EUROPEAN TELECOMMUNICATION STANDARD

DRAFT
pr **ETS 300 392-5**
May 1998

Source: TETRA

Reference: DE/TETRA-03001-05

ICS: 33.020

Key words: Data, TETRA, V+D, voice

Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 5: Peripheral Equipment Interface (PEI)

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
Internet: secretariat@etsi.fr - http://www.etsi.fr - http://www.etsi.org

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

Contents

Foreword 11

1 Scope 13

2 Normative references 13

3 Symbols and abbreviations 14
3.1 Symbols 14
3.2 Abbreviations 14

4 Overview of TETRA PEI 15
4.1 Introduction 15
4.2 Protocol architecture 16
4.2.1 AT Commands 16
4.2.2 Point-to-Point Protocol (PPP) and packet data 17
4.2.3 PPP and radio remote control 18

5 Mobile Termination (MT) operating states 18
5.1 "Command" state 19
5.2 "On-line command" state 19
5.3 "On-line data" state 19
5.3.1 Transparent mode data 19
5.3.2 PPP mode data 19
5.4 Transition between MT operating states 19
5.4.1 Transition from "Command" state to "On-line data" state 19
5.4.2 Transition from on-line "Command" state to "On-line data" state 19
5.4.3 Transition from "On-line data" state to "On-line command" state 20

6 Physical layer 20
6.1 Electrical characteristics 20
6.2 Physical connection 20
6.2.1 Physical requirements 20
6.3 Asynchronous transmission 21
6.4 Data transmission rate 22

7 AT command set 22
7.1 Introduction 22
7.2 AT command syntax 22
7.2.1 Command line 22
7.2.2 Information responses and result codes 23
7.3 ITU-T Recommendation V.25ter TE-MT interface commands 23
7.4 ITU-T Recommendation V.25ter general commands 24
7.5 Cellular DCE control commands 25
7.5.1 Request manufacturer identification +CGMI 25
7.5.1.1 Description 25
7.5.1.2 Defined values 25
7.5.1.3 Implementation 26
7.5.2 Request model identification +CGMM 26
7.5.2.1 Description 26
7.5.2.2 Defined values 26
7.5.2.3 Implementation 26
7.5.3 Request revision identification +CGMR 26
7.5.3.1 Description 26
7.5.3.2 Defined values 26
7.5.3.3 Implementation 26
7.5.4 Request product serial number identification +CGSN 27
7.5.4.1 Description 27

7.5.4.2 Defined values 27
7.5.4.3 Implementation 27
7.5.5 Select TE character set +CSCS 27
7.5.5.1 Description 27
7.5.5.2 Defined values (default value is underlined) 27
7.5.5.3 Implementation 28
7.6 Portable Computer and Communications Association (PCCA) wireless extended commands 28
7.6.1 Select TE-side stack +WS45 28
7.6.1.1 Description 28
7.6.1.2 Defined values (default value is underlined) 28
7.6.1.3 Implementation 28
7.6.2 Select wireless network +WS46 28
7.6.2.1 Description 29
7.6.2.2 Defined values 29
7.6.2.3 Implementation 29
7.7 Call Control (CC) commands and methods 29
7.7.1 Select TETRA type identifier +CSTI 29
7.7.1.1 Description 29
7.7.1.2 Defined values (default value is underlined) 29
7.7.1.3 Implementation 30
7.7.2 Select TETRA basic service information +CBSI 30
7.7.2.1 Description 30
7.7.2.2 Defined values (default value is underlined) 30
7.7.2.3 Implementation 30
7.7.3 Select TETRA data call capacity +CDCC 30
7.7.3.1 Description 31
7.7.3.2 Defined values (default value is underlined) 31
7.7.3.3 Implementation 31
7.7.4 Dial command D 31
7.7.4.1 Dialling digits 31
7.7.4.2 Modifier characters 31
7.7.4.3 Dialled string 31
7.7.5 Extended error report +CEER 32
7.7.5.1 Description 32
7.7.5.2 Defined values 32
7.7.5.3 Implementation 32
7.7.6 ITU-T Recommendation V.25ter [5] CC commands 32
7.8 Short Data Service (SDS) related commands 33
7.8.1 Parameter Definitions 33
7.8.2 Select SDS +CSDS 34
7.8.2.1 Description 35
7.8.2.2 Defined values 35
7.8.2.3 Implementation 35
7.8.3 New message indications to TE +CNMI 35
7.8.3.1 Description 35
7.8.3.2 Defined values (default value is underlined) 36
7.8.3.3 Implementation 36
7.8.4 Send message +CMGS 36
7.8.4.1 Description 36
7.8.4.2 Defined values 37
7.8.4.3 Implementation 37
7.8.5 List messages +CMGL 37
7.8.5.1 Description 37
7.8.5.2 Implementation 38
7.8.6 Delete message +CMGD 38
7.8.6.1 Description 38
7.8.6.2 Implementation 38
7.8.7 Read message +CMGR 38
7.8.7.1 Description 38
7.8.7.2 Implementation 38
7.9 Network service related commands 38
7.9.1 Subscriber number +CNUM 39

7.9.1.1 Description 39
7.9.1.2 Defined values 39
7.9.1.3 Implementation 39
7.9.2 Network registration +CREG 39
7.9.2.1 Description 39
7.9.2.2 Defined values (default value is underlined) 40
7.9.2.3 Implementation 40
7.10 MT control and status commands 40
7.10.1 MT activity status +CPAS 40
7.10.1.1 Description 40
7.10.1.2 Defined values 40
7.10.1.3 Implementation 41
7.10.2 Battery charge +CBC 41
7.10.2.1 Description 41
7.10.2.2 Defined values 41
7.10.2.3 Implementation 41
7.10.3 Signal quality +CSQ 41
7.10.3.1 Description 41
7.10.3.2 Defined values 42
7.10.3.3 Implementation 42
7.11 MT errors 42
7.11.1 Report MT error +CMEE 42
7.11.1.1 Description 42
7.11.1.2 Defined values (default value is underlined) 42
7.11.1.3 Implementation 43
7.11.2 MT error result code +CME ERROR 43
7.11.2.1 Implementation 43

8 PEI Data Link Layer (DLL) 43
8.1 Introduction 43
8.2 PEI DLL context 44
8.3 PEI DLL service description 44
8.3.1 Service primitives offered at PL-SAP 44
8.3.2 Parameter description 46
8.3.3 Service states for PL-SAP 48
8.4 PEI DLL protocols 49
8.4.1 Introduction 49
8.4.2 Protocol encapsulation and protocol numbers 49
8.4.3 Framing 50
8.4.4 PPP Link Control Protocol (LCP) 50
8.4.4.1 LCP configuration options 50
8.4.4.2 LCP protocol states 51
8.4.4.3 LCP procedures 51
8.4.4.3.1 Opening and configuring the Data Link 51
8.4.4.3.2 Closing the Data Link 52
8.4.4.3.3 Reopening the Data Link 53
8.4.4.3.4 Abnormal closing of the Data Link 53
8.4.4.3.5 Informative report indications 54
8.4.4.3.6 Link testing procedures 54
8.4.5 PPP Internet Protocol Control Protocol (IPCP) 54
8.4.5.1 IPCP configuration options 55
8.4.5.2 IPCP protocol states 55
8.4.5.3 IPCP procedures 55
8.4.5.3.1 Opening, reopening and resetting the Data Link for IPv4 55
8.4.5.3.2 Closing the Data Link to IPv4 56
8.4.5.3.3 Abnormal termination of the IP transmission 56
8.4.6 TNP1 Control Protocol (TNP1CP) 56
8.4.6.1 TNP1CP configuration options 56
8.4.6.2 TNP1CP protocol states 57
8.4.6.3 TNP1CP procedures 57

8.4.6.3.1 Opening, reopening and resetting the Data Link for TNP1 ... 57
8.4.6.3.2 Closing the Data Link to TNP1 ... 57
8.4.6.3.3 Abnormal termination of the TNP1 transmission ... 57
8.4.7 Network layer protocols over PEI DLL ... 57
8.4.7.1 Introduction ... 58
8.4.7.2 Basic procedures ... 58

9 Overview of TETRA Network Protocol type 1 (TNP1) ... 58
9.1 Introduction ... 58
9.2 TNP1 context ... 59

10 TNP1 service description ... 59
10.1 Introduction ... 59
10.2 Service primitives at the TNP1A-SAP ... 60
10.3 Service primitives at the TNP1B-SAP ... 60
10.4 Service primitives at TNP1A-SAP and TNP1B-SAP ... 60
10.5 Primitive descriptions ... 60
10.5.1 TNP1-CAPABILITY ... 60
10.5.2 TNP1-IDENTIFICATION ... 61
10.5.3 TNP1-OPERATION ... 61
10.5.4 TNP1-REPORT ... 62
10.5.5 TNP1-SERVICE ACCESS ... 62
10.5.6 TNP1-SERVICE PROFILE ... 62
10.5.7 TNP1-STATE ... 63
10.5.8 TNP1-UNITDATA ... 63
10.6 Parameter description ... 64
10.7 Service states for TNP1A-SAP ... 67
10.8 Service states for TNP1B-SAP ... 68

11 TNP1 protocol ... 68
11.1 Introduction ... 68
11.2 Services required by TNP1 entity ... 68
11.3 Procedures ... 69
11.3.1 Establishing TNP1 communication between TE2 user applications and MT2 ... 69
11.3.2 Closing the TNP1 communication ... 69
11.3.3 Reporting abnormal events ... 69
11.3.4 Querying MT2 identification information ... 70
11.3.5 Querying MT2 capabilities ... 70
11.3.6 Querying MT2 state ... 71
11.3.7 Communication between TE2 and MT2 user applications ... 71
11.3.8 Setting/getting the service profile ... 71
11.3.9 Accessing CMCE and MM services ... 72
11.3.10 Circuit mode data ... 72
11.4 Protocol timers ... 72
11.5 PDU structure ... 72
11.5.1 Structure and encoding of Type 1 elements ... 74
11.5.2 Structure and encoding of Type 2 elements ... 74
11.5.3 Structure and encoding of Type 3 elements ... 74
11.5.3.1 Type 3 element identifier ... 74
11.5.3.2 Type 3 element ... 75
11.6 TNP1 PDU descriptions ... 75
11.6.1 CC PDUs ... 75
11.6.1.1 TECC-ALERT IND ... 75
11.6.1.2 TECC-COMPLETE CON ... 75
11.6.1.3 TECC-COMPLETE IND ... 76
11.6.1.4 TECC-COMPLETE REQ ... 76
11.6.1.5 TECC-DTMF IND ... 76
11.6.1.6 TECC-DTMF REQ ... 76
11.6.1.7 TECC-MODIFY IND ... 77
11.6.1.8 TECC-MODIFY REQ ... 77

