion Detection System Sensor*
IDSS Manager	*Intrusion Detection System Sensor Manager*
IEC	International Electro-technical Committee
IEEE	Institute of Electrical and Electronic Engineers
IFM	Interzone Fault Management
iGAS	See *Improved Generic Application Server*

Item	Description
IHLR	Individual Home Location Registration
ILO	See *Integrated Lights Out*
ILOM	See *Integrated Lights Out Manager*
Immediate Acknowledgment	A message indicating status transmitted without delay.
Implicit Authentication	An authentication procedure where the mobile station/infrastructure are assumed to be implicitly authenticated based on knowledge of the static cipher key-trunked mode operation (SCK-TMO) key.
Improved Generic Application Server (iGAS)	Improved Generic Application Server (iGAS) is a management system that allows the user to easily administer different server containers run on one dedicated server hardware.
Inbound Event	Request made by a radio user and sent to the RCM.
Individual Call	Private Call or telephone interconnect call.
Individual Site Access	This command allows individual radio user access for Private Call and Interconnect options on specific sites, as configured by the Dimetra Network Manager.
Individual- Based Service	Individual voice-based services which include Private Calls, Landline-to-Radio Interconnect Calls and Radio-to-Landline Interconnect Calls.
InfoVista	A customisable performance management application for the transport system. It reports and graphs a wide variety of data from multiple devices, such as routers, Ethernet LAN switches, and the WAN switches. InfoVista resides on the Transport Network Performance Server (TNPS).
Information Assurance (IA)	Information Assurance (IA) aims at protecting and defending information and information systems by ensuring confidentiality, integrity, authentication, availability, and non-repudiation. In Dimetra there are numerous improvements that have been implemented on the application/configuration level, focusing on fixing the information-related risks inherited from previous releases, or on ensuring the IA-compliance of the new components.
Infrastructure	The equipment and facilities that make up the Dimetra IP radio system. These include zone, BTS site, and network management devices.
Inhibit	A Dimetra RCM feature cancelling transmit and receive functions of a radio. The target radio must be on and within system range in order for this feature to function.
Initial cell selection	In TETRA, the act of choosing a first serving cell to register in. The initial cell selection is performed by procedures located in MLE and in the MAC. When the cell selection is made and possible registration is performed, the Mobile Station (MS) is said to be attached to the cell.
INM	Integrated Network Management
Integrated Lights Out (ILO)	An autonomous management processor that resides on the system board of a host server.
Integrated Lights Out Manager (ILOM)	Integrated Lights Out Manager (ILOM) is a system management tool that enables you to remotely manage and monitor the server. ILOM provides a web interface, which enables you to monitor and control the server over the network. The system that controls the features in ILOM enables you to monitor the health of your system and to detect errors.
Interconnect	This option provides independent telephone call capability for mobiles and portables.

Item	Description
Internal calls	A call where both the source (the calling party) and the destination (the called party) both lie in a TETRA network domain.
Internet Protocol (IP)	A protocol used for carrying packets of data primarily in Ethernet based systems.
Internet Protocol Packet Delay Variation (IPDV)	The IPDV of a pair of packets within a stream of packets is defined for a selected pair of packets in the stream going from measurement point MP1 to measurement point MP2.
Interrupt Mode	A mode of operation for multigroup calls that can be programmed so that the system immediately terminates all currently active talkgroup calls of all talkgroups within the multigroup.
Inter-TETRA call	A call where source and destination are in different TETRA networks.
InterVening Network (IVN)	IVN is the network which is used to interconnect two TETRA SwMIs at the ISI. The network may be of the following types: - dedicated transmission system for example PCM; - permanent circuit switched for example PSTN and ISDN; - on-demand circuit switched for example PSTN and ISDN. The IVN is also used to connect remote service terminal to Zone LAN switch.
Interzone (IZ)	General term that refers to call processing that involves more than one zone in the system.
Interzone Audio Card (IZAC) (R4.0)	plugs into an Ambassador Electronics Bank (AEB). The card has modified AMB firmware to support interzone audio. The hardware is the same as an AMB board that interfaces Central Electronics Banks (CEBs) or sites to the AEB.
Interzone Audio Slot (IZAS) (R4.0)	64 kbps channel on OmniLink Ambassador card that carries audio DS0 level between two Ambassador Electronics Banks (AEBs) in different zones.
Interzone Trunking	A trunking state between two zones in which the Ambassador Electronics Bank (AEB) and Zone Controller can communicate, and talkgroup-to-controlling zone mapping tables exist in both zones.
Intra-TETRA call	A call where both source and destination are in the same TETRA network subdomain.
Intrusion Detection System Sensor (IDSS)	The IDSS contacts the Authentication Server for user authentication when a user attempts to establish a connection to the IDSS via for example telnet. Access via the IDSS's console port will also initiate the authentication process.
Intrusion Detection System Sensor Manager (IDSS Manager)	The IDSS Manager is used for configuration of the IDSS located at the Network Interface Barrier (NIB). Furthermore the IDSS Manager provides event notification and local logging when the IDSS reports about potential attacks or abnormal behavior.
IOP	Interoperability
IP	See *Internet Protocol*
IP in IP	IP in IP is a way to alter the normal routing of an IP packetby encapsulating it within another IP header.
IP Packet Loss Ratio (IPLR)	The ratio of total lost IP packet outcomes to total transmitted IP packets in a population of interest
IP Packet Transfer Delay (IPTD)	Time necessary for the packet to reach its destination
IPDV	See *Internet Protocol Packet Delay Variation*

Item	Description
IPLR	See *IP Packet Loss Ratio*
IPTD	See *IP Packet Transfer Delay*
IPsec	See *IP Security*
IP Security (IPsec)	IPsec provides interoperable, high quality and cryptographically based security services for traffic at the IP layer, such as authenticity, integrity, confidentiality and access control to each IP packet. An abbreviation for IP Security, it is a set of protocols developed by the Internet Engineering Task Force (IETF) to support secure exchange of packets at the IP layer. IPsec has been deployed widely to implement Virtual Private Networks (VPNs).
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ISSI	Individual Short Subscriber Identity. TETRA term, in Dimetra called Individual ID, a subset of ITSI.
ITC	Inter TETRA Connection.
ITSI	Individual TETRA Subscriber Identity, consists of ISSI plus Country and Network codes
ITU	International Telecommunications Union.
ITU Conference	Conference Europene des Postes et Telecommunications. An association of the 26 European PTTs that recommends communication specifications to the International Telecommunications Union (ITU).
ITU-T	International Telecommunications Union - Telecommunications Sector.
IV&D	Integrated Voice and Data
IVN	InterVening Network
IZ	See *Interzone*
IZAC	1. See *Interzone Audio Card* 2. Interzone Audio Channel
IZAS (R4.0)	See *Interzone Audio Slot*
IZCP	Interzone Control Path
IZNM	Interzone Network Manager
K	See *Authentication Key*
K-REF	A pair of parameters that identify a mobile station (MS) to the Authentication Centre (AuC). A K-REF pair is needed by the AuC to create authentication material (KS and KS') for a MS.
KAG	Key Association Group
Kbps	Kilobits (1024 bits) per second.
KEK	See *Key Encryption Key*
Key Encryption Key (KEK)	The KEK is also known as a shadow key. An encryption key used solely to encrypt traffic keys.