11.6.1.9 TECC-NOTIFY IND 77
11.6.1.10 TECC-PROCEED IND 78
11.6.1.11 TECC-RELEASE CON 78
11.6.1.12 TECC-RELEASE IND 78
11.6.1.13 TECC-RELEASE REQ 78
11.6.1.14 TECC-SETUP CON 79
11.6.1.15 TECC-SETUP IND 79
11.6.1.16 TECC-SETUP REQ 80
11.6.1.17 TECC-SETUP RES 80
11.6.1.18 TECC-TX CON 81
11.6.1.19 TECC-TX IND 81
11.6.1.20 TECC-TX REQ 82
11.6.2 PDUs for circuit mode data 82
11.6.2.1 TEMAC-FLOW CONTROL PDU for circuit mode data 82
11.6.2.2 TEMAC-UNITDATA 82
11.6.3 MM PDUs 83
11.6.3.1 TEMM-ATTACH DETACH GROUP IDENTITY CON 83
11.6.3.2 TEMM-ATTACH DETACH GROUP IDENTITY IND 83
11.6.3.3 TEMM-ATTACH DETACH GROUP IDENTITY REQ 83
11.6.3.4 TEMM-DISABLING IND 83
11.6.3.5 TEMM-ENABLING IND 84
11.6.3.6 TEMM-ENERGY SAVING REQ 84
11.6.3.7 TEMM-ENERGY SAVING CON 84
11.6.3.8 TEMM-ENERGY SAVING REQ 84
11.6.3.9 TEMM-REPORT IND 84
11.6.3.10 TEMM-REGISTRATION IND 85
11.6.3.11 TEMM-REGISTRATION CON 85
11.6.3.12 TEMM-SERVICE IND 85
11.6.4 MT Application PDUs 85
11.6.4.1 TEMTA-CAPABILITY INFO 85
11.6.4.2 TEMTA-CAPABILITY QUERY 86
11.6.4.3 TEMTA-IDENTIFICATION INFO 86
11.6.4.4 TEMTA-IDENTIFICATION QUERY 86
11.6.4.5 TEMTA-SDS DELETE MESSAGES REQ 86
11.6.4.6 TEMTA-SDS LIST MESSAGES ERROR 87
11.6.4.7 TEMTA-SDS LIST MESSAGES IND 87
11.6.4.8 TEMTA-SDS LIST MESSAGES REQ 88
11.6.4.9 TEMTA-OPERATION 88
11.6.4.10 TEMTA-SERVICE PROFILE INFO 88
11.6.4.11 TEMTA-SERVICE PROFILE REQ 89
11.6.4.12 TEMTA-SERVICE PROFILE SET 89
11.6.4.13 TEMTA-STATE INFO 89
11.6.4.14 TEMTA-STATE QUERY 90
11.6.5 SDS PDUs 90
11.6.5.1 TESDS-REPORT IND 90
11.6.5.2 TESDS-STATUS IND 90
11.6.5.3 TESDS-STATUS REQ 91
11.6.5.4 TESDS-UNITDATA IND 91
11.6.5.5 TESDS-UNITDATA REQ 92
11.6.6 SS PDUs 92
11.6.6.1 TESS-FACILITY CON 92
11.6.6.2 TESS-FACILITY IND 93
11.6.6.3 TESS-FACILITY REQ 93
11.6.6.4 TESS-FACILITY RES 93
11.7 TETNP1-REPORT PDU for protocol layer management 93
11.8 Information elements coding 93
11.8.1 Access Priority (AP) 94
11.8.2 Area Selection (AS) 94
11.8.3 Basic service information 95
11.8.4 Battery charge 95
11.8.5 Bit error ratio 96
11.8.6 Called party type identifier 96
11.8.7 Called party short number address 96

11.8.8 Called party extension 96
11.8.9 Called party short subscriber identity (SSI) 97
11.8.10 Call identifier 97
11.8.11 Calling party extension 97
11.8.12 Calling party Short Subscriber Identity (SSI) 97
11.8.13 Calling party type identifier 97
11.8.14 Call ownership 98
11.8.15 Call priority 98
11.8.16 Call queued 98
11.8.17 Call status 99
11.8.18 Call time-out 99
11.8.19 Call time-out, set-up phase 99
11.8.20 CC profile 100
11.8.21 Circuit mode data 100
11.8.22 Circuit mode services 100
11.8.23 Continue 101
11.8.24 Disabling type 101
11.8.25 Disconnect cause 101
11.8.26 DTMF 102
11.8.27 Encryption 102
11.8.28 Encryption control 102
11.8.29 Energy saving mode 103
11.8.30 Error parameter 103
11.8.31 Error value 103
11.8.32 External Subscriber Number 104
11.8.33 Facility 104
11.8.34 Field strength 104
11.8.35 Function 105
11.8.36 Group identity acknowledgement request 105
11.8.37 Group identity acknowledgement type 105
11.8.38 Group identity attach/detach mode 105
11.8.39 Group identity downlink 106
11.8.40 Group identity report 106
11.8.41 Group identity uplink 107
11.8.42 Hardware version 107
11.8.43 Hook method selection 107
11.8.44 Invoke-ID 107
11.8.45 ISO Global Object ID 108
11.8.46 Length indicator 108
11.8.47 Manufacturer ID 108
11.8.48 Max data 108
11.8.49 MM profile 109
11.8.50 Model 109
11.8.51 Modify 109
11.8.52 Network time 109
11.8.53 New call identifier 109
11.8.54 Notification indicator 110
11.8.55 Number of SDS User Data 4 Profiles 110
11.8.56 Packet Mode Services 110
11.8.57 PDU type 111
11.8.58 Poll request 112
11.8.59 Poll response 112
11.8.60 Poll response addresses 113
11.8.61 Poll response number 113
11.8.62 Poll response percentage 113
11.8.63 Port selection 113
11.8.64 Pre-coded status 114
11.8.65 Product Serial No 114
11.8.66 Proprietary 114
11.8.67 Range for deleted SDS messages 114
11.8.68 Range for listed SDS messages 114
11.8.69 Range for requested SDS messages 115
11.8.70 Range type information element 115

11.8.71 Reason 115
11.8.72 Receiving Application Identifier 116
11.8.73 Reject cause 116
11.8.74 Registration status 116
11.8.75 Request to transmit/send data 117
11.8.76 Reset call time-out timer (T310) 117
11.8.77 SDS error 117
11.8.78 SDS message index 117
11.8.79 SDS message status 118
11.8.80 SDS User Data 1/2/3 Profile 118
11.8.81 SDS User Data 4 Profile 119
11.8.82 Sending Application Identifier 119
11.8.83 Service profile operation 119
11.8.84 Short data type identifier 120
11.8.85 Simplex/duplex selection 120
11.8.86 Software version 120
11.8.87 Speech service 120
11.8.88 SS profile 121
11.8.89 SS type 121
11.8.90 Status 121
11.8.91 Status number 121
11.8.92 Sub-primitive parameters 122
11.8.93 Temporary address 122
11.8.94 Terminal Equipment Identity (TEI) 122
11.8.95 Traffic stealing 122
11.8.96 SDS Transfer result 122
11.8.97 Transmission condition 123
11.8.98 Transmission grant 123
11.8.99 Transmission request permission 123
11.8.100 Transmitting party type identifier 123
11.8.101 Transmitting party extension 124
11.8.102 Transmitting party Short Subscriber Identity (SSI) 124
11.8.103 TX demand priority 124
11.8.104 Type 3 CMCE element identifier 124
11.8.105 Type 3 MM element identifier 125
11.8.106 User defined data-1 125
11.8.107 User defined data-2 125
11.8.108 User defined data-3 125
11.8.109 User defined data-4 126

12 TNP1 Relay (TNP1R) 126
12.1 Introduction 126
12.2 Service primitives at the TNP1R-SAP 126
12.3 Underlying services required 126
12.4 Procedures 126
12.4.1 General 126
12.4.2 Mapping of the TNP1 PDUs and MT2 service primitives 128

Annex A (normative): Formatting transparent circuit mode data to MAC PDU 130

History 131

Blank page

Foreword

This draft European Telecommunication Standard (ETS) has been produced by the ETSI Project Terrestrial Trunked Radio (TETRA) of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

This ETS is a multi-part standard and will consist of the following parts:

Part 1: "General network design".

Part 2: "Air Interface (AI)".

Part 3: "Inter-System Inter-working (ISI)".

Part 4: "Gateways".

Part 5: "Peripheral Equipment Interface (PEI)".

Part 6: "Line connected Station (LS)", (DE/TETRA-03001-6).

Part 7: "Security".

Part 9: "General requirements for Supplementary Services (SS)".

Part 10: "Supplementary Services (SS) stage 1".

Part 11: "Supplementary Services (SS) stage 2".

Part 12: "Supplementary Services (SS) stage 3".

Part 13: "SDL model of the Air Interface (AI)".

Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification".

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Blank page

1 Scope

This ETS specifies the functional and technical aspects of TETRA Peripheral Equipment Interface (PEI) that is the interface between a Terminal Equipment type 2 (TE2) and a Mobile Termination type 2 (MT2) at reference point R_T. The protocols and procedures defined for PEI in this ETS are intended to be used in all TETRA systems as a standard interface.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 392-1: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

[2] ETS 300 392-2 (1996): "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[3] ETS 300 392-12: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary Services (SS) stage 3".

[4] ITU-T Recommendation V.24: "List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE)".

[5] ITU-T Recommendation V.25ter: "Serial asynchronous automatic dialling and control".

[6] ITU-T Recommendation V.28 (03/93): "Electrical characteristics for unbalanced double-current interchange circuits".

[7] ETS 300 585: "Digital cellular telecommunication system (Phase 2); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) (GSM 07.05)".

[8] ETS 300 916: "Digital cellular telecommunication system (Phase 2+); AT command set for GSM Mobile Equipment (ME) (GSM 07.07)".

[9] Telecommunications Industry Association TIA-99: "Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System".

[10] Telecommunications Industry Association TIA-135: "800 MHz Cellular Systems, TDMA Services, Async Data and Fax".

[11] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) - Information technology - 7-bit coded character set for information interchange".

[12] RFC 1332: "The PPP Internet Protocol Control Protocol (IPCP)".

[13] RFC 1661: "The Point-to-Point Protocol (PPP)".

[14] RFC 1662: "PPP in HDLC-like Framing".

[15] RFC 1663: "PPP Reliable Transmission".

[16] RFC 1144 (01/90): "Compressing TCP/IP Headers; Jacobson V.".

[17] ISO 7776: "Information technology - Telecommunications and information exchange between systems - High level data link control procedures - Description of the X.25 LAPB-compatible DTE data link procedures".

[18] ISO 2110: "Information technology - Data communication - 25-pole DTE/DCE interface connector and contact number assignments".

[19] PCCA STD-101: "Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services".

[20] Internet STD2: "Assigned Numbers".

[21] ETS 300 392-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for Supplementary Services (SS)".

[22] RFC 2023: "IP Version 6 over PPP".

[23] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

3 Symbols and abbreviations

3.1 Symbols

For the purposes of this ETS, the following symbols apply:

<CR> Carriage return character, the value is specified by command S3.
<LF> Linefeed character, which value is specified with command S4.
<...> Name enclosed in angle brackets is a syntactical element. Brackets themselves do not appear in the command line.
[...] Optional subparameter of a command or an optional part of a Mobile Termination (MT) response is enclosed in square brackets. Brackets themselves do not appear in the command line. When subparameter is not given in parameter type commands, new value equals to its previous value. In action type commands, action should be done on the basis of the recommended default setting of the subparameter.
underline Underlined defined subparameter value is the recommended default setting of this subparameter. In parameter type commands, this value should be used in factory settings which are configured by ITU-T Recommendation V.25ter [5] command &F0. In action type commands, this value should be used when subparameter is not given.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AI Air Interface
AT ATtention
BCD Binary Coded Decimal
CDPD Cellular Digital Packet Data
FE Functional Entity
CC Call Control
CMCE Circuit Mode Control Entity
GSM Global System for Mobile communications
GTSI Group TETRA Subscriber Identity
IP Internet Protocol
IPCP Internet Protocol Control Protocol
IPv4 Internet Protocol version 4
IPv6 Internet Protocol version 6
IRA International Reference Alphabet
IrDA Infrared Data Association
IT Information Technology

ITSI	Individual TETRA Subscriber Identity
LCP	Link Control Protocol
MM	Mobility Management
MT	Mobile Termination
MT2	Mobile Termination type 2
NCP	Network Control Protocol
PC	Personal Computer
PCCA	Portable Computer and Communications Association
PDU	Packet Data Unit
PEI	Peripheral Equipment Interface
PPP	Point-to-Point Protocol
SDL	Specification and Description Language
SDS	Short Data Service
SMG	Special Mobile Group
SMS	Short Message Service
SS	Supplementary Service
SwMI	Switching and Management Infrastructure
TE	Terminal Equipment
TE2	Terminal Equipment type 2
TEI	Terminal Equipment Identity
TETRA	TErrestrial Trunked RAdio
TIA	Telecommunications Industry Association
TNP1	TETRA Network Protocol type 1
TNP1CP	TNP1 Control Protocol
TNP1R	TETRA Network Protocol 1 Relay

4 Overview of TETRA PEI

4.1 Introduction

The TETRA PEI provides a link between a Data TE2, such as a portable Personal Computer (PC) or specialist data terminal, and a TETRA MT2 at reference point R_T and hence provides external data devices with access to the services offered by a TETRA network.

With respect to data services, the TETRA PEI will be used for the following:

- transmission and reception of packet data (including setting of packet data parameters);
- transmission and reception of circuit data (including setting of circuit data parameters);
- transmission and reception of short data (including setting of short data parameters).

In addition to data services the TETRA PEI may be used for the following:

- setup and control of speech calls (including setting of speech call parameters);
- access to general information of MT2 and network e.g. battery status, received signal strength etc;
- access to user applications located in MT2.

The TETRA PEI includes components which are not required by all the functions listed above and therefore, depending on the functionality that a MT2 supports, not all aspects of the PEI need to be implemented.

TETRA PEI has been designed to fulfil the following key requirements:

- a standard physical interface to all MT2s which is widely adopted in the Information Technology (IT) world;
- minimal extra software in the TE2; at most only a device driver should be required;

- maximum compatibility with other wireless data systems e.g. Global System for Mobile communications (GSM), Cellular Digital Packet Data (CDPD), Mobitex and Ardis;

- access to the full range of MT2 functionality.

4.2 Protocol architecture

The physical layer for the TETRA PEI is assumed to be a serial form channel. Use of the ITU-T Recommendations V.24 [4] and V.28 [6] type serial interface is defined in this ETS in detail due to the widespread use in the computing industry. PEI uses a sub-set of ITU-T Recommendation V.24 [4] interchange circuits. This ETS allows a manufacturer to provide other data interfaces in addition (e.g. infra red and ethernet).

Figure 1 proposes the protocols to be used over the V.24/V.28 (or other) physical interface.

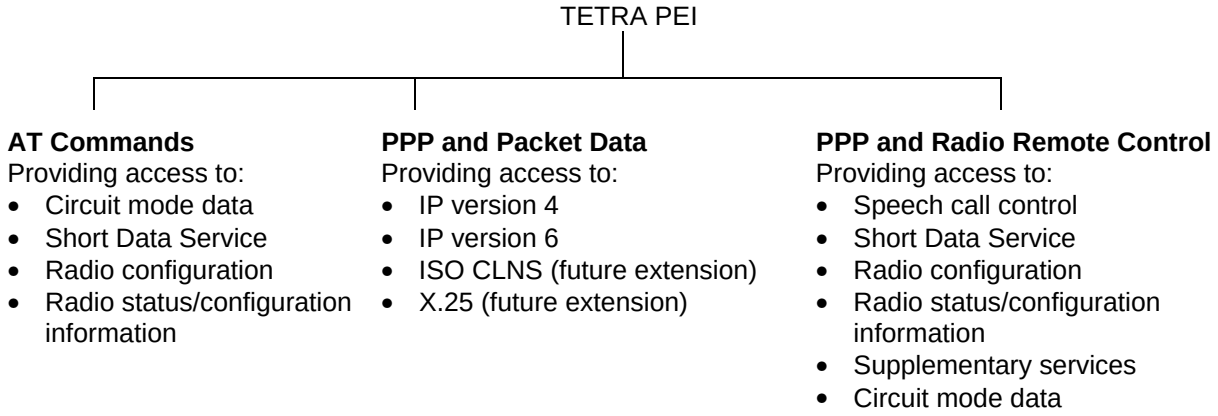


Figure 1: PEI Components

These three categories of service access are outlined in detail in this ETS. Depending on the services being supported by a MT2, it may not be necessary to support all of these categories.

4.2.1 AT Commands

AT commands are widely used in the IT world as a means of controlling modems from a PC or other intelligent terminal. AT commands have been adopted by many wireless systems as a means for accessing data services (e.g. GSM, CDPD, Mobitex etc.) and are therefore supported also in TETRA PEI. These AT commands allow access to circuit data services, Short Data Services (SDSs) and MT2 parameters and information.

Figure 2 shows a typical protocol stack where AT commands are used to access TETRA data services. The figure assumes the modem is in "Command" state or "On-Line Command" state as described in clause 5.

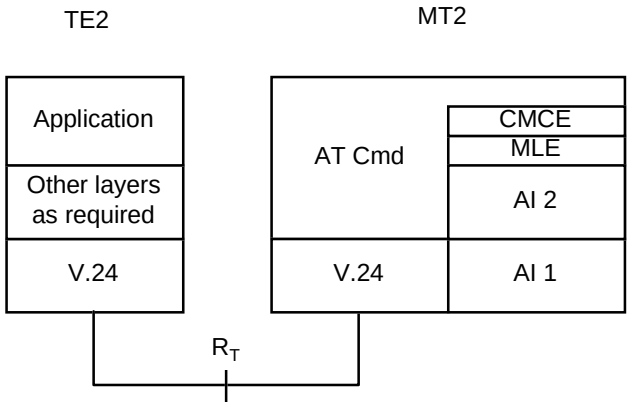


Figure 2: AT Commands over the TETRA PEI ("Command"/"On-Line Command" state)

A small number of TETRA specific AT commands have been defined based on the extension rules specified in ITU-T Recommendation V.25ter [5], enabling a user application to specify parameters such as the data rate to be used for a circuit data call. As well as the small number of TETRA specific AT commands there are also commands specified which are identical to those used in GSM and thus ensuring a degree of compatibility with applications written for use over GSM.

When the MT2 switches to "On-Line Data" state, it is prepared to receive user data from the Terminal Equipment (TE) and forward it to the network and vice-versa. The protocol stack for this case is shown in figure 3.

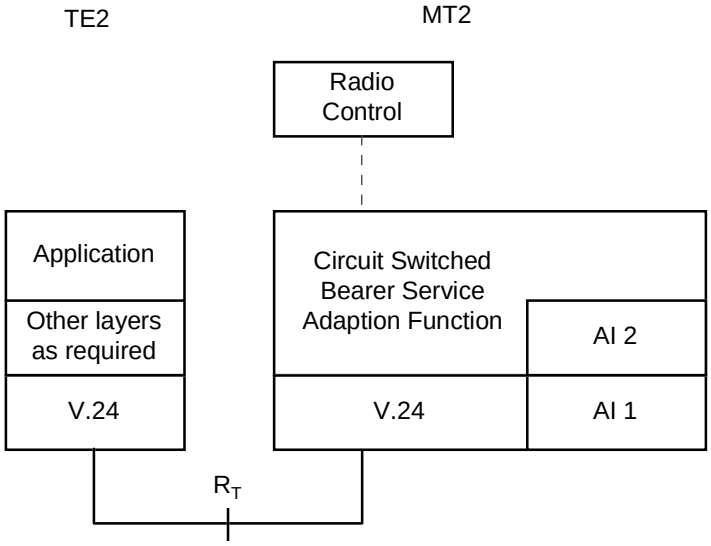


Figure 3: AT Commands over the TETRA PEI ("On-Line Data" state)

4.2.2 Point-to-Point Protocol (PPP) and packet data

The PPP shall be used for access to TETRA packet data services via the PEI. If an MT wishes only to support packet data services, then PPP is the only required component of the TETRA PEI (see subclause 5.3.2).

This ETS completely defines the use of Internet Protocol version 4 (IPv4), however definitions for Internet Protocol version 6 (IPv6) are included though IPv6 is still under development. Where references to Internet RFCs handling IPv6 are made, the latest published versions should be considered.

Figure 4 presents schematically the PEI for Internet Protocol (IP) packet data. Packet Data Units (PDU) received by PPP from the network layer will get routed through to the same network layer stack in the peer entity.

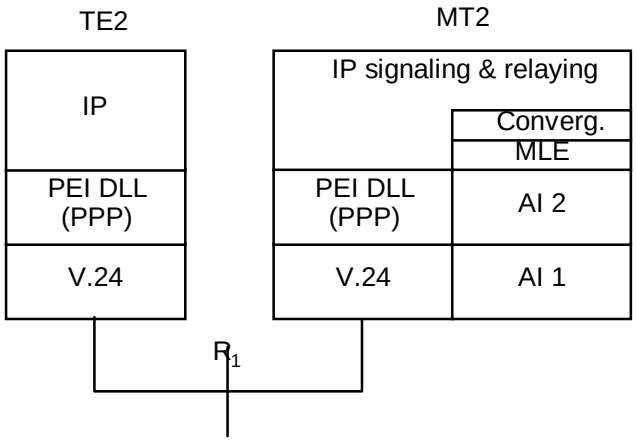


Figure 4: TETRA PEI for Packet Data

4.2.3 PPP and radio remote control

The TETRA Network Protocol type 1 (TNP1) specifies a protocol to be used over the TETRA PEI allowing Circuit Mode Control Entity (CMCE) functions (Call Control (CC) and SDS) and Mobility Management (MM) functions to be accessed from a peripheral device (TE2) such as a PC. Basic primitives to access circuit mode data services of Air Interface (AI) stack Layer 2 are specified. Furthermore, communication between peer applications located in TE2 and MT2 is supported. TNP1 resides above PPP in the protocol stack and therefore requires a PPP Network Control Protocol (NCP), TNP1 Control Protocol (TNP1CP), defined in this ETS.

NOTE: NCPs already exist for the well known network layer protocols such as IP, CLNP, Appletalk, IPX etc.

All services as presented in figure 5 are available in this mode.

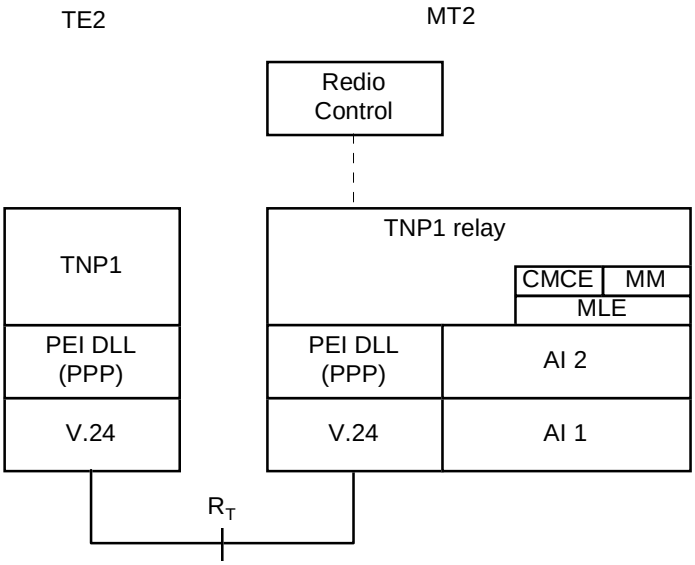


Figure 5: TNP1 over the TETRA PEI

5 Mobile Termination (MT) operating states

In relation to the PEI, the MT operates in one of three states, namely "Command" state, "On-line command" state and "On-line data" state. Furthermore, when in "On-line data" state, the MT can select between two data modes, PPP mode and Transparent mode. The MT operating states are presented schematically in figure 6.

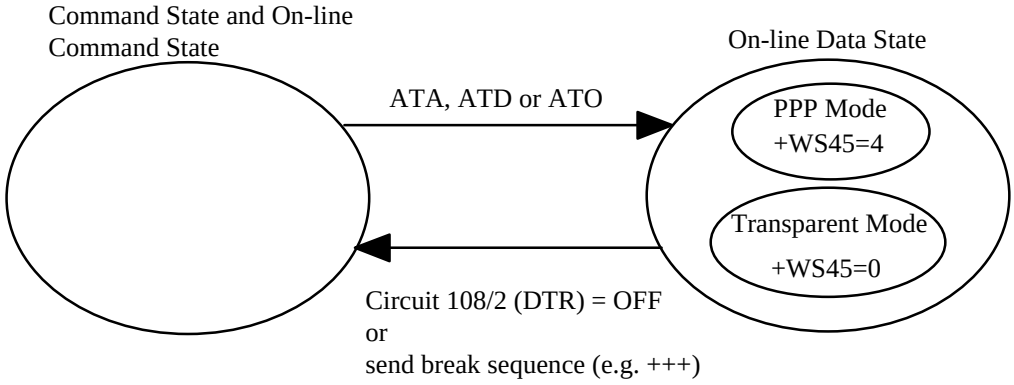


Figure 6: MT operating states

5.1 "Command" state

In "Command" state, the MT is not communicating with a remote station and is ready to accept commands. Data received from the TE on logical circuit TD (V.24 circuit 103 - Transmitted Data) is treated as command lines and processed by the MT. The MT responses and unsolicited result codes are sent to the TE on logical circuit RD (V.24 circuit 104 - Received Data). Typically, the TE continuously asserts logical circuit DTR (V.24 circuit 108/2 - Data Terminal Ready) if this circuit is implemented. The MT enters this state upon power-up, and when all calls are disconnected.