Item	Description
Key Management Facility (KMF)	The KMF manages, distributes, and tracks the various types of key material used in the MS for the end-to-end encryption feature. The KMF distributes keys to the MS using the short data service as a transport.
Key Variable	Also known as an encryption key. A set of 1s and 0s that is used to encrypt and decrypt information.
Key Variable Loader (KVL)	A portable device used to load encryption keys to a secure entity.
Ki	Authentication (Infrastructure) Key. A secret key used to encrypt and decrypt system and zone key encryption keys (KEKm and KEKz) transported over the infrastructure of the radio network system. Each zone controller, TETRA site controller, and base radio controller in the system is assigned a unique infrastructure key. An infrastructure key is generated and sent from the Authentication Centre (AuC) to the system entities using the Key Variable Loader (KVL) device.
KID	Key Identification
KMF	See *Key Management Facility*
KMM	Key Management Message
KMT	Key Message Transport protocol. Protocol used to transfer keys between the AuC and ZC, TSC, and BRC
KS, KS'	Session Authentication Keys. See *Authentication Material*.
KSG	Key Stream Generator
KSS	Key Stream Segments
KVL	See *Key Variable Loader*
KVM	Keyboard Video Mouse
LA	Location Area
LAN	Local Area Network
Land Use Land Cover (LULC)	Also known as "clutter data". Computer readable data base with information about the surface of the earth, for example wood, urban areas.
LAPD	Link Access Procedure for D channel. A data transmission procedure used in ISDN systems on the D channel.
LC	Log Collector
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LGC	Local Group Call
License Key	A unique set of numbers used to enable the Zone Manager/Radio Dispatch Management core software and purchasable options.
LMI	Link Management Interface
Local Site Trunking (LST)	When a system fails or many of the sites lose connection to the CNE, the sites are designed to go into a fall back situation known as Local Site Trunking (LST). When the sites are forced to go into LST, the radios (users) are randomly distributed across all the sites and communication between radios is dependant on at which site they are registered. Only radios registered at a particular site can communicate to each other.

Item	Description
Location Area (LA)	The area within radio coverage of a base station or group of base stations within which a Mobile Station (MS) is allowed to operate.
Logging Operator Multiplex Interface (LOMI)	A Central Electronics Bank (CEB) module responsible for demultiplexing audio routed to a recording device.
Logging Recorder Interface (LORI)	This Central Electronics Bank (CEB) module interfaces with a recording device to provide audio from the LOMI through the AEI.
LOMI	See *Logging Operator Multiplex Interface*
LORI	See *Logging Recorder Interface*
LLR	Local Logging Recorder
LS	LAN Shared
LS-MSO	A LAN Shared MSO (LS-MSO) is a collection of one and up to three zone cores, which are physically colocated and share one LAN switch. All zones in a LS-MSO are connected to a single TLAN pair.
LST	See *Local Site Trunking*
LULC	See *Land Use Land Cover*
MAC	See *Media Access Control*
MACE	Motorola Advanced Crypto Engine
Main Control Channel (MCCH)	The main control channel at a site. The channel is used by Mobile Stations to register on the system and to request and setup speech calls with other Mobile Stations.
Managed Resource (MR)	Any Network Element managed by the Network Management System.
Management Information Base (MIB)	A management information base (MIB) stems from the OSI/ISO Network management model and is a type of database used to manage the devices in a communications network. It comprises a collection of objects in a (virtual) database used to manage entities (such as routers and switches) in a network.
Manager of Managers (MoM)	A high-level network management system (NMS) that gathers and correlates alarms and alerts from multiple element management systems (EMSs)
Master Key	An encryption key stored in the PrC Encryption Device used to encrypt/decrypt data stored in the PrC database. The master key is loaded into the PrC Crypto Card using a Key Variable Loader (KVL) at the request of the PrC. The Master Key is also used in the AUC encryption device.
Master Site	A physical location in a Dimetra system containing one or more sets of zone control equipment, including a Network Manager, Zone Controller, Ambassador Electronics Bank (AEB), Dispatch Console, Transcoder, Telephone Interconnect Gateway, and Site Link Multiplexer.
Mbps	Megabits (1,000,000 bits) per second.
MBTS	See *Mini Base Transceiver System*
MCC	See *Mobile Country Code*
MCC 7500	A software based radio dispatch console working under Microsoft Windows® operating system RoHS and WEEE compliant.

Item	Description
MCCH	See *Main Control Channel*
MDEG	Mobile Data Encryption Gateway
MDG IPL	Mobile Data Gateway Initial Program Load
MDM	See *Preside Multiservice Data Manager*
MDMWeb	A Web interface provided with Preside MDM that allows you to perform fault management tasks from the web browser.
Media Access Control (MAC)	An address that is hardware coded into every Ethernet controller and is unique and cannot be changed. It is also the lower part of the second layer of the OSI Reference Model.
MER	See *Message Error Rate*
Message Error Rate (MER)	Similar to Bit Error Rate (BER), but related to whole messages instead of single bits.
Message number	The number of a selectable message corresponding to a predefined text for radio to dispatcher communications.
Message Trunking	A feature that allows radios in the same talkgroup call to continue utilizing a hang time to allow responding users to respond on the same channel assignment.
MG	Multigroup
MGCK	Modified Group Cipher key
MGEG	See *Motorola Gold Elite Gateway*
MIB	See *Management Information Base*
MiBAS	Motorola Integrated Billing and Administration System
Migration	The act of changing to a new Location Area in a network (either with different MNC and/or MCC) where the user does not have subscription (ITSI) for that network.
Mini Base Transceiver System (MBTS)	The Mini Base Transceiver System connects to the MSO through an X.21 or fractional E1 link. Contains up to 4 base radios, TETRA Site Controller, RF Distribution System, remote GPS receiver and power supply.The MBTS uses a hybrid combiner and is only available in dual diversity.
MLE	See *Mobile Link Entity*
MLS	Motorola Location Server
MMI	Man Machine Interface
MMC	Microsoft Management Console
MNC	See *Mobile Network Code*
MND	Motorola Networks Division
MNR	Motorola Network Router
MO	Mobile Originated
Mobile Country Code (MCC)	The Mobile Country Code is as defined in CCITT recommendation X.121 and is normally the same as used for GSM systems in that country. The MCC and MNC together form a unique TETRA system identifier that is broadcast by a Dimetra system over the air interface.

Item	Description
Mobile Link Entity (MLE)	TETRA air interface term, see Announced Cell Reselection
Mobile Network Code (MNC)	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.
Mobile Network Identity (MNI)	The identity that is broadcast by all TETRA base stations to uniquely identify the network.
Mobile Station (MS)	A two-way voice and data communications device used by Dimetra IP system subscribers. For the Dimetra IP system, the MS stores and utilizes an authentication key (K) for explicit authentication purposes and a static cipher key- trunked mode operation key (SCK-TMO) for implicit authentication and air interface encryption purposes.
Mobile Switching Office (MSO)	MSO is a collection of zone cores that coincides on a physical location and that may consist of several Local Area Networks (LANs) connecting various servers and clients into the network and one or more Wide Area Network (WAN) switches providing the Frame Relay (FR) for the Base Sites and Asynchronous Transfer Mode (ATM) for the Inter-MSO. An MSO may consist of one or more and up to seven Zone Cores connected via LANs and WAN links.
MoCa	Motorola California
Modulation Types	Methods used to modify the radio frequency carrier signal to carry speech and/or data information over the carrier signal.
MoM	See *Manager of Managers*
Motorola Gold Elite Gateway (MGEG)	The MGEG is the interface between the IP packet switched transport of a Dimetra IP System and the circuit switched transport of the Gold Series system and the telephone interconnect system.
Motorola Telephone Interconnect Gateway (MTIG)	The MTIG acts as a gateway in the TI architecture and provides transcoding of voice between the external PBX and the Dimetra IP network.
Motorola Transceiver Station (MTS)	A site connected to a Dimetra master site via a site link. A Dimetra MTS site consists of 1 (MTS1), 2 (MTS2) or 4 (MTS4) base radios and a site controller. RoHS and WEEE compliant.
MoU	Memorandum of Understanding
MR	See *Managed Resource*
MS	TETRA Mobile Station (portable and mobile radios). See *Mobile Station*
MSEL	See *Multiselect*
MSFC	Multilayer Switch Feature Card
MSI	Microsoft Installer
MSK	Minimum Shift Keying. A smooth transition form of PSK.
MSMQ	Microsoft Message Queues
MSO	See *Mobile Switching Office*
MSO CSMS	A CSMS that operates on MSO level.