5.2 "On-line command" state

In "On-line command" state, the MT is communicating with a remote station. The MT is ready to accept commands, and data received from the TE on logical circuit TD (V.24 circuit 103 - Transmitted Data) is treated as command lines and processed by the MT. The MT responses and unsolicited result codes are sent to the TE on logical circuit RD (V.24 circuit 104 - Received Data). Depending on the implementation, data received from the remote station during "On-line command" state may be either discarded, or retained in the MT until "On-line data" state is once again entered (by a command from the DTE). Data previously transmitted by the TE and buffered by the MT may be transmitted from the buffer to the remote station during "On-line command" state. "On-line command" state may be entered from "On-line data" state by a mechanism defined in ITU-T Recommendation V.25ter [5] or by other manufacturer-defined means.

5.3 "On-line data" state

In "On-line data" state, data is being transmitted over the PEI. Two data modes are defined for TETRA, transparent mode data and PPP mode data. The TE indicates whether transparent or PPP mode data is to be used before entering "On-line data" state (by default transparent mode is selected) using the command +WS45 as described in subclause 7.6.1 of this ETS. While in "On-line data" state the MT monitors data and control circuits to detect events such as loss of the remote connection and TE requests for disconnection or switching to "On-line command" state. "On-line data" state is entered by successful completion of a command to originate or answer a call, by automatically answering a call, or by a TE command to return to "On-line data" state from "On-line command" state.

5.3.1 Transparent mode data

By default, the MT enters "On-line data" state with transparent mode data selected. Transparent mode data may be explicitly selected using the command +WS45 (see subclause 7.6.1). When selected, the data transmitted over the PEI is a transparent data stream and typically is the format used for a circuit mode data call. Data received from the TE on logical circuit TD (V.24 circuit 103 - Transmitted Data) is forwarded to the appropriate destination (typically the MT U-Plane for transmission over the TETRA AI). Data destined for the TE is forwarded on logical circuit RD (V.24 circuit 104 - Received Data).

5.3.2 PPP mode data

PPP mode data is selected using the command +WS45 (see subclause 7.6.1). When selected, the data transmitted over the PEI is in the form of PPP packets and typically is the format used for a packet data call or for radio remote control using TNP1. Data received from the TE on logical circuit TD (V.24 circuit 103 - Transmitted Data) is forwarded to the PPP stack. PPP packets destined for the TE are forwarded on logical circuit RD (V.24 circuit 104 - Received Data). The MT switches to "Command" state if the PPP connection between the TE and MT is terminated.

5.4 Transition between MT operating states

5.4.1 Transition from "Command" state to "On-line data" state

There are two possibilities, either the TE issues a dial command (ATD) or the TE issues an answer command (ATA).

5.4.2 Transition from on-line "Command" state to "On-line data" state

After temporarily switching the MT to "On-line command" state, the MT may be switched back to "On-line data" state through issuing the go on-line command (ATO).

5.4.3 Transition from "On-line data" state to "On-line command" state

While in "On-line data" state the TE may wish to issue an AT command, in which case it is required that the MT is returned (temporarily) to "On-line command" state. The TE can bring about this change in operating state through issuing an escape sequence or through use of logical circuit DTR (V.24 circuit 108/2 - Data Terminal Ready).

NOTE 1: ITU-T Recommendation V.25ter [5], subclause 6.2.9 describes how the command "AT&D" can be used in association with logical circuit DTR (V.24 circuit 108/2 - Data Terminal Ready) to switch between "On-line data" state and "On-line command" state. It is also common for manufacturers to provide an escape sequence which can be used to force the modem to return to "On-line command" state from "On-line data" state. This escape sequence (e.g. +++) is placed on logical circuit TD (V.24 circuit 103 - Transmitted Data).

NOTE 2: If in PPP mode data, the termination of the PPP link will result in the MT returning to "Command" state.

6 Physical layer

This clause defines the physical layers that shall be used between a TE2 and a MT2 at the TETRA reference point R_T. The TE represents a DTE. The MT represents a DCE.

This ETS defines a point-to-point configuration using a sub-set of ITU-T Recommendation V.24 [4] and ITU-T Recommendation V.28 [6]. In addition to the electrical level it defines physical connection pin numbers for certain widely used connector types, and the lowest layer transmission format for V.24/V.28.

In addition to the physical layer defined in the following subclauses, other serial form physical layers may be used, where appropriate.

6.1 Electrical characteristics

The electrical characteristics shall follow ITU-T Recommendation V.28 [6] for unbalanced signalling. Some electrical values are copied here for convenience. Source output voltage for any load resistance between 3 kilo ohms and 7 kilo ohms shall be between +5 volts and +15 volts for binary value "0" and ON condition (Space) and between -5 volts and -15 volts for binary value "1" and OFF condition (Mark). The open circuit source voltage shall not exceed 25 volts in magnitude.

The receiver shall detect binary value "0" (Space) when voltage at the interface point is higher than +3 volts and binary value "1" (Mark) when voltage is lower than -3 volts.

6.2 Physical connection

The circuits that shall be used in this V.24 interface are shown in table 1. Other circuits specified by V.24 may be used for appropriate purposes. Examples of these are circuit 125 (Calling indicator) and 133 (Ready for receiving). Designers should follow V.24 recommendations when these are adequate for the purpose.

Table 1: V.24 interface signals

Circuit number	Signal	Abbreviation	Direction DTE DCE
102	Signal Ground	SG	<--->
103	Transmitted Data	TxD	--->
104	Received Data	RxD	<---

6.2.1 Physical requirements

The MT is fitted with a device specific connector. If submin-D type connector is used, then the radio unit may have either a 25-pole or a 9-pole connector (receptacle). If RJ11/RJ45 type connector is used, then the radio unit may have a 10-pole, 8-pole, 6-pole or 4-pole connector.

The pin assignment of a sub-set of V.24 signals to submin-D type connector that shall be used is shown in table 2 (the 25-pole connector follows the assignment plan defined by ISO 2110 [18]). The signal PG (Protective Ground) may be used additionally with 9-pole or 25-pole connectors.

Table 2: V.24 interface pin assignment for Submin-D type connector

Circuit number	Signal	Abbreviation	Submin-D type	
			9-pole	25-pole
106	Ready for sending (Clear to Send), note 1	CTS	8	5
108/2	Data Terminal Ready, note 1	DTR	4	20
103	Transmitted Data	TxD	3	2
102	Signal ground	SG	5	7
109	Data Channel received line signal Detector, note 1	DCD	1	8
104	Received Data	RxD	2	3
105	Request to Send, note 1	RTS	7	4
107	Data Set Ready, note 1	DSR	6	6
101	Protective ground, note 2	PG	Screen	Screen + 1
NOTE 1: This interface signal is not supported by this ETS. NOTE 2: This interface signal should be used if available.				

The pin assignment of a sub-set of V.24 signals to RJ11/RJ45 type connector is shown in table 3.

Table 3: V.24 interface pin assignment for RJ11/RJ45 type connector

Circuit number	Signal	Abbreviation	RJ11/RJ45			
			4-pole	6-pole	8-pole	10-pole
						1
					1	2
				1	2	3
103	Transmitted Data	TxD	1	2	3	4
102	Signal ground	SG	2	3	4	5
104	Received Data	RxD	3	4	5	6
			4	5	6	7
				6	7	8
					8	9
						10

The use of the sub-sets according to table 2 and table 3 or other signals shall not prevent co-operation with an equipment using only signals defined in the table 1. Signals or voltage levels shall be within the limits set by ITU-T Recommendation V.28 [6] to ensure that no damage is caused to any DTE to which the unit is connected.

6.3 Asynchronous transmission

To enable fully transparent data transmission an 8-bit character format shall be used by default. In 8-bit format, characters are transmitted asynchronously with 1 start bit and 1 stop bit. No bit is used for parity checking. The 8-bit code is identified by b_8, b_7, b_6, b_5, b_4, b_3, b_2 and b_1, where b_8 is the most-significant bit (MSB) and b_1 is the least-significant bit (LSB). The bit combinations represent integer in the range 0 to 255 where b_8 has a weight of 128 and b_1 has a weight of 1.

The character format in the asynchronous operation is shown in figure 7.

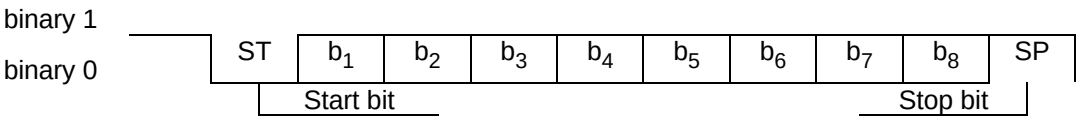


Figure 7: Asynchronous character transmission

The least-significant bit b_1 of the character is transmitted first.

An MT2 may support other character formats, which a TE2 may select using the AT-command +ICF.

6.4 Data transmission rate

ITU-T Recommendation V.28 [6] shall apply.

ITU-T Recommendation V.28 [6] generally applies for signalling rates below 20 kbit/s, however under specific conditions described in annex A of ITU-T Recommendation V.28 [6], operation up to 64 kbit/s is possible.

The MT2 should be able to accept commands initially at 9 600 bit/s, as recommended in ITU-T Recommendation V.25ter [5], subclause 4.3, and optionally be able to automatically detect the baud rate.

7 AT command set

7.1 Introduction

This clause defines a profile of AT commands that may optionally be used in PEI for controlling MT functions and TETRA network services from a TE. These AT commands allow access to circuit data services, SDSs and MT2 parameters and information. AT commands are used to enter PPP mode (see subclause 5.3.2).

The command prefix +C is reserved for Digital Cellular in ITU-T Recommendation V.25ter [5]. This ETS has also the syntax details used to construct these extended TETRA commands. Commands from ITU-T Recommendation V.25ter [5] and existing digital cellular standards (GSM 07.07 [8], Telecommunications Industry Association (TIA) IS-99 [9] and TIA IS-135 [10]) are used whenever applicable.

7.2 AT command syntax

This subclause summarizes general aspects on AT commands and issues related to them. For further information see ITU-T Recommendation V.25ter [5].

7.2.1 Command line

Figure 8 shows the general structure of the command line. Standardized *basic* commands are described in ITU-T Recommendation V.25ter [5]. TETRA commands use the syntax rules of *extended* commands. Each extended command has a *test* command (e.g. +CMD2=?) which can be used to test if the command is supported and the format and type of its subparameters. *Read* commands (e.g. +CMD2?) are used to display the current value of subparameters.

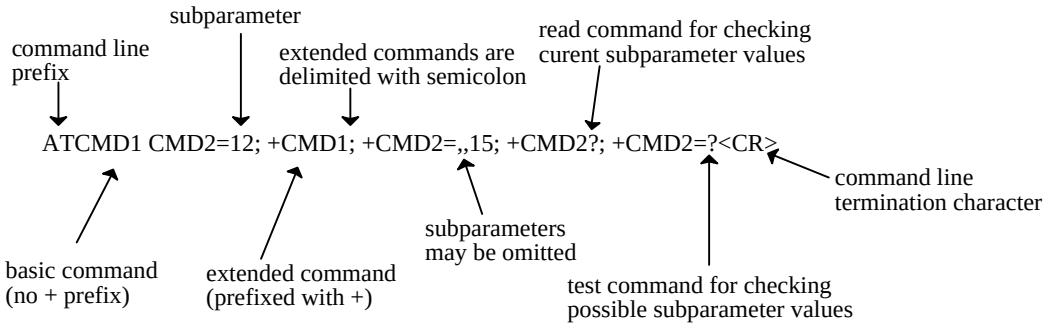


Figure 8: Basic structure of a command line

7.2.2 Information responses and result codes

The MT responses for the example command line in figure 8 could be as shown in figure 9. Verbose response format is assumed (see *V* command in ITU-T Recommendation V.25ter [5] for information regarding verbose and numeric response codes).