Item	Description
MT	Mobile Terminal
MTBF	Mean Time Between Failures
MTIG	See *Motorola Telephone Interconnect Gateway*
MTS	See *Motorola Transceiver Station*
MTU	Maximum Transmission Unit
MultiCADI	Multi CADI provides an expansion of the CADI allowing multiple CADI clients and inter zone/cluster routing of commands and events.
Multilink Frame Relay	This feature provides a cost-effective way to increase bandwidth for particular applications by enabling multiple serial links to be aggregated into a single bundle of bandwidth. Multilink Frame Relay is supported on User-to-Network Interfaces (UNI) and Network-to-Network Interfaces (NNI) in Frame Relay networks.
Multizone COAM	Multizone COAM is a multiple zone Dimetra IP system that is customer-owned and operated. The customer has purchased the perimeter protection (NIB) option but is self-maintaining.
Multicast Traffic	IP Multicast traffic is more efficient than normal unicast transmissions because the source can send a message to many recipients simultaneously. One-to-one communication for each source destination pair is not required. IP Multicasting allows many recipients to share the same source. This means that just one set of packets is transmitted to send the same information to many destinations.
Multicluster System	System configuration with up to 16 clusters and a maximum number of 56 zone cores in total. The clusters are individually configured and managed. Multicluster network management capabilities also allow integrated configuration and management across clusters. Through proper configuration, mobile stations can operate and communicate with other mobile stations in other clusters.
Multigroup	A talkgroup composed of other talkgroups.
Multiselect (MSEL)	Dispatchers can select several talkgroups at once for dispatching, using a single channel resource.
Multi-slot Packet Data Channel	Multi-slot Packet Data Channels (PDCHs) comprise between 2 and 4 timeslots configured to form a single logical channel. A multi slot PDCH can provide higher data throughput than a single slot PDCH.
Mute	A control signal used by the repeater to quiet audio and break the in-cabinet repeat.
MUX	Multiplex/Multiplexer
MZC 5000	Zone Controller equipped with a Netra 240 server.
MZS	Multizone System
NACK	Negative status acknowledgment
NAM	Network Analyser Module which is part of the Ethernet LAN Switch
NAT	Network Address Translation
Nationwide	See *Multicluster System*
NBI	See *North Bound Interface*
NE	Network Element. See *Managed Resource (MR)*
NETIP	Network IP (IP Network)

Item	Description
Network Configuration Tool (NCT)	An engineering tool for managing and configuring network devices in a Dimetra IP Compact system. NCT is installed on an NM Client PC
Network Information Service (NIS)	A system that allows files such as hosts passwords, and so on, to be updated in only one place and shared across multiple hosts
Network Interface Barrier (NIB)	The Network Interface Barrier (NIB) is the barrier between the RNI and the CEN that makes up the secure boundary and therefore contains the network security functions such as Firewalls
Network Management (NM)	Network Management consists of a set of software tools that supports the management of a complex radio communications system and its component parts, which include radios, computers, and internetworking components.
Network Management Client	The Network Management Client is a Windows based PC running the various network management client applications accessing the network management servers
Network SAP Address (NSAP Address)	Addresses that belong to other (non-TETRA) addressing domains. These other domains include ISDN, PSTN and PDN domains.
Network Time Protocol (NTP)	A protocol used to provide a time and date reference to all IP connected system elements (NTP clients) that support the NTP protocol.
Network Time Server (NTS)	The NTS is a server that acts both as an NTP server and as clock reference for the CNE equipment.
Network Transport Management Server (NTMS)	NTMS provides the backup and restore management for the HP 5308XL LAN switch, Cisco Catalyst 6509 LAN switch, and the Nortel 7480 WAN switch.
NI	Network Interface
NIB	See *Network Interface Barrier*
NIC	1. Network Interface Card (Ethernet Card). 2. Network Interface Controller.
NICE	Various equipment used for call logging purposes at a Console Site office.
NIS	See *Network Information Service*
NLB	Network Load Balancing
NM	See *Network Management*
NMC	Network Management Centre
NMS	Network Management System. See *Manager of Managers (MoM)*
NMT	Network Management Terminal
NNM	Network Node Manager
Nominal radio coverage area	The nominal radio coverage area is the geographical area over which the radio transmission performance exceeds a defined level. Note: The boundary of the nominal radio coverage area is defined by a Bit Error Ratio (BER) contour as defined in ETS 300 392-2 [17], clause 6.

Item	Description
North Bound Interface (NBI)	North Bound Interface (NBI) describes an interface offered by many NMS products, such as the UEM. NBI allows for NMS features, functions, and data to be accessible for an OSS (MoM).
NS	Network Security
NSC	Normal Synchronization Configuration
NSM	Juniper NetScreen-Security Manager
NSMS	Network Security Management Subsystem
NT	1. New Technologies. A Microsoft Windows® environment 2. Network Termination
NTM	Network Transport Management (Replaces TNM)
NTMS	See *Network Transport Management Server*
NTP	Network Time Protocol.
NTS	See *Network Time Server*
OAM	Operational Administration and Management
Object	A term referring to a system resource manipulated through the Dimetra Manager.
On/off hook signalling	A signalling procedure which includes an alerting process to the called user. The calling user should wait for an explicit response from the called user that he has answered before the call can be set-up.
Open Systems Interconnect (OSI)	The OSI model is an international standard layered reference model that defines a generalized communication system. It shows how the functions in a communication system can be divided into seven functional layers
OS	Operating System
OSI	See *Open Systems Interconnect*
OSI Model	An international standard layered reference model that defines a generalized communication system. It shows how the functions in a communication system can be divided into seven functional layers.
OSPF	Open Shortest Path First
OSS	Operations Support Subsystem. See *Manager of Managers (MoM)*
OTAK	Over-The-Air-Key management
OTEK	Over-The-Ethernet-Key management
OTAR	Over-The-Air-Rekeying protocol. Used in connection with Air Interface Encryption
Outbound Function	initiated by RCM user and sent from the RCM to a target radio
P-ISSI	Permanent ISSI
P25	APCO's Project 25
PA	Power Amplifier
PAP	Push Access Protocol
PABX	Private Automatic Branch Exchange, also called PBX

Item	Description
Packet Data Gateway (PDG)	One PDG is made up of one PDR and one RNG. A Packet Data Gateway (PDG) provides IP connectivity between host applications connected to Dimetra Mobile Stations or between a host application connected to a Dimetra Mobile Station and a host application connected through the Dimetra Master Site.
Packet Data Mode (PDM)	A data mode selected from the radio. It offers the possibility of transferring data in the packet data format.
Packet Data Prioritization	Delivers downlink data according to priority set by the end-user application rather than determined by order of arrival. This allows high priority data to be delivered prior to any lower priority data in queue.
Packet Data Router (PDR)	The Packet Data Router is one of the two software packages in the Packet Data Gateway. The PDR handles the IP functionality. See also RNG. The two software packages, PDR and RNG, cannot function as stand alone applications, that is both must be in operation before PDG functionality is available.
Packet Data Service (PDS)	Packet Data Service is a TETRA bearer service that allows IP hosts to communicate using the Internet Protocol.
Participating Zone	For a particular talkgroup call, is a zone that has talkgroup members A zone ‘participating' in a particular talkgroup call, but is NOT the Controlling Zone.
Participating Zone Controller	A Zone Controller that is active in a call or busy but that is not in overall control of the call.
Patching Talkgroups	By selecting two of more talkgroups, dispatchers can join members of talkgroups for normal message trunking operations.
Patch Panel	Switches all the links on the interface to one of the routers connected to it.
PB (R3.x & R4.0)	PathBuilder
PBX	Private Branch Exchange
PCI	Peripheral Component Interconnect
PCM	See *Pulse Code Modulation*
PD	Packet Data
PDCH	Packet Data Channel
PDCIA	Personal Computer Memory Card International Association: A standard that defines I/O interface and software specification for 68 pin connector interface cards (memory, modem, and so on).
PDEG	Packet Data Encryption Gateway
PDG	See *Packet Data Gateway*
PDN	Packet Data Network
PDR	See *Packet Data Router*
PDR/RNG/SDR - Active	The device that currently is delivering service (packet data service or short data service)
PDR/RNG/SDR - Standby	The device that is standby for the active device.that is the standby does not currently deliver service (packet data service or short data service)
PDS	See *Packet Data Service*
PDU	Protocol Data Unit

Item	Description
PEI	Peripheral Equipment Interface
Peripheral Network Router	The Peripheral Network Routers allow communication between DeMilitarized Zone (DMZ) subnets.
Performance Management	Pertains to monitoring, controlling, and optimizing the utilization of system resources.
Performance Reports	These applications allow you to capture system wide and zone wide activity data.
Permanent Virtual Circuit	A virtual circuit that is permanently available. The only difference between a PVC and a switched virtual circuit is that an SVC must be re-established each time data is to be sent. Once the data has been sent, the SVC disappears. PVCs are more efficient for connections between hosts that communicate frequently.
PIM-SM	Protocol Independent Multicast-Sparse Mode
PIN	Personal Identification Number
PKI	Public Key Infrastructure
PN	Peripheral Network
PN Router	Peripheral Network Router
Point-to-MultiPoint EVC	A layer 2 or layer 3 connection that associates two or more UNIs between one core router and multiple BTSes over Ethernet GBN. In this deployment multiple IP tunnels are configured over one EVC.
Point-to-Point EVC	A layer 2 or layer 3 connection that associates two UNIs between one core router and one BTS over Ethernet GBN. Each IP tunnel is configured over dedicated EVC.
Positive subscriber list	A feature enabling radios to use the system until they are deleted from the database.
PPC	See *Pre-emptive Priority Call*
PPP	Point to Point Protocol
PrC	See *Provisioning Centre*
PRC	Primary Reference Clock
Pre-emptive Priority Call (PPC)	The Pre-emptive Priority Call (PPC) feature allows enabled talkgroups, multigroups and radio users to be given higher priority for the allocation of traffic resources.
Preside Multiservice Data Manager (MDM) (R5.0 & R5.1)	A network management application that manages the WAN switch. Preside MDM resides on the WAN Switch Management Server (WSMS).
Primary Ethernet link	IP tunnel encapsulating all Dimetra traffic transported over GBN network and assigned higher routing metric than the secondary Ethernet link associated with the same deployment. It may also refer to physical Ethernet link over which the primary IP tunnel is transported.
Primary Rate ISDN	ISDN channels delivered on a 2Mbit/s line.
Primary Talkgroup	Talkgroup configured for a radio user determining which RCM(s) should receive the corresponding radio events.
Private Call	An "individual" call between two radios or between a radio and a console operator.

Item	Description
Private Radio Network Managment Suite Application Launcher	The Private Radio Network Management Suite Application Launcher is the single entry to all the management applications on a Dimetra system.
PRNM	Private Radio Network Management
PRNMS Application Launcher	See *Private Radio Network Management Suite Application Launcher*
PROM	Programmable Read Only Memory
Provisioned Data	Provisioned Data give users access to data repositories or grant authorization to systems, networks applications and databases based on a unique user identity
Provisioned Unique Radio User	A Radio User is considered provisioned unique at the UCS level when its ISSI value falls into the Individual Subscriber Map range (of the last submitted Home Zone Map) of a local zone which belongs to a home cluster.
Provisioned Unique Talkgroup (or Multigroup)	A Talkgroup (or Multigroup) is considered provisioned unique at the UCS level when the ID of a Talkgroup or Multigroup falls into a Group Map range (of the last submitted Home Zone Map) of a local zone which belongs to a home cluster.
Provisioning Centre (PrC)	The PrC consists of a Client/Server and database application. The PrC SW will generate, store, and track the delivery of the K and the SCK TMO from the PrC to the MS. The PrC interfaces with the KVL to transport and confirm delivery of keys to the MS. Once keys are provisioned, the PrC will provide derived key material through an electronic file. This file will be written to a CD and be provided to the Dimetra AuC, or other non-Dimetra network key management application.
PS	Presence Server
PSK	Phase Shift Keying
PSM	Public Safety Microphone
PSTN	Public Switched Telephone Network
PSU	Power Supply Unit
PTT	See *Push-to-Talk*
PTT message	The indication when a call begins informing the dispatcher of the type of call, current talkgroup or multigroup, and the time of the call request.
Pulse Code Modulation (PCM)	The type of modulation used over T1 and E1 communication facilities.
Push-to-Talk (PTT)	Button on a Mobile Station radio unit that allows the subscriber to transmit.
PVC	See *Permanent Virtual Circuit*
QAM	Quadrature Amplitude Modulation
QoS	See *Quality of Service*
QSIG	Q-reference point Signalling
Quality of Service (QoS)	Refers to certain characteristics of a Network Connection (NC) as observed between the NC end points which are attributable solely to the Network Service (NS) provider.
R-CEN	Red CEN (trusted)

Item	Description
R-ISSI	Radio ISSI
Radio	A two-way communication device used for voice and data. Referred to as Mobile Station in the TETRA standard.
Radio activated deregistration	A radio function to send in a deregistration signal when turning off power or going to another trunked or conventional personality.
Radio Control Manager (RCM)	RCM is a software application which runs at the System Manager and is primarily used by certain Console dispatchers, typically supervisors.
Radio Frequency (RF)	General term for the range of frequencies used in radio communication systems.
Radio Network Gateway (RNG)	The Radio Network Gateway is one of the two software packages in the Packet Data Gateway. The RNG handles the BTS interface. See also PDR. The two software packages, PDR and RNG, cannot function as stand alone applications, that is both must be in operation before PDG functionality is available.
Radio Network Infrastructure (RNI)	The Radio Network Infrastructure is a term for the Dimetra specific infrastructure, that is the system excluding the DMZ and the CEN.
Radio Query Tasks	A set of dispatcher commands to obtain information on radio users in the Dimetra system.
Radiocheck	A Radio Query Task command the dispatcher uses to verify registered radio users.
RADIUS	Remote Authentication Dial-in User Service
RAG	Resource Allocation Group
RAID	See *Redundant Array of Independent Disks*
RAIM	Receiver Autonomous Integrity Monitoring. This feature is provided to handle a specific GPS satellite which is known to provide a low quality signal.
RAM	Random Access Memory
Random Access	The method by which a Mobile Station transmits unsolicited requests to the BTS. This might occur in the case of specific periods where Mobile Stations are permitted to transmit requests.
Ranking	A procedural method of listing cells in descending order from the most suitable for communication to the least suitable for communication. The method comprises multiple calculations of C4 parameters and C3 parameters, defined in ETS 300 392-2 [17], clause 10. As inputs to the ranking procedure are: - outputs from the monitor process (for example C2 parameters); - outputs from the scanning process (for example C1 parameters); - network parameters received in the MLE broadcast.
RAPI	Radio Applications Programming Interface
RAS	Remote Access Server
RCM	See *Radio Control Manager*
RDBMS	Relational Database Management System
RDP	Remote Desktop Protocol.
Recent System User (RSU)	A radio user recently active on the system receives a higher priority for service requests before new users who have not been assigned channel resources.
Red Key	An encryption key that is not encrypted by another key.