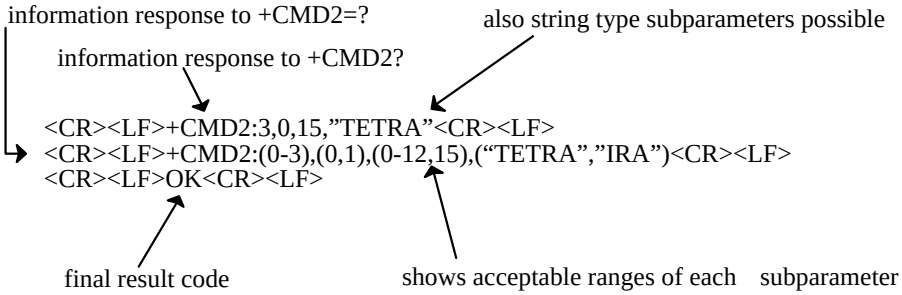


Figure 9: Response to a command line

7.3 ITU-T Recommendation V.25ter TE-MT interface commands

Table 4 summarizes ITU-T Recommendation V.25ter [5] commands relating to command line and response formatting and TE-MT interface operation. All are applicable to TETRA MTs. For further information see the indicated section in ITU-T Recommendation V.25ter [5].

Table 4: ITU-T Recommendation V.25ter [5] commands relating to TETRA PEI

Command	Section	Impl.	Use in TETRA
S3=[<value>]	7.2.1	mand.	command line termination character (mandatory default setting IRA 13)
S4=[<value>]	7.2.2	mand.	response formatting character (recommended default IRA 10)
S5=[<value>]	7.2.3	mand.	command line editing character (recommended default IRA 8)
E[<value>]	7.2.4	mand.	command echo (recommended default 1 i.e. MT echoes commands back)
Q[<value>]	7.2.5	mand.	result code suppression (recommended default 0 i.e. MT transmits result codes)
V[<value>]	7.2.6	mand.	MT response format (recommended default 1 i.e. verbose format)
X[<value>]	7.2.7	mand.	defines CONNECT result code format; values are manufacturer specific
&C[<value>]	7.2.8	mand.	determines how logical circuit RLSD (V.24 circuit 109 - Data Channel received line signal Detector) relates to the detection of received line signal from remote end (recommended default 1 i.e. logical circuit RLSD operation relates to detection of received signal)
&D[<value>]	7.2.9	mand.	determines how MT responds when logical circuit DTR (V.24 circuit 108/2 - Data Terminal Ready) is changed from ON to OFF condition during "On-line data" state
+IPR=[<value>]	7.2.10	opt.	fixed TE data rate (recommended default 0 i.e. automatic detection)
+ICF=[<format>[,<parity>]]	7.2.11	opt.	TE-MT character framing (recommended default 3,3 i.e. eight data bits, no parity, 1 stop bit)
+IFC=[<by_te>[,<by_mt>]]	7.2.12	opt.	TE-MT local flow control (recommended default 2,2 i.e. TE uses logical circuit RFR (V.24 circuit 133 - Ready for Receiving), and MT logical circuit CTS (V.24 circuit 106 - Ready for sending)
+ILRR=[<value>]	7.2.13	opt.	determines whether the used local TE-MT data rate is informed using intermediate result code +ILRR: <rate> before going online data state after call answering or originating

7.4 ITU-T Recommendation V.25ter general commands

ITU-T Recommendation V.25ter [5] includes basic commands and extended commands (using the +G extension) to provide "Generic DCE Control". These commands are listed in table 5 and are applicable to TETRA. For further information see the indicated section in ITU-T Recommendation V.25ter [5].

Table 5: ITU-T Recommendation V.25ter [5] generic MT control commands

Command	Section	Impl.	Use in TETRA
Z[<value>]	7.1.1	mand.	MT sets all parameters to their defaults as specified by a user memory profile or by the manufacturer and resets the MT.
&F[<value>]	7.1.2	mand.	MT sets all parameters to their defaults as specified by the manufacturer.
I[<value>]	7.1.3	opt	request manufacturer specific information about the MT (software cannot use this command to determine the capabilities of the MT)
+GMI	7.1.4	mand.	request MT manufacturer identification (may equal to +CGMI)
+GMM	7.1.5	mand.	request MT model identification (may equal to +CGMM)
+GMR	7.1.6	mand.	request MT revision identification (may equal to +CGMR)
+GSN	7.1.7	opt.	request MT serial number identification (may equal to +CGSN)
+GOI	7.1.8	opt.	request ISO system global object identification of the MT (general format defined in ITU-T Rec. X.208; encoding rules in ITU-T Rec. X.209)
+GCAP	7.1.9	mand.	request overall capabilities of the MT; the response code for a MT building on the present document shall be +CTETRA
+GCI=<T.35>	7.1.10	opt.	selects the country of installation for the MT using ITU-T Rec. T.35 annex A country codes.

7.5 Cellular DCE control commands

Four of the ITU-T Recommendation V.25ter [5] "Generic DCE Control" commands have been adapted by Special Mobile Group (SMG) for GSM 07.07 [8] and by TIA IS-99 [9]. These commands are applicable to TETRA and are presented below together with a cellular command to define the character set being used over the PEI.

7.5.1 Request manufacturer identification +CGMI

The command and responses shall be as presented in table 6.

Table 6: +CGMI action command syntax

Command	Possible Response(s)
+CGMI	<manufacturer> +CME ERROR: <err>
+CGMI=?	

7.5.1.1 Description

Execution command causes the MT to return one or more lines of information text <manufacturer>. Typically this information will consist of a single line containing the name of the manufacturer, however more information may be provided if desired. Error codes are described in subclause 7.11.2.

7.5.1.2 Defined values

<manufacturer>: the total number of characters, including line terminators, in the information field shall not exceed 2 048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

7.5.1.3 Implementation

Optional.

7.5.2 Request model identification +CGMM

The command and responses shall be as presented in table 7.

Table 7: +CGMM action command syntax

Command	Possible Response(s)
+CGMM	<model> +CME ERROR: <err>
+CGMM=?	

7.5.2.1 Description

Execution command causes the MT to return one or more lines of information text <model>. Typically this information will consist of a single line containing the name of the product, however more information may be provided if desired. Error codes are described in subclause 7.11.2.

7.5.2.2 Defined values

<model>: the total number of characters, including line terminators, in the information field shall not exceed 2 048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

7.5.2.3 Implementation

Optional.

7.5.3 Request revision identification +CGMR

The command and responses shall be as presented in table 8.

Table 8: +CGMR action command syntax

Command	Possible Response(s)
+CGMR	<revision> +CME ERROR: <err>
+CGMR=?	

7.5.3.1 Description

Execution command causes the MT to return one or more lines of information text <revision>. Typically this information will consist of a single line containing the version of the product, however more information may be provided if desired. Error codes are described in subclause 7.11.2.

7.5.3.2 Defined values

<revision>: the total number of characters, including line terminators, in the information field shall not exceed 2 048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

7.5.3.3 Implementation

Optional.

7.5.4 Request product serial number identification +CGSN

The command and responses shall be as presented in table 9.

Table 9: +CGSN action command syntax

Command	Possible Response(s)
+CGSN	<sn> +CME ERROR: <err>
+CGSN=?	

7.5.4.1 Description

Execution command causes the MT to return one or more lines of information text <sn>. Typically this information will consist of a single line containing the TETRA Terminal Equipment Identity (TEI) of the product as defined in ETS 300 392-1 [1], however more information may be provided if desired. Error codes are described in subclause 7.11.2.

7.5.4.2 Defined values

<sn>: the total number of characters, including line terminators, in the information field shall not exceed 2 048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

7.5.4.3 Implementation

Optional.

7.5.5 Select TE character set +CSCS

The command and responses shall be as presented in table 10.

Table 10: +CSCS parameter command syntax

Command	Possible Response(s)
+CSCS=[<chset>]	
+CSCS?	+CSCS: <chset>
+CSCS=?	+CSCS: (list of supported <chset>s)

7.5.5.1 Description

Set command informs the MT which character set <chset> is used by the TE. Read command shows current setting and test command displays character sets supported by MT.

7.5.5.2 Defined values (default value is underlined)

<chset>:

"HEX" character string consists only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three characters with decimal values 3,47 and 230
"IRA" International Reference Alphabet (ITU-T Recommendation T.50 [11])
"GSM" GSM 7-bit alphabet
"PCCPxxx" PC character set Code Page xxx
"PCDN" PC Danish/Norwegian character set
"UCS2" Universal Multiple-Octet Coded Character Set, 16 bit coding
"8859-n" ISO 8859 Latin n (1-6) character set
"8859-C" ISO 8859 Latin/Cyrillic character set
"8859-A" ISO 8859 Latin/Arabic character set

"8859-G" ISO 8859 Latin/Greek character set
"8859-H" ISO 8859 Latin/Hebrew character set

7.5.5.3 Implementation

Mandatory when a command using the setting of this command is implemented.

7.6 Portable Computer and Communications Association (PCCA) wireless extended commands

PCCA STD101 [19] specifies AT commands for use with wireless modems.

7.6.1 Select TE-side stack +WS45

The command +WS45 is used to select the data mode to be used during "On-line data" state. The data modes supported are Transparent mode data and PPP mode data as described in subclause 5.3. Only two values are applicable to TETRA, transparent character stream and PPP. By selecting transparent character stream (WS45=0), the MT will switch to Transparent mode data once "On-line data" state is entered, whereas when PPP is selected (WS45=4), the MT will switch to PPP mode data when "On-line data" state is entered.

The command and responses shall be as presented in table 11.

Table 11: +WS45 parameter command syntax

Command	Possible Response(s)
+WS45=[<n>]	
+WS45?	<n>
+WS45=?	(list of supported <n>s)

7.6.1.1 Description

Set command selects the DTE side stack <n> to be used by the MT. Read command shows current setting and test command displays side stacks implemented in the MT.

7.6.1.2 Defined values (default value is underlined)

Two values of <n> shall be applicable to TETRA:

<n>:

0 Transparent character stream
4 Point-to-Point Protocol (PPP)

for other values see PCCA STD101 [19].

NOTE: This command is described as specified in STD101 from the PCCA [19]. For correct interpretation of the values "Transparent character stream" and "PPP", the reader should see subclause 5.3.

7.6.1.3 Implementation

Mandatory if other than default value is allowed.

7.6.2 Select wireless network +WS46

The PCCA STD-101 command +WS46 is used to select the Wireless Data Service (WDS) to be used by the MT. This command will be used when the MT is asked to indicate the networks in which it can operate.

The command and responses shall be as presented in table 12.

Table 12: +WS46 parameter command syntax

Command	Possible Response(s)
+WS46=[<n>]	
+WS46?	<n>
+WS46=?	(list of supported <n>s)

7.6.2.1 Description

Set command selects the WDS side stack <n> to be used by the MT. Read command shows current setting and test command displays side stacks implemented in the MT.

7.6.2.2 Defined values

<n>:

see PCCA STD101 [19] for defined values.

NOTE: A value will be requested from the PCCA for TETRA.

7.6.2.3 Implementation

Optional.

7.7 Call Control (CC) commands and methods

This subclause describes the control of TETRA circuit data and packet data calls. Three new commands defined for use with TETRA are first presented, followed by ITU-T Recommendation V.25ter [5] commands and GSM 07.07 [8] commands, all of which are applicable to TETRA.

7.7.1 Select TETRA type identifier +CSTI

The command and responses shall be as presented in table 13.

Table 13: +CSTI parameter command syntax

Command	Possible Response(s)
+CSTI=[<toa>]	
+CSTI?	+CSTI: <toa>
+CSTI=?	+CSTI: (list of supported <type>s)

7.7.1.1 Description

This is a TETRA command used in association with the dial (D) command. The set command selects the type of number to be used for further dialling commands (D) according to TETRA specifications. The test command returns values supported by the MT. The parameter setting has no meaning when the "Select TE-side stack" command (subclause 7.6.1) has selected PPP.

7.7.1.2 Defined values (default value is underlined)

<toa>:

0 short number address (SNA)
1 short subscriber identity (SSI)
2 TETRA subscriber identity (TSI)
3 external subscriber number

7.7.1.3 Implementation

Mandatory when other than default value is allowed.

7.7.2 Select TETRA basic service information +CBSI

The command and responses shall be as presented in table 14.

Table 14: +CBSI parameter command syntax

Command	Possible Response(s)
+CBSI=[<circuit>[,<encryption>[,<ct>]]]	
+CBSI?	+CBSI: <circuit>[,<encryption>, <ct>]
+CBSI=?	+CBSI: (list of supported <circuit>s), (list of supported <encryption>s), (list of supported <ct>s)

7.7.2.1 Description

The parameters set with this TETRA command are used by a MT after reception of a dial command (D), when setting up a circuit mode data call. Set command selects the type of circuit <circuit>, the type of encryption <encryption> and the communication type <ct> to be used for originating circuit data calls. The test command returns values supported by the MT.