Item	Description
Redundant Array of Independent Disks (RAID))	A technology which is a combination of hardware and software functionality that improves data availability on drives by using a portion of the array to store redundancy information.
Redundant Switchover Module (RSOM)	The Redundant Switchover Module (RSOM) in a call processing hardware configuration is the mechanism used to switch manually from the active zone controller to the standby zone controller (and vice versa) to maximize system availability and to maximize system performance during hardware or software upgrade procedures.
Registration	The act of becoming an active and recognised TETRA user by exchange of ITSI with the Switching and Management Infrastructure (SwMI).
Relay Panel	See *Patch Panel*
Remote Console	A console located off the master site through remote access equipment.
Remote Monitor	The instruction sent to a radio that causes the radio to key its transmitter and open its microphone.
Remote Operator Console Interface (ROCI)	An interface board used in a remote operator position to provide connections between the Console Interface Electronics and telecom lines to a Central Electronics Bank at another location.
Remote Site	See *Enhanced Base Transceiver System or Control Site*
Requesting Zone	The actual Zone the radio is registered with at that moment if it is not the selected home Zone of the talkgroup
Resource Manager Essentials (RME)	A suite of Web-based applications that manage the LAN switches and the MSFC router cards on the LAN switch.
Resources	A general term for network infrastructure and radio channels.
RF	See *Radio Frequency*
RF Distribution System (RFDS)	Remote Base Transceiver System (BTS) site component that combines inputs from the base radios and combines them to feed one or more antennas.
RFDS	See *RF Distribution System*
RIP	Routing Information Protocol
RM	1. Resource Manager 2. Radio Manager
RMC	Receiver Multicoupler
RJ45	A serial connector similar to a standard telephone connector, except it houses eight wires instead of four
RME	See *Resource Manager Essentials*
RNG	See *Radio Network Gateway*
RNI	See *Radio Network Infrastructure*
Roaming	The movement of a radio user from one site to another site. The radio registers and affiliates on each site as the user moves from one coverage area to another.
ROCI	See *Remote Operator Console Interface*
RoHS	Reduction of Hazardous Substances

Item	Description
Router Manager User Interface (UI)	A configuration management application that enables you to group routers so you can backup, restore, and reboot more than one router at a time. You can also use Router Manager to maintain router configuration and software files on the FullVision® server and view router information, perform tasks, and launch WebLink sessions. Router Manager UI resides on the FullVision® INM server.
RP	Rendezvous Point
RSM	Remote Speaker Microphone (for a Mobile Station).
RSOM (R5.0 & R5.1)	See *Redundant Switchover Module*
RSSI	Radio Signal Strength Indicator
RSS	Radio Service Software. See *CPS*
RSU	See *Recent System User*
RTC	Real Time Clock
RTP	1. Real-time Transport Protocol 2. Real Time Processor
RUA	Radio User Assignment
RUI	Radio User Identity
RUN	Radio User Number
Ruthless Pre-emption	A method of acquiring a channel for an emergency call in a busy condition. A call with a lower priority is terminated to release a channel for assignment to the emergency call.
RX	Receiver
S&F	Store and Forward feature
SAC	Subscriber Access Control
SAI	Session Authentication Information
SACCH	Slow Associated Control Channel.
SAS	Symantec AntiVirus™ Server. Serial Attached SCSI
SATA	Serial ATA
SAV	Symantec AntiVirus™ Client
SAVCE	Symantec AntiVirus™ Corporate Edition.
SC	See *Site Controller*
SCCH	Secondary Control Channel
SCI	Serial Communications Interface.
SCK	See *Static Cipher Key*
SCKN	Static Cipher Key Number.
SCK-TMO	See *Static Cipher Key-Trunked Mode Operation Key*
SCO	See *Site Capacity Option*

Item	Description
Screened Network	The screened network design is seen as a framework or a template for how to make RNI provided services available to non RNI users without having the non RNI users contacting the core of the RNI directly. The purpose of a screened network is: 1. to protect the feature devices it is hosting 2. to protect the RNI 3. to enable the RNI to manage the feature devices
SD	Short Data
SDEG	Short Data Encryption Gateway
SDK	See *Software Development Kit*
SDR	See *Short Data Router*
SDS	See *Short Data Service*
SDS - TL	Short Data Service Transport Layer
SDTS	Short Data Transport Service
Secondary Ethernet link	IP tunnel encapsulating all Dimetra traffic transported over GBN network and assigned lower routing metric than the primary Ethernet link associated with the same deployment. It may also refer to physical Ethernet link over which the secondary IP tunnel is transported.
SEI	Service Endpoint Interface
SEK	See *Signalling Encryption Key*
Secure Database	A database in encryption mode which holds all of the encryption keys.
Services	The TETRA standard offers a range of services.
Serving cell	The cell that is currently providing service to the Mobile Station (MS).
Session Initiation Protocol	A signalling protocol used by MTIG.
SFS	Store and Forward Server
SGSN	Serving GPRS Support Node. The PDG acts as SGSN.
Shared TLAN	An optional feature in Dimetra that lets seven zones share three HP LAN switches.
Short Data Router (SDR)	A Short Data Router (SDR) provides TETRA short data services between host applications connected to Dimetra Mobile Stations or between a host application connected to a Dimetra Mobile Station and a host application connected through the Dimetra Master Site. Furthermore the SDR provides TETRA short data services directly between two Dimetra Mobile Stations or directly between a Dimetra Mobile Station and a host application connected through the Dimetra Master Site.
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 TSI. An SSI is only unique within one TETRA subdomain (one TETRA network). **Note:** There are four different types of SSI (see subclause 7.2.3): a) Individual SSI (ISSI); b) Group SSI (GSSI); c) Alias SSI (ASSI); d) Unexchanged SSI (USSI).

Item	Description
SIB	Service Interface Barrier is the barrier between the RNI and the infrastructure of the service organization.
Signalling Encryption Key (SEK)	The SEK is used for encrypting and decrypting KMMs.
Signalling System 7 (SS7)	A signalling protocol used in the Integrated Services Digital Network (ISDN) that controls how the ISDN network is managed.
SIM	Subscriber Identity Module
SIMM	Single In-Line Memory Module
Simple Network Management Protocol (SNMP)	The Simple Network Management Protocol (SNMP) is a set of protocols used for managing complex networks. It is an application layer protocol that facilitates the exchange of management information between network devices. It is also a part of the Transmission Control Protocol/Internet Protocol (TCP/IP) suite. A means to monitor and set network configuration and runtime parameters.
SIP	See *Session Initiation Protocol*
Site	This normally refers to a remote base station site.
Site Capacity Option (SCO)	The Dimetra SCO System is a downsized version of theDimetra IP Multizone system. The Dimetra SCO System consists of one zone only.
Site Controller (SC)	The Site Controller is capable of controlling up to 8 BRs (32 logical channels) and contains the SRI (Site Reference ISA) time and frequency reference module. The function of the module is to provide a precise timing reference and a highly stable frequency reference for the BTS. An optional second Site Controller can be added to an EBTS, but not to an MBTS, for redundancy.
Site Handover	When a roaming Mobile Station in handing over within the same zone or to a new zone.
Site Link	Wide area network (WAN) communication link that connects a Dimetra master site to a remote site.
Site Link Multiplexer (SLM) (R3.x & R4.0)	The Site Link Multiplexer combines all the necessary control, management, IP data, and voice/data traffic into one n * 64 kbit Frame Relay formatted link between the master and remote sites. This allows efficient use of the links between the remote and master site which are often expensive leased links. The SLM also ensures system synchronization to the network, that is the provider of the leased synchronous lines.
Site Registration and Affiliation	Automatic radio transmission of talkgroup affiliation and radio ID when powering up or entering a new site. This site registration information enables the Zone Controller to locate all active radio users and talkgroup members.
Site switch activated deregistration	When a radio registers on a new site, the Zone Controller deregisters the radio from its previous trunking site and registers it on the new site.
Site Switch Deaffiliation	When a radio changes sites and affiliates on the new site, the Zone Controller automatically deaffiliates the radio from its previous trunking site.
Site trunking mode	Local trunking operations after remote site and audio link failures. The site controller performs all call processing. No communication links exist to other sites.
Site Wide Call (SWC)	This feature is similar to system wide call in SMARTNET II. A site wide call goes out to all radio users and talkgroups registered on the sites selected for the call.
SLG	Self Learning Group

Item	Description
SLM (R3.x & R4.0)	See *Site Link Multiplexer*.
SmartCenter	Checkpoint's Firewall / Security management console suite.
Smart Phone Interface (SPI)	One of the telephone interconnect interfaces for the CENTRACOM consoles.
SMS	Secure Manager Subsystem
SMSO	Shared MSO
SNDCP	Sub Network Dependent Convergence Protocol
SNMP	See *Simple Network Management Protocol*.
Software Development Kit	Also know as API, an interface implemented by a software program which enables it to interact with other software.
Software Download	A System Manager application that allows remote software upgrades on the EBTS/MBTS.
SONET	See *Synchronous Optical Network*.
Source Site	The site where a radio user initiates any of the call types.
SQL	Structured Query Language
SPAS	System Parent AntiVirus Server
SPI	See *Smart Phone Interface*
SRAM	Static Random Access Memory.
SRI	Site Reference ISA
SS7	See *Signalling System 7*
SSC	Symantec System Center™
SSI	Short Subscriber Identity
SSL	Secure Socket Layer
SSS	See *System Statistics Server*
Standard IP Plan	Configuration of the system, where zone octet is equal to zone ID for all 56 zones and the cluster octet is equal to the cluster ID for all 16 clusters.
Static Cipher Key (SCK)	Key used for encryption between subscribers and BTS base radio.
Static Cipher Key-Trunked Mode Operation Key (SCK-TMO)	A key used to provide over-the-air encryption services for mobile stations operating in a trunking mode. All MSs and BTS site equipment within the radio system share a unique SCK-TMO key. A static cipher key is imported or typed into the Authentication Center (AuC) and is distributed to all base radio controllers using its zone key encryption key (KEKz).
STM	See *System Timer Module*
Storm Plan	An RCM optional function to regroup talkgroups for special situations, such as disasters or crowd control. The feature allows preset procedures for quick and efficient manipulation of emergencies and planned events.
Subnetwork	A collection of equipment and physical media which forms an autonomous whole and which can be used to interconnect real systems for purpose of communication.
Subscriber	A Mobile Station, with Dimetra software installed.

Item	Description
Supplementary service	A service which modifies or supplements a bearer service or a teleservice. A supplementary service cannot be offered to a customer as a stand alone service. It should be offered in combination with a bearer service or a teleservice.
SVC	Switched Virtual Circuit. See *PVC*
SWC	See *Site Wide Call*
Switching and Management Infrastructure (SwMI)	The TETRA term for FNE. See *FNE*
SWDL	Software Download feature
SWDLM	Software Download Manager
SwMI	See *Switching and Management Infrastructure*
SWTG	Site Wide Talkgroup
Symmetricom S200	The SyncServer Network Time Server offering protocols for synchronizing equipment over a network
Synchronous Optical Network (SONET)	A synchronous optical hierarchical time division multiplexing system that operates at speeds referenced to 51.84 Mbps, commonly referred to as OC1. OCn data speeds are multiples of the basic data rate transfer of OC1.
System CSMS	A CSMS that operates on system level.
System	A System is a collection of Clusters where the maximum number of zones in all the clusters cannot exceed 56.
System ID	A unique identification used as a reference for the system licence keys and for CCMS.The system ID is required when ordering additional licences or upgrading to ensure the original licence credits are retained. The system ID is not broadcast by the Dimetra system.This ID should not be confused with the Mobile Network Code (MNC) that is broadcast by a Dimetra system over the air interface.
System Statistics Server (SSS)	The SSS is a UNIX based server that provides data storage for statistics data. It allows for system wide reporting functions to be stored.
System Timer Module (STM)	This CEB module controls the timing signals for data and audio processing.
T1	Digital carrier facility used for transmission of data through the telephone hierarchy. T1 links are mostly used in the US and Japan. E1 links are used in most other countries. Both T1 and E1 are composed of DS0s, the basic 64 Kbps path that makes up these links.
Talkgroup	A group of radio users that can share calls and messages as a group. Normally a talkgroup is comprised of users who normally have a need to communicate with each other.
Talkgroup Scan	A feature that allows a Mobile Station to scan those talkgroups that have an affiliated member at the site of the scanning radio. The Talkgroup Scan list(s) must be programmed in the radio.
Talkgroup site access	The Zone Manager can limit access by talkgroups to specific sites and the controller rejects call requests on non-designated sites. Emergency calls can access any site.
Target talkgroup	Talkgroup assignment made by a dispatcher for communications between regrouped radio users.
Task	A dynamic function command directing radios and talkgroups to execute an action.

Item	Description
Task indicator	A screen indicator to inform dispatchers that a task requires service.
Task work window	An interactive window that allows dispatchers to enter information into the RCM database.
TCH	Traffic Channel
TCP/IP	Transmission Control Protocol / Internet Protocol
TDMA	See *Time Division Multiple Access*
TE	Terminal Equipment
TEA1/TEA2/TEA3 (R5.2)	TETRA Encryption Algorithms.
TEDS	TETRA Enhanced Data Services
TEI	TETRA Equipment Identity
TEK	See *Traffic Encryption Key*
Telephone Interconnect	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.
Telephone Interconnect Gateway (TIG)	Dimetra master site equipment providing a computer telephony-based Telephone Interconnect Gateway function providing easy adaptation of current and new analogue and digital line interfaces. The Telephone Interconnect Gateway connects to a PBX via QSIG.
Teleservice	End to end application that allows for example group calls, emergency calls and private calls.
Telsis	An infrastructure and services vendor.
TESS	TETRA EBTS Service Software. See *EBTS Service Software*
TETRA	**TE**rrestrial **T**runked **RA**dio. The digital trunked radio standard produced by ETSI providing detailed telecommunications specifications to which Base Stations and Mobile Stations should adhere.
TETRA Equipment Identity (TEI)	An electronic serial number that is permanently embedded in the TETRA equipment. A TEI is embedded in both Mobile Stations (MSs) (in the MT) and in LSs (in the NT).
TETRA site controller (TSC)	The TETRA Site Controller is capable of controlling up to 8 BRs (32 logical channels) and contains the SRI (Site Reference ISA) time and frequency reference module. The function of the module is to provide a precise timing reference and a highly stable frequency reference for the BTS. An optional second Site Controller can be added to an EBTS, but not to an MBTS, for redundancy
TFTP	Trivial File Transfer Protocol
TG	See *Talkgroup*
TI	See *Telephone Interconnect*
TIA	Telecommunications Industries Association
TIG	See *Telephone Interconnect Gateway*

Item	Description
Time Division Multiple Access (TDMA)	A method that divides a single communications channel into a number of separate channels by dividing a fixed time period into time slots. Multiplexing scheme used over T1 and E1 and other transmission media for transferring multiple streams of voice and data over the same physical transmission medium.
Time slot	Element of the TETRA frame structure corresponding to one traffic channel.
TIP	TETRA Interoperability Profile
TLAN	Transitional Local Area Network.
TM-SCK	Trunked Mode Static Cipher Key
TMI	TETRA Management Identity
TMO	Trunked Mode Operation
TMSS	Transmit Mode Selector Switch
TNCT	Transport Network Configuration Tool
TNM	Transport Network Management, replaced by NTM
TNP1	TETRA Network Protocol 1
TNPS	See *Transport Network Performance Server (TNPS)*
Top of queue	A method of acquiring a channel for an emergency call by transmission trunking calls with the lowest priority. When a call ends, the controller assigns the available channel to the emergency call.
TPI	Talking Party Identification
Traffic Channel	Traffic channels are logical channels used to carry user data over the air interface. Traffic channels may be assigned to carry speech or packet data. Each Base radio in a BTS supports up to 4 traffic channels.
Traffic Encryption Key (TEK)	The TEK is also known as a traffic key. An encryption key used for voice and data.
Traffic Packet	Term used to describe the voice signal sent between the BTS and a Mobile Station.
Trak 9100	A system providing ultrastable frequency time and reference signals, referenced to the GPS satellite system.
Transcoder (XCDR) (R3.x & R4.0)	Dimetra master site equipment that converts audio streams between TETRA ACELP compressed voice and 64 Kbps PCM voice. Pulse Code Modulation voice is used for the Dispatch Consoles and the Telephone Interconnect Gateway.
Transmission Delay	Transmission of circuit mode voice or data in a digital communications network is subject to delay. The transmission delay is defined as the time from the voice or data input at the transmitting end to the time at which the data is received at the receiving end. In the case of audio, for example, this is the time from microphone input to speaker output.
Transmission Trunking	Trunking application that requires radios in a talkgroup to return to the control channel and receive a new channel assignment after each Push-To-Talk (PTT).
Transport Network Performance Server (TNPS)	The HP NetServer server where the InfoVista application resides.
Truncate	To shorten or cut off. For example, if a voice transmission is truncated, the receiving radios do not hear part of the message.