7.7.2.2 Defined values (default value is underlined)

<circuit>:

0 TETRA encoded speech (For future use)
1 7,2 kbit/s unprotected data/speech
2 Low protection 4,8 kbit/s short interleaving depth = 1
3 Low protection 4,8 kbit/s medium interleaving depth = 4
4 Low protection 4,8 kbit/s long interleaving depth = 8
5 High protection 2,4 kbit/s short interleaving depth = 1
6 High protection 2,4 kbit/s medium interleaving depth = 4
7 High protection 2,4 kbit/s high interleaving depth = 8

<encryption>:

0 Clear end-to-end transmission
1 Encrypted end-to-end transmission

<ct>:

0 Point-to-point
1 Point-to-multipoint
2 Point-to-multipoint acknowledged
3 Broadcast

7.7.2.3 Implementation

Mandatory when other than default value is allowed.

7.7.3 Select TETRA data call capacity +CDCC

The command and responses shall be as presented in table 15.

Table 15: +CDCC parameter command syntax

Command	Possible Response(s)
+CDCC=[<capacity>]	
+CDCC?	+CDCC: <capacity>
+CDCC=?	+CDCC: (list of supported <capacity>s

7.7.3.1 Description

This TETRA command is used both for circuit mode data and packet data calls. Set command selects the number of time slots <capacity> to being requested for originating circuit mode data and packet data calls. The test command returns values supported by the MT.

NOTE: If the requested capacity is not available when the data call is initiated, then the MT will respond with a result code "No Carrier".

7.7.3.2 Defined values (default value is underlined)

<capacity>:

0 One time slot
1 Two time slots
2 Three time slots
3 Four time slots

7.7.3.3 Implementation

Mandatory when other than default value is allowed.

7.7.4 Dial command D

The dial command D instructs a MT to originate a call and enter "On-line data" state in the transparent mode, when the transparent character stream mode is selected by the "Select TE-side stack" command (subclause 7.6.1). The dial command D instructs a MT to use PPP, ignore the optional dial string and enter "On-line data" state in PPP mode, when the PPP mode is selected by the "Select TE-side stack" command.

ITU-T Recommendation V.25ter [5] lists characters that may be used in a dialling string. Their use in TETRA are listed in this subclause.

7.7.4.1 Dialling digits

"0 1 2 3 4 5 6 7 8 9 * # A B C D". Implementation of these characters is mandatory for TETRA.

7.7.4.2 Modifier characters

, pause during dialling (shall be implemented in TETRA i.e. recognized, however it may be ignored)

T P tone dialling/pulse dialling (shall be implemented in TETRA i.e. recognized, however they will be ignored)

! W @ register recall/wait for dial tone/wait for quiet answer (shall be implemented in TETRA i.e. recognized, however they will be ignored)

7.7.4.3 Dialled string

The address type can be changed by +CSTI command, see subclause 7.7.1.

The addresses SNA, SSI and TSI are 8 bits, 24 bits and 48 bits binary information elements respectively. See ETS 300 392-1 [1] clause 7 for a description of the SNA, SSI and TSI fields. The address extention

part of the TSI is divided into two sub-elements Country code (10 bits) and Network code (14 bits) which are encoded as independent elements. For dialling purposes the addresses shall be presented as strings of decimal digits having same value as the binary numbers in each element.

The SNA shall contain 1 to 3 decimal digits.

The SSI may contain 1 to 7 decimal digits as addresses above 9.999.999 are used for internal purposes in Switching and Management Infrastructure (SwMI).

The TSI may contain 3 decimal digit for country code, 4 decimal digits for network code and 1 to 7 decimal digits for short subscriber identity part.

The external subscriber number shall be a number as defined in ITU-T Recommendation E.164 [23].

Each decimal digit shall be encoded using the currently selected character set. The possible leading zeros of the SSI shall be suppressed.

7.7.5 Extended error report +CEER

This command is used by GSM (ETS 300 392-2 [2]) to enable the supply of information to the TE as to the reasons behind a call failure. This command will also be used in TETRA.

The command and responses shall be as presented in table 16.

Table 16: +CEER action command syntax

Command	Possible Response(s)
+CEER	+CEER: <report>
+CEER=?	

7.7.5.1 Description

Execution command causes the MT to return one or more lines of information text <report>. Typically this information will consist of an extended report in textual format of the reason for the failure in the last unsuccessful call set-up (originating or answering) or in call modification, or the reason for the last call release based on the information provided by the TETRA network.

7.7.5.2 Defined values

<report>: the total number of characters, including line terminators, in the information field shall not exceed 2 048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

7.7.5.3 Implementation

Optional.

7.7.6 ITU-T Recommendation V.25ter [5] CC commands

The commands shall be as presented in table 17.

Table 17: ITU-T Recommendation V.25ter [5] CC commands

Command	Section	Impl.	Use in TETRA
D[<dial_string>]	7.3.1	mand.	originates a call
T	7.3.2	mand.	ignored (select tone dialling)
P	7.3.3	mand.	ignored (select pulse dialling)
A	7.3.5	mand.	answer a call
H [<value>]	7.3.6	mand.	hang up a call
O [<value>]	7.3.7	mand.	returns MT to online data state from online command mode (only value equal to zero needed)
S0=[<value>]	7.3.8	mand.	sets the number of call indications (rings) before automatically answering the call; value equalling zero disables automatic answering and is the default
S6=[<value>]	7.3.9	mand.	ignored (pause before blind dialling)
S7=[<value>]	7.3.10	mand.	may be ignored (sets number of seconds to wait for completion of call answering or originating procedure before giving up and disconnecting)
S8=[<value>]	7.3.11	mand.	may be ignored (sets number of seconds to wait when comma dial modifier is encountered in dial string of D command (default is 2 seconds))
S10=[<value>]	7.3.12	mand.	may be ignored (sets number of tenths of seconds to wait before disconnecting after MT has indicated the absence of received signal)
L [<value>]	7.3.13	mand.	ignored (monitor speaker loudness)
M [<value>]	7.3.14	mand.	ignored (monitor speaker mode)

7.8 Short Data Service (SDS) related commands

The commands listed below for use with the TETRA SDS and precoded status messaging service are very similar to those used in conjunction with the GSM Short Message Service (SMS) (ETS 300 585 [7]). The command *+CSDS* is a command specific to TETRA and is used to indicate if the SDS is accessible via AT commands. All other commands are GSM commands which are applicable to TETRA.

7.8.1 Parameter Definitions

The following parameters are used in the subsequent subclauses.

<index> Integer type; value used to reference a message stored in the MT.

<stat> Integer or string type; indicates the status of the a message stored in the MT; defined values:

0	"REC UNREAD"	received unread message (i.e. new message)
1	"REC READ"	received read message
2	"STO UNSENT"	stored unsent message
3	"STO SENT"	stored sent message
4	"ALL"	all messages

<alpha> String type alphanumeric representation of the destination address *<da>* or originating address *<oa>,* which may contain more information than the actual dialled address. Implementation of this parameter is manufacturer specific. The character set used to encode *<alpha>* should be the one selected using the command Select TE Character Set +CSCS (subclause 7.5.5).

<da> The short message or precoded status message destination address. The character set used to encode <da> should be the one selected using the command Select TE Character Set +CSCS (subclause 7.5.5). The destination address <da> shall consist of one of the following:

- Short Number Address (SNA);
- Short Subscriber Identity (SSI);

- TETRA Subscriber Identity (TSI);
- External subscriber number.

The addresses SNA, SSI and TSI are 8 bits, 24 bits and 48 bits binary information elements respectively. See ETS 300 392-1 [1] clause 7 for a description of the SNA, SSI and TSI fields. The address extention part of the TSI is divided into two subelements Country code (10 bits) and Network code (14 bits) which are encoded as independent elements. For dialling purposes the addresses shall be presented as strings of decimal digits having same value as the binary numbers in each element.

The SNA shall contain 1 to 3 decimal digits.

The SSI may contain 1 to 7 decimal digits as addresses above 9.999.999 are used for internal purposes in SwMIs.

The TSI may contain 3 decimal digit for country code, 4 decimal digits for network code and 1 to 7 decimal digits for short subscriber identity part.

The external subscriber number shall be an E.164 number.

Each decimal digit shall be encoded using the currently selected character set. The possible leading zeros of the SSI shall be suppressed.

<toa> The type of address shall identify the contents of the <da> field as shown in table 18.

Table 18: Relationship between the <toa> field and contents of <da> field

<toa> field	Contents of <da> field
0	SNA
1	SSI
2	TSI
3	External subscriber number

<length> Integer type; value indicates the length of the message body (including SDS Transport Layer header) in bits. The character set used to encode *<length>* should be the one selected using the command Select TE Character Set +CSCS (subclause 7.5.5).

<oa> The short message or precoded status message originating address. The character set used to encode *<da>* should be the one selected using the command Select TE Character Set +CSCS (subclause 7.5.5).

<scts> This is the "service centre time stamp", a GSM specific parameter which has no equivalent in TETRA. This parameter is supported for future expansion and to ensure compliance with the GSM commands, however where it is required, the field will be left blank.

7.8.2 Select SDS +CSDS

The command and responses shall be as presented in table 19.

Table 19: +CSDS parameter command syntax

Command	Possible Response(s)
+CSDS=<service>	+CSDS: *<mt>,<mo>* *+CME ERROR: <err>*
+CSDS?	+CSDS: *<service>,<mt>,<mo>* *+CME ERROR: <err>*
+CSDS=?	+CSDS: (list of supported <service>s)

7.8.2.1 Description

Set command selects messaging service *<service>.* By default *<service>* is set to SDS (user defined data 4). It returns the type of messages supported by the MT: *<mt>* for mobile terminated messages and *<mo>* for mobile originated messages. If chosen service is not supported by the MT, then final result code *+CME ERROR: <err>* shall be returned. Error codes are described in subclause 7.11.2.

Read command returns supported message types along with the current service setting.

Test command returns a list of all services supported by the MT.

7.8.2.2 Defined values

<service>:

0 SDS (user defined data 4)
1 precoded status messages
128.. manufacturer specific

<mt>, <mo>:

0 type not supported
1 type supported

7.8.2.3 Implementation

Mandatory.

7.8.3 New message indications to TE +CNMI

The command and responses shall be as presented in table 20.

Table 20: +CNMI parameter command syntax

Command	Possible Response(s)
+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	*+CME ERROR: <err>*
+CNMI?	+CNMI: *<mode>,<mt>,<bm>,<ds>,<bfr>*
+CNMI=?	+CNMI: (list of supported <modes>s), (list of supported <mt>s), (list of supported <bm>s), (list of supported <ds>s), (list of supported <bfr>s)

7.8.3.1 Description

Set command selects the procedure, how receiving new messages from the network is indicated to the TE when TE is active, e.g. DTR signal is ON. *<mode>* controls the processing of unsolicited result codes specified within this command, *<mt>* sets the result code indication routing for newly received SDS messages, *<bm>, <ds>* and *<bfr>* are GSM parameters which will be recognized to ensure compatibility however shall be ignored. If chosen service is not supported by the MT, then final result code *+CME ERROR: <err>* shall be returned. Error codes are described in subclause 7.11.2.

Read command returns the current settings.

Test command returns a list of all settings supported by the MT.

7.8.3.2 Defined values (default value is underlined)

<mode>:

0 Buffer unsolicited result codes in the MT. If MT result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications.
1 Discard indication and reject new received message unsolicited result codes when MT-TE link is reserved (e.g. in "On-line data" state). Otherwise forward them directly to the TE.
2 Buffer unsolicited result codes in the MT, when MT-TE link is reserved (e.g. in "On-line data" state) and flush them to the TE after the reservation. Otherwise forward them directly to the TE.
3 Forward unsolicited result codes directly to the TE. MT-TE link specific inband technique used to embed result codes and data when TA is in "On-line data" state.

NOTE: The MT-TE link specific inband technique is outside the scope of the present document.

<mt>:

0 type not supported
1 type supported

Result codes forwarded to the TE are of the format:

+CMT: [<alpha>,]<length><CR><LF><data>

where *<alpha>* is an alphanumeric representation of the originating address and is manufacturer specific and *<length>* is the length of the message body *<data>* in bits.

7.8.3.3 Implementation

Mandatory.

7.8.4 Send message +CMGS

The command and responses shall be as presented in table 21.

Table 21: +CMGS action command syntax

Command	Possible Response(s)
+CMGS= <da>[,<toa>[,<area>[,<length>]]]<CR> **user defined data-4 information is entered**<ctrl-Z/ESC>	**If sending is successful** *+CMGS: <mr>* **If sending fails** *+CME ERROR: <err>*
+CMGS=?	

7.8.4.1 Description

Execution command sends a message from a TE to the network. The message is sent to the address *<da>*. This command differs from the GSM command through the presence of two parameters <area> and *<length>*, however as these parameters are optional, compatibility with the GSM command is retained. <area> represents Area Selection and is used to indicate to the TETRA SwMI the distribution of the Short Data message.<length> indicates the length in bits of the user defined data-4 information which follows (excluding the *<CR>* and *<ctrl-Z/ESC>*). The *<length>* parameter is not required for text messages but is required when the message body contains binary data, see subclause 7.5.5 for character set selection. Message reference value *<mr>* is returned to the TE on successful delivery. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in the network or an MT error occurs, then the final result code *+CME ERROR : <err>* is returned. Error codes are described in subclause 7.11.2. It should be possible to abort this command.

- the <toa> defines the address type, see subclause 7.8.1;
- entered user information is sent to address *<da>* and all current settings are used to construct the actual PDU in the MT;
- the user information shall include the SDS User Defined Data-4 bits, see ETS 300 392-2 [2] subclause 14.8.52;
- the Data Channel received line signal Detector (DCD) signal (if implemented) shall be in the ON state while text is entered;
- echoing of entered characters back from the MT is controlled by the V.25ter command *E*;
- sending may be cancelled using the *<ESC>* character (IRA 27);
- the end of the message is indicated by *<ctrl-Z>* (IRA 26).

7.8.4.2 Defined values

<da>: destination address, see subclause 7.8.1. The destination address shall be coded in the currently selected TE character set, refer command +CSCS subclause 7.5.5.

<length>: integer type value indicating the length of the message body in bits (excluding the <CR> and <ctrl-Z/ESC>). Supported values depend on the setting of the command Select Short Data Service (subclause 7.8.1) and are as shown in table 20. The length shall be coded in the currently selected TE character set (refer command +CSCS subclause 7.5.5). The allowed lengths are presented in table 22.

Table 22: Supported values for <length> field

Short data service	Supported <length>s
user defined data-4	1 - 2 047
precoded status messages	16

7.8.4.3 Implementation

Optional.

7.8.5 List messages +CMGL

The command and responses shall be as presented in table 23.

Table 23: +CMGL action command syntax

Command	Possible Response(s)
+CMGL[=<stat>]	**If command is successful** *+CMGL: <index>,<stat>,<oa>,[<alpha>][<CR><LF>* *+CMGL: <stat>,<oa>,[<alpha>][...]]* **If command fails** *+CME ERROR: <err>*
+CMGL=?	

NOTE: The corresponding GSM command returns the message body with the result codes. However in this implementation, only an index of the message *<index>*, status of the message *<stat>*, originating address of the message *<oa>* and optional alphanumeric representation of the originating address *<alpha>* are returned. The read message command *+CMGR* (subclause 7.8.5) is used in conjunction with the *<index>* to return the message body.

7.8.5.1 Description

Execution command returns a list of messages stored in the MT with status value *<stat>* to the TE. If reading fails, then the final result code *+CME ERROR : <err>* is returned. Error codes are described in subclause 7.11.2.

7.8.5.2 Implementation

Optional.

7.8.6 Delete message +CMGD

The command and responses shall be as presented in table 24.

Table 24: +CMGD action command syntax

Command	Possible Response(s)
+CMGD= <index>	*+CME ERROR: <err>*
+CMGD=?	

7.8.6.1 Description

Execution command deletes message from storage location *<index>*. If deleting fails then the final result code *+CME ERROR : <err>* is returned. Error codes are described in subclause 7.11.2. It should be possible to abort this command.

7.8.6.2 Implementation

Optional.

7.8.7 Read message +CMGR

The command and responses shall be as presented in table 25.

Table 25: +CMGR action command syntax

Command	Possible Response(s)
+CMGR= *<index>*	**If command is successful** *+CMGR: <stat>,<oa>,[<alpha>,]<scts><CR><LF>data* **If command fails** *+CME ERROR: <err>*
+CMGR=?	

NOTE: The corresponding GSM command can have extra parameters in the result code however these parameters will only be shown if the TE requests that they be shown using the command *+CSDH* (Show Text Mode Parameters). By default these parameters are not shown.

7.8.7.1 Description

Execution command returns message with location value *<index>* from storage in the MT to the TE. If status of the message *<stat>* is "received unread", status in the storage changes to "received read". If reading fails, then the final result code *+CME ERROR : <err>* is returned. Error codes are described in subclause 7.11.2.

7.8.7.2 Implementation

Optional.

7.9 Network service related commands

This subclause describes TETRA network related commands, which are not covered in the subclause on CC.

7.9.1 Subscriber number +CNUM

The command and responses shall be as presented in table 26.

Table 26: CNUM action command syntax

Command	Possible Response(s)
+CNUM	*+CNUM: [<alpha1>] , <number1> , <type1>* *[<CR><LF>+CNUM: [<alpha2>] , <number2> , <type2>* *[...]]*
+CNUM=?	

7.9.1.1 Description

Action command returns the TETRA subscriber identity number. If there are different numbers for different services then each number will be returned in a separate line.

7.9.1.2 Defined values

<alphax>: optional alphanumeric string associated with <numberx>; used character set should be the one selected with command Select TE Character Set +CSCS.

<numberx>: string type number of format specified by <typex>.

<typex>: Individual TETRA Subscriber Identity (ITSI), Group TETRA Subscriber Identity (GTSI) (as defined in ETS 300 392-1 [1].

7.9.1.3 Implementation

Optional.

7.9.2 Network registration +CREG

The command and responses shall be as presented in table 27.

Table 27: +CREG parameter command syntax

Command	Possible Response(s)
+CREG=[<n>]	
+CREG?	+CREG: *<n>, <stat> [,<area>]* *+CME ERROR: <err>*
+CREG=?	+CREG: (list of supported <n>s)

7.9.2.1 Description

Set command controls the presentation of an unsolicited result code *+CREG: <stat>* when *<n>*=1 and there is a change in the MT network registration status, or code *+CREG: <stat> [,<la>]* when *<n>*=2 and there is a change of the network cell.

Read command returns the status of result code presentation and an integer *<stat>* which shows whether the network has currently indicated the registration of the MT. Location information element*<la>* is returned only when *<n>*=2 and the MT is registered in the network. Error codes are described in subclause 7.11.2.

7.9.2.2 Defined values (default value is underlined)

<n>:

0 disable network registration unsolicited result code
1 enable network registration unsolicited result code *+CREG: <stat>*
2 enable network registration and location information unsolicited result code *+CREG: <stat> [,<lac>]*

<stat>:

0 not registered, MT is not currently searching a new operator to register to
1 registered home network
2 not registered, but MT is currently searching a new operator to register to
3 registration denied
4 unknown
5 registered, roaming

<la>: string type ; 14 bit location area code (as defined in ETS 300 392-2 [2]).

7.9.2.3 Implementation

Optional.

7.10 MT control and status commands

The commands defined below are used all used by GSM [2] with some also used by TIA IS-99 [9] and TIA IS-135 [10]. They include commands relating to MT power, signal strength, keypad, display and indicator handling.

7.10.1 MT activity status +CPAS

The command and responses shall be as presented in table 28.

Table 28: CPAS action command syntax

Command	Possible Response(s)
+CPAS	+CPAS: <pas> *+CME ERROR: <err>*
+CPAS=?	+CPAS: (list of supported <pas>s) *+CME ERROR: <err>*

7.10.1.1 Description

Action command returns the activity status <pas> of the MT. It can be used to interrogate the MT before requesting action form the radio. Error codes are described in subclause 7.11.2.

Test command returns values supported by the MT.

7.10.1.2 Defined values

<pas>:

0 ready (MT allows commands from TE)
1 unavailable (MT does not allow commands from TE)
2 unknown (MT is not guaranteed to respond to instructions)
3 ringing (MT is ready for commands from TE, but the ringer is active)
4 call in progress (MT is ready for commands from TE, but a call is in progress)
5 asleep (MT is unable to process commands from TE because it is in a low functionality state)

7.10.1.3 Implementation

Mandatory when MT can be operated form a TE.

7.10.2 Battery charge +CBC

The command and responses shall be as presented in table 29.

Table 29: CBC action command syntax

Command	Possible Response(s)
+CBC	+CBC: <bcs> , <bcl> *+CME ERROR: <err>*
+CBC=?	+CBC: (list of supported <bcs>s), (list of supported <bcl>s)

7.10.2.1 Description

Action command returns the battery connection status <bcs> and battery charge level <bcl> of the MT. Error codes are described in subclause 7.11.2.

Test command returns values supported by the MT.

7.10.2.2 Defined values

<bcs>:

0 MT is powered by the battery
1 MT has a battery connected, but is not powered by it
2 MT does not have a battery connected
3 Recognized power fault, calls inhibited

<bcl>:

0 battery is exhausted, or MT does not have a battery connected
1 battery has 1 to 100 percent capacity remaining

7.10.2.3 Implementation

Optional.

7.10.3 Signal quality +CSQ

The command and responses shall be as presented in table 30.

Table 30: CSQ action command syntax

Command	Possible Response(s)
+CSQ	+CSQ: <rssi> , <ber> *+CME ERROR: <err>*
+CSQ=?	+CSQ: (list of supported <rssi>s), (list of supported <ber>s)

7.10.3.1 Description

Action command returns the received signal strength indication <rssi> and channel bit error ratio <ber> from the MT. Error codes are described in subclause 7.11.2.

Test command returns values supported by the MT.

7.10.3.2 Defined values

<rssi>:

0 -113 dBm or less
1 -111 dBm
2..30 -109...-53 dBm
31 -51 dBm or greater
99 not known or not detectable

<ber>:

0 < 0,01 %
1 0,01 % to less than 0,1 %
2 0,1 % to less than 0,5 %
3 0,5 % to less than 1,0 %
4 1,0 % to less than 2,0 %
5 2,0 % to less than 4,0 %
6 4,0 % to less than 8,0 %
7 ≥ 8,0 %
99 not known or not detectable

7.10.3.3 Implementation

Optional.

7.11 MT errors

This subclause describes how to enable extended error reporting from the MT using the +CMEE command and the form of those errors which can be reported. These codes are identical to codes specified in GSM [2] and are seen as applicable to TETRA also.

7.11.1 Report MT error +CMEE

The command and responses shall be as presented in table 31.

Table 31: +CMEE parameter command syntax

Command	Possible Response(s)
+CMEE=[<n>]	
+CMEE?	+CMEE : <n>
+CMEE=?	+CMEE: (list of supported <n>s

7.11.1.1 Description

Set command disables or enables the use of result code *+CME ERROR : <err>* as an indication of an error relating to the functionality of the MT. When enabled, MT related errors cause *+CME ERROR : <err>* final result code instead of the regular *ERROR* final result code. *ERROR* is returned normally when error is related to syntax, invalid parameters, MT functionality.

Test command returns values supported by the MT.

7.11.1.2 Defined values (default value is underlined)

<n>:

<u>0</u> disable *+CME ERROR : <err>* result code and use *ERROR* instead
1 enable*+CME ERROR : <err>* result code and use numeric *<err>* values (see next subclause)
2 enable*+CME ERROR : <err>* result code and use verbose *<err>* values (see next subclause)

7.11.1.3 Implementation

Mandatory for *<n>* values 0 and 1.

7.11.2 MT error result code +CME ERROR

The operation of the *+CME ERROR: <err>* result code is similar to the regular *ERROR* result code. If *+CME ERROR: <err>* is the result code for any of the commands in a command line, none of the following commands in the same command line are executed (neither *ERROR* or *OK* result code shall be returned as a result of a completed command line execution). The format of *<err>* can be either numeric or verbose. This is set with the command *+CMEE* (as described in the previous subclause).

NOTE: ITU-T Recommendation V.25ter [5] command *V* does not affect the format of this result code.