Item	Description
Trunking	The automatic and dynamic sharing of a small number of communication channels between a large number of radio users.
TSC	See *TETRA Site Controller*
TSI	TETRA Subscriber Identity
TTR	TETRA Association Technical Report
TRS	TETRA Requirements Specification
TX	Transmitter
TXI	Transmit Inhibit
UCL	User Configuration of Logging interfaces
UCM	1. See *User Configuration Manager* 2. Universal Crypto Module
UCS	See *User Configuration Server.* (R3.x) See *User Configuration Subsystem*
UCS Synchronisation Tool	The User Configuration Server (UCS) Synchronisation Tool provides automated intercluster configuration of some of the UCS objects that require to be registered in all clusters in a multicluster system.
UDP	User Data Protocol
UEM	See *Unified Event Manager*
UI	1. User Interface. 2. See *Router Manager User Interface (UI)*
UKEK	See *Unique Key Encryption Key*
Unannounced Cell Reselection	This type of cell reselection occurs during a call when the Mobile Station (MS) suddenly loses cell coverage before it has found an alternative cell. The MS has no time to inform the serving cell that it is about to change cell and so simply scans for an alternative cell, registers with the new cell, if necessary, and attempts to reconnect the call. This results in a break in communication which can be several seconds.
UNC	Universal Naming Convention (specifies a common syntax to describe the location of a network resource, such as a shared file).
Undeclared Cell Reselection	This type of cell reselection occurs when the Mobile Station (MS) is not in a call and is idle. When an MS then decides that a better cell is available and hence wants to change cell, it will then switch to the new cell and register itself. The changeover will be very fast (less than 500 milliseconds) as the MS need not to synchronize or search for any new cell as this already has been done while still on the ‘old' cell.
Unicast Traffic	IP traffic that requires one-to-one communication for each source destination pair. This means that multiple identical packets must be transmitted to send the same information to many destinations.
Unified Event Manager (UEM)	Unified Event Manager (UEM) is an application that provides reliable fault management services for Dimetra IP Systems.
Unique Key Encryption Key (UKEK)	A key used by the key variable loader (KVL) device to communicate with other secure devices. This UKEK key is used for secure communications between the PrC and KVL. An encryption key used solely to encrypt traffic keys targeted for an individual secure entity.

Item	Description
Uplink	The radio frequency communications path from the Mobile Station to the BTS. Also referred to as the BTS receive path.
UPS	Uninterruptable Power Supply. Highly recommended to supplement the standard battery backup in the fault tolerant Zone Controller and for network management computer devices.
User	There are three types of users in a Dimetra system: individual radio users, console operators, and network manager users (administrators and maintainers of the system).
User Configuration Manager (UCM)	The User Configuration Manager (UCM) is a Windows based management application used to enter and maintain provisioning information and cluster level configuration data stored in the database on the UCS.
User Configuration Server (UCS) (R5.x) onwards	The User Configuration Server holds the database containing provisioning information and cluster level configuration data.
User Configuration Subsystem (UCS)(R3.x)	The User Configuration Subsystem consists of the User Configuration Subsystem Database Server and the User Configuration Subsystem User Server.
User Configuration Subsystem Database Server (R3.x)	The UCS Database Server is part of the User Configuration Subsystem and holds the database containing provisioning information and cluster level configuration data
User Configuration Subsystem User Server (R3.x)	The UCS User Server runs the applications accessing the User Configuration Server
User ID	User ID is sent to receiving Mobile Stations (MSs) at start of transmission. Also called Radio ID
User station (terminal)	A terminal with a monitor, keyboard, and mouse. Provides a user interface to the Dimetra applications and database via the Ethernet network
User Network Interface (UNI)	The physical demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber.
User-Based Security Model (USM)	The security model related to SNMPv3. Security is based on users who are assigned specific names, credentials, and privileges.
USM	See *User-Based Security Model*
UST	See *UCS Synchronisation tool*
UTC	Universal Time Coordinated. Indication of time, that is h:m:s
UTP	Unshielded Twisted Pair. Category 5 UTP is used in Dimetra systems for some Ethernet connections
V+D	Voice and data
VDTM	Virus Definition Transport Method
VICP	Very Intelligent Communications Processor
Virtual Local Area Network (VLAN)	A technology that allows the formation of Virtual Ethernet segments and subnets according to business needs, not cabling needs
Virtual Private Network (VPN)	A private communications network often used within a company, or by several companies or organizations, to communicate confidentially over a publicly accessible network.

Item	Description
Visited network	A network where a subscriber has an indirect subscription. This means that a valid subscriber identity is only allocated as part of the first network access.
Visitor Location Register (VLR)	The entity that is used to manage a local copy of zone specific information for individuals and Talkgroups. This includes subscriber database information as well as site location information for both the individual and the Talkgroup. There is a VLR associated with each zone in the system.
VistaPortal	A Web interface provided with InfoVista that is used to view reports from the web.
VLAMS	Voice, Location and Messaging Services
VLAN	See *Virtual Local Area Network.*
VLR	See *Visitor Location Register.*
VM	Virtual Machine
Voice Channel	When a call request is made by Mobile Stations the system will assign a voice channel for the call. Mobile Stations are informed of the assigned channel and are then permitted to transmit and receive speech on that channel.
VOIP	Voice over IP
VOX	Voice Operated Control
VPN	See *Virtual Private Network*
VPN-1	Checkpoint's VPN implementation
VPN-1 PRO	Checkpoint's combined VPN-1 and Firewall-1 software.
VRRP	Virtual Router Redundancy Protocol.
VU	Voice Unit.
WAN	See *Wide Area Network.*
WAN Switch Management Server (WSMS) (R5.0 & R5.1)	The Compact PCI server where the Preside MDM application resides.
WEBLink	A Web-based network management application for management of the routers. Router Manager provides a launch point for WEBLink.
WEEE	Waste Electrical and Electronic Equipment
Wide area call	A call using a channel resource at all sites in a wide area system.
Wide Area Network (WAN)	A transport network that delivers communication between two geographically separated areas.
Windows Terminal Service	Windows remote desktop.
WS-MSO	A WAN Shared MSO is a collection of LS-MSOs of four and up to 7 zones, which are physically colocated, where the Exit routers from each LS-MSO share one WAN switch for interzone connectivity.
WSMS (R5.0 & R5.1)	See *WAN Switch Management Server (WSMS).*
XEG	PDEG, SDEG or MDEG

Item	Description
XCDR (R3.x & R4.0)	Transcoder, See *Transcoder*
XML	Extensible Markup Language
X-Press Update	An update that contains only security content updates (protocol updates, new signatures, and security content bug fixes).
ZAMBI	1. See *Zone Ambassador Interface Board* 2. Zone Controller Ambassador Multiplex Interface
ZC	See *Zone Controller*
ZCM	See *Zone Configuration Manager*
ZDS	See *Zone Database Server*
Zeroize	To erase information, specifically, to write 0s to memory.
ZLM	See *Zone Link Multiplexer*
ZM	See *Zone Manager*
ZMS	See *Zone Manager Subsystem*
Zone	1) A geographical region covered by a Dimetra system. The zone design comprises sites to allow intrazone communications and roaming between sites/subsystems within a zone. 2) The equipment (Network Management, Data Management, Networking, Switching, Infrastructure, that is SwMi) that forms the central part of a Dimetra radio communications system with interfaces to air, telephone and other zones/radio systems.
Zone Ambassador Interface Board (ZAMBI)	Interfaces Embassy Switch with Zone Controller. A Board that acts as an interface between the Ambassador Electronics Bank (AEB) and the Zone Controller.
Zone Chooser	The Zone Manager window through which all Dimetra applications are opened.
Zone Configuration Manager	A Motorola software application that is used to configure zone parameters.
Zone Controller (ZC)	Dimetra master site equipment providing very fast call control for group communication in a wide area network. The Zone Controller supports Status.
Zone Core	Zone Core is a one ZC system, which is the central point for all the equipment necessary to control and manage the sites in a zone. BTS and control site equipment are not part of the zone core.
Zone Database Server (ZDS)	The Zone Database Server holds the database containing zone level configuration data.
Zone Level Trunking	Trunking operation is limited to the coverage area of one single Dimetra system.
Zone Link Multiplexer (R4.0)	Zone SLM. The ZLM ensures interzone connectivity. The ZLM is based upon the Zhone (Premisys) IMACS platform.
Zone Manager (ZM)	A network management product allowing configuration of the Dimetra system and system management activities. The Zone Manager interfaces the Zone Controller for software functions and database access.
Zone Manager Subsystem (R3.x)	The Zone Manager Subsystem consists of the Zone Database Server and one or more Zone User Server(s).

Item	Description
Zone Master Site	A Master Site containing a set of zone control equipment (for example Zone Controller, AEB, and so on) comprising a single zone.
Zone Statistics Server (ZSS)	The ZSS is a UNIX based server that provides data storage for statistics data. Each zone contains one ZSS for statistics that should be stored locally.
Zone User Server (R3.x)	The Zone User Server runs the applications accessing the Zone Database Server.
ZoneWatch	A Motorola software application that allows system managers to monitor activity within a zone.
ZSS	See *Zone Statistics Server*

Appendix B: CPS Glossary

Active document or file — The document in which you are working.

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

AIE — Air Interface Encryption provides confidentiality on the radio link over the air.

APAC — Asia Pacific region.

ASSI — Alias Short Subscriber Identity.

Audio Profile — represents radios audio characteristics that fit to a specific operating environment, for example Indoor for an office or Outdoor for high traffic noise. It is not recommended to edit it.

Audio Template — a baseline file for creating audio profiles. Audio experts prepare and modify audio templates.

BUP — Backup.

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

Call — There are two types of calls: individual call or group call. An individual call is a complete sequence of related call transactions between two radios in DMO. There are always two participants in an individual call. A group call is a complete sequence of related call transactions involving two or more DM-MSs. The number of participants in a group call is not fixed, but it is at least two. Participants may join (late entry) and leave an on-going group call.

CCK — Common Cipher Key. The infrastructure generates this key to protect a group address signaling and traffic. Also used to protect SSI identities (ESI).

Class — Also called the security class.

Class 1 — no encryption, may use authentication.

Class 2 — SCK encryption, ESI with SCK, may use authentication.

Class 3 — DCK encryption, ESI with CCK, authentication.

Clear — An application without encryption support.

CP — Codeplug. Repository of personality data for a radio. It includes features (also the selling features) and adjustable parameters.

Compatibility field — Codeplug fields that include identity information such as Model Type, Codeplug Structure Version, and Codeplug Default Version.

CPS — Customer Programming Software used to program Tetra radios.

CPV — Codeplug Value, clear-text file format that contains codeplug paths and values in lines; `<fullpath, value>`. It is not recommended to export and import CPV files, unless you have a thorough knowledge about the codeplug structure.

DCE — Data Communication Equipment.

DCK — Derived Cipher Key generated during authentication for protection of individually addressed signaling and traffic.

DCK — Digital Car Kit

DGNA — Dynamic Group Number Assignment allows a network operator or an authorized user to dynamically allocate talkgroups to selected radios over the air interface. Using supplementary services messages (SS-DGNA) the network operator can command the radio to add talkgroups to the radios talkgroup list, to attach or select these talkgroups, to delete talkgroups from the list, or modify parameters of existing talkgroups. A special feature

of the radio, if provisioned, causes a new group that is assigned by the SwMI to be automatically attached as the selected group, whether an attachment was received with the assignment. In order for an MS to be allowed to participate in communication of a given group, the MS must request and receive permission from the SwMI. This is called group attachment.

DMO — Direct Mode Operation a mode of simplex operation where radios may communicate using radio frequencies that may be monitored by, but which are outside the control of, the TETRA V+D network. DM is performed without the intervention of a base.

DMO Gateway — Direct Mode Operation Gateway: A device that provides gateway connectivity between DM-MS and the TETRA V+D network. The gateway provides the interface between the TETRA DMO and TETRA V+D modes. A gateway may provide only the gateway function (DM-GATE) or may provide the functions of both a DM repeater and a DM gateway during a call (DM-REP/GATE).

Dongle — USB stick with licenses for radio features.

Downgrade — to replace radio firmware with an older version and preserve User and Sensitive Data..

DTE — Data Radio Equipment.

DTMF — Dual Tone Multi-Frequency. 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.

EMEA — Europe, the Middle East and Africa regions.

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.

ESI — Encrypted Short Identity.

ESSC — EMEA System Support Center

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

Flash — a storage chip integrated in to radio hardware, that can be erased and reprogrammed.

Flashing — Writing a software image file to a radio.

Fly-out GUI element or menu — a popup menu that extends from other visual element. In CPS Plus, it is a right-side bar that can auto hide or 'fly out' to display connected radios.

GCK — Group Cipher Key. Predetermined cipher key used to provide confidentiality in Class 3 system with corresponding algorithm.

GCK KAR — Group Cipher Key Key Association Range

GPIO — General Programmable Input Output pins.

Group Call — an instant communication between users that belong to the same talkgroup.

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.

Hotfix — a special purpose file, used by service or support teams, that allows to apply a set of predefined settings to codeplugs. Hotfixes are similar to profiles but allow to modify not only user data but also calibration values, which are not available to a regular CPS Plus user.

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.

LIP — Location Information Protocol.

Local Site Trunking — 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.

LRPP — Location Request/Response Protocol. This protocol allows for a single and efficient format of passing location information (requests and responses).

MACE — Motorola Advanced Crypto Engine

MCCH — Main Control Channel. The principal common control channel transmitted by the infrastructure to control the radios in a cell.

MLE — Mobile Link Entity.

MMI — Man Machine Interface, relates to the CPS Plus and radios user interface.

NGCH — Next Generation Control Head.

OTAK — Over the Air Keying.

OTAR — Over the Air Rekeying.

PABX — Private Automatic Branch Exchange, allows to call local (office) extension numbers.

PABX Gateway — A device that provides connectivity from a TETRA user to a PABX subscriber and the other way around.

PDV2 — Permanent Disable Version 2; you can restore a disabled radio using CPS Plus.

PEI — Peripheral Equipment Interface.

PHF — Personal Hands-Free kit, in other words an earpiece or a handset.

Private Call — call between two and only individuals. 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.

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.

PTPC — Point-to-Point Call also known as Private Call.

PTT Button — Push To Talk button that initiates a group call.

RCU — Remote Control Unit, 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 — Receiver Signal Strength Indication.

RUA — Radio User Assignment.

RUI — Radio User Identity.

SCK — Static Cipher Key, used to provide confidentiality in Class 2 system with corresponding algorithm.

SDS — Short Data Services.

SDMO KAG — Secure Direct Mode Operation Key Association Group.

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.

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

SIM — Subscriber Identity Module a smart card that holds subscriber information (including the authentication key) and is inserted into the radio to grant its personality.

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

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.

SwMI — Switching and Management Infrastructure. The TETRA term for Fixed Network Equipment (FNE). It consists of the system components, that is, the Central Network Equipment located at the Master Site (or Mobile switching Office) and all the remote site equipment, but excludes the mobile equipment.

TEI — TETRA Equipment Identity, an electronic serial number that is permanently embedded in the TETRA equipment.

Talkgroup — A group of subscribers enabled to initiate and participate in a Group Call.

Telephone Interconnect — also knows as Phone Call.

TETRA — TErrestrial Trunked Radio. The digital trunked radio standard produced by ETSI providing detailed telecommunications specifications to which Base Stations and Mobile Stations should adhere.

TMO — Trunking Mode Operation.

Trunked — Trunked Radio Communications - 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.