<err> values (numeric format followed by verbose format):

0 MT failure
1 no connection to MT
2 MT adapter link reserved
3 operation not allowed
4 operation not supported
5 PH-SIM PIN required
10 SIM not inserted
11 SIM CHV1 required
12 SIM UNBLOCKING CHV1 required
13 SIM failure
14 SIM busy
15 SIM wrong
16 incorrect password
17 SIM CHV2 required
18 SIM UNBLOCKING CHV2 required
20 memory full
21 invalid index
22 not found
23 memory failure
24 text string too long
25 invalid characters in text string
26 dial string too long
27 invalid characters in dial string
30 no network service
31 network timeout
100 unknown

also all other values are reserved by ETS 300 916 [8].

7.11.2.1 Implementation

Mandatory for numeric format codes applicable to implemented command set.

8 PEI Data Link Layer (DLL)

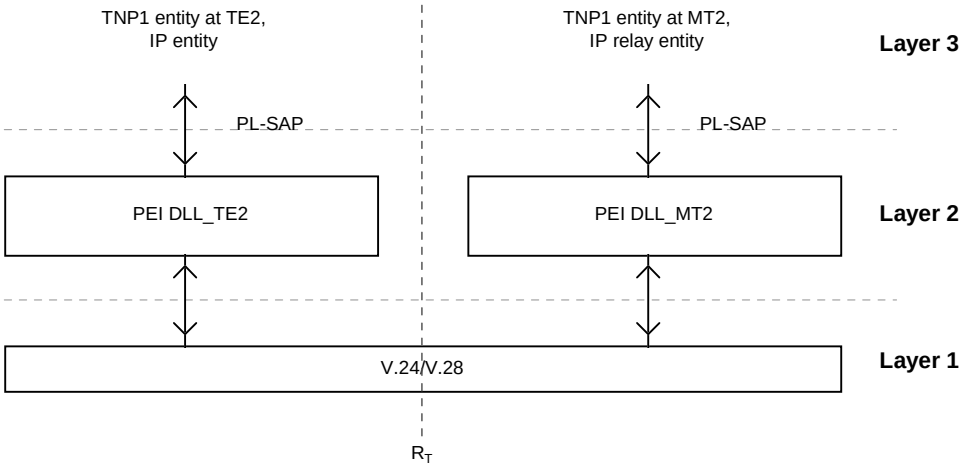
8.1 Introduction

This clause defines the services and protocols that comprise the PEI Data Link Layer (PEI DLL). PEI DLL shall be used as the underlying service for transmitting IP version 4 and 6, and TNP1 protocols between a TE2 and a MT2 over reference point R_T. The reference architecture is shown in figure 10.

Functions of the PEI DLL are:

- configurability to support the various needs of the service users;
- multiplexing and demultiplexing the Network Layer protocols accessing it;
- providing transfer between the peer entities that satisfy the requirements of the Network Layer protocols using the service.

8.2 PEI DLL context



PEI DLL_TE2 Peripheral Equipment Interface, Data Link Layer Entity at Type 2 Terminal Equipment
PEI DLL_MT2 Peripheral Equipment Interface, Data Link Layer Entity at Type 2 Mobile Termination
PL-SAP Peripheral Link, Service Access Point

Figure 10: PEI DLL reference architecture

PEI DLL services are provided to the TE2 user applications at PL-SAP. Only a single instance of PL-SAP may exist. All protocols using PEI DLL are multiplexed to the same SAP and distinguished by a protocol number.

The peer entities communicating with TNP1 protocol over PEI DLL are the TNP1 entity at TE2 and TNP1 Relay entity at MT2. TNP1 Relay is defined in clause 12.

The peer entities communicating with IP version 4 and 6 protocols over PEI DLL are the IP entity at TE2 and IP Relay entity at MT2.

As an underlying service, the PEI DLL shall use the physical layer defined in clause 8.

8.3 PEI DLL service description

This subclause describes the services offered by the PEI Data Link Layer. This service boundary is an internal sub-layer boundary that is defined to clarify the description of the PEI Data Link Layer, and is included in this ETS for informative purposes only.

The underlying protocols of the PEI Data Link service are assumed to be the Internet Point-to-Point protocol (PPP) defined in RFC 1661 [13], with framing methods defined in RFC 1662 [14] and RFC 1663 [15], the Internet Protocol version 4 Control Protocol (IPCP) defined in RFC 1332 [12], and TNP1CP defined in this ETS.

8.3.1 Service primitives offered at PL-SAP

In parameter descriptions M = Mandatory, O = Optional, - = Not allowed.

PL-OPEN request/indication: PL-OPEN request shall be used by the service user at TE2 to request an administrative open of the Data Link or open of any of the Network Layer protocols. PL-OPEN indication shall be used by the PEI DLL to indicate the success/failure of the open request.

PL-OPEN request may also be used to reset an established link or negotiate new parameters for a Network Layer protocol. Where an established link is successfully reset, the link shall have default configuration and all Network Layer protocols shall be in a closed state.

Parameters of the primitive are shown in table 32.

Table 32: Parameters for the primitive PL-OPEN

Parameter	Request	Indication	Response	Confirm
Control Protocol Number (CPN)	M	M	M	M
Success-Code	-	M (note 1)	M	M
Maximum-Receive-Unit	O (note 1)	O (note 1)	O (note 1)	O (note 1)
Quality-Protocol	O (note 1)	O (note 1)	O (note 1)	O (note 1)
Magic-Number	O (note 1)	O (note 1)	O (note 1)	O (note 1)
Protocol-Field-Compression	O (note 1)	O (note 1)	O (note 1)	O (note 1)
Address-and-Control-Field-Compression	O (note 1)	O (note 1)	O (note 1)	O (note 1)
Numbered-Mode	O (note 1)	O (note 1)	O (note 1)	O (note 1)
IP-Compression Protocol	O (note 2)	O (note 2)	O (note 2)	O (note 2)
IP-Address	O (note 2)	O (note 2)	O (note 2)	O (note 2)
Interface-Token	O (note 3)	O (note 3)	O (note 3)	O (note 3)
IPv6-Compression-Protocol	O (note 3)	O (note 3)	O (note 3)	O (note 3)
NOTE 1: Shall be used only when CPN indicates LCP. NOTE 2: Shall be used only when CPN indicates IP version 4. NOTE 3: Shall be used only when CPN indicates IP version 6.				

PL-CLOSE request/indication: PL-CLOSE request shall be used by the service user at TE2 to request an administrative closing of the Data Link or any of the Network Layer protocols. PL-CLOSE indication shall be used by the PEI DLL to indicate a successful close request.

Parameters of the primitive are shown in table 33.

Table 33: Parameters for the primitive PL-CLOSE

Parameter	Request	Indication
Control Protocol Number	M	M

PL-UNITDATA request/indication: PL-UNITDATA request shall be used by the service users at the TE2 and MT2 ends to submit transmission of a Network Layer Protocol Data Unit (PDU). PL-UNITDATA indication shall be used by a PEI DLL entity to deliver a successfully received Network Layer PDU to the service user. The PDU shall be transmitted in the User Data parameter.

Parameters of the primitive are shown in table 34.

Table 34: Parameters for the primitive PL-UNITDATA

Parameter	Request	Indication
Network Protocol Number	M	M
User Data	M	M

PL-REPORT indication: PL-REPORT indication shall be used to indicate incorrect function within the local DDL entity or any of the Network Layer Protocols.

Parameters of the primitive are shown in table 35.

Table 35: Parameters for the primitive PL-REPORT

Parameter	Indication
Protocol Number	M
Cause	M
Result	M
Report Data	O

PL-TEST request/indication: PL-TEST primitive provides the service users at the TE2 and MT2 ends with a loopback mechanism for use in exercising both directions of the link.

PL-TEST request shall be used by the service users to submit transmission of a test PDU that shall be echoed back at the receiving end unmodified. PL-UNITDATA indication shall be used by a PEI DLL entity to deliver a successfully received, echoed PDU to the service user. Any information can be transmitted in the User Data parameter.

When parameter "Loopback" is assigned the value "Discard", the test PDU shall be discarded at the receiving end.

Parameters of the primitive are shown in table 36.

Table 36: Parameters for the primitive PL-TEST

Parameter	Request	Indication
Loopback	M	M
Test Data	M	M

8.3.2 Parameter description

Address-and-Control-Field-Compression =

Definition of RFC 1661 [13] shall apply.

Air Interface Compression =

0 No compression;
1 V.42bis.

Cause =

1 Physical Layer down;
2 Unknown LCP PDU received (Code-Reject);
3 Unknown Protocol Number detected (Protocol-Reject);
4 PDU silently discarded;
5 Restart Timer expired (Unnumbered Mode);
6 Max-Configure counter exhausted;
7 Max-Terminate counter exhausted;
8 Max-Failure counter exhausted;
9 Retransmission timer expired (Numbered Mode, timer T1);
10 Idle state timer expired (Numbered Mode, timer T3);
11 Maximum number of retransmission attempts exhausted (Numbered Mode, counter N2).

Control Protocol Number (values in hexadecimal presentation), as defined in Internet STD2 [20] =

8021 Internet Protocol Control Protocol;
804f Header Compression Control Protocol;
8057 IPv6 Control Protocol;
c021 Link Control Protocol;
<tbd> TNP1 Control Protocol.

Interface-Token =

Definition of RFC 2023 [22] shall apply.

IP-Address =

Definition of RFC 1332 [12] shall apply.

IP-Compression-Protocol =

Definition of RFC 1332 [12] shall apply.

IPv6-Compression-Protocol =

Definition of RFC 2023 [12] shall apply.

Loopback =

0 Discard at the receiving end;
1 Loopback.

Magic-Number =

Definition of RFC 1661 [13] shall apply.

Maximum-Receive-Unit =

Definition of RFC 1661 [13] shall apply.

Minimum Number of Timeslots =

0 No requirement;
1 At least 1 timeslot to be allocated for IP context;
2 At least 2 timeslots to be allocated for IP context;
3 At least 3 timeslots to be allocated for IP context;
4 At least 4 timeslots to be allocated for IP context.

Network Protocol Number (values in hexadecimal presentation), as defined in Internet STD2 [20] =

0021 Internet Protocol version 4;
002d Van Jacobson Compressed TCP/IP;
002f Van Jacobson Uncompressed TCP/IP;
004f IP6 Header Compression;
0057 Internet Protocol version 6;
<tbd> TETRA Network Protocol Type 1.

Numbered-Mode =

Definition of RFC 1661 [13] shall apply.

Protocol-Field-Compression =

Definition of RFC 1661 [13] shall apply.

Protocol Number =

c021 Link Control Protocol;
0021 Internet Protocol version 4;
002d Van Jacobson Compressed TCP/IP;
002f Van Jacobson Uncompressed TCP/IP;
004f IP6 Header Compression;
0057 Internet Protocol version 6;

<tbd> TETRA Network Protocol Type 1;
8021 Internet Protocol Control Protocol;
804f IP6 Header Compression Control Protocol;
8057 IPv6 Control Protocol;
c021 Link Control Protocol;
<tbd> TNP1 Control Protocol.

Quality-Protocol =

Definition of RFC 1661 [13] shall apply.

Report Data =

Length + Rejected-Packet, when "Cause" = Code-Reject;
Length + Rejected-Protocol + Rejected-Information, when "Cause" = Protocol-Reject.

Result =

0 No action;
1 Network Layer PDU lost;
2 Network Layer PDU discarded;
3 Network Layer Protocol closed;
4 Link closed.

Service priority =

0 No incoming speech call may override IP traffic;
1 Individual calls may override IP traffic;
2 Group calls may override IP traffic;
3 Any speech call may override IP traffic.

Success Code =

0 Configure-Ack, all parameters recognizable and accepted, open successful;
1 Configure-Nak, parameters recognizable, some values not accepted, open failed;
2 Configure-Rej, some parameters not recognizable or acceptable for negotiation, open failed.

Test Data =

Any number of octets comprising the test data.

User Data =

Any number of octets needed to carry a Network Layer protocol PDU.

8.3.3 Service states for PL-SAP

Clause 3 of RFC 1661 [13] shall apply, with amendments defined in this subclause. Phases defined in the reference are interchangeably called in this ETS as service states of PL-SAP, see figure 11.

Authentication phase shall not be implemented, as authentication will be performed at the MT2 registration.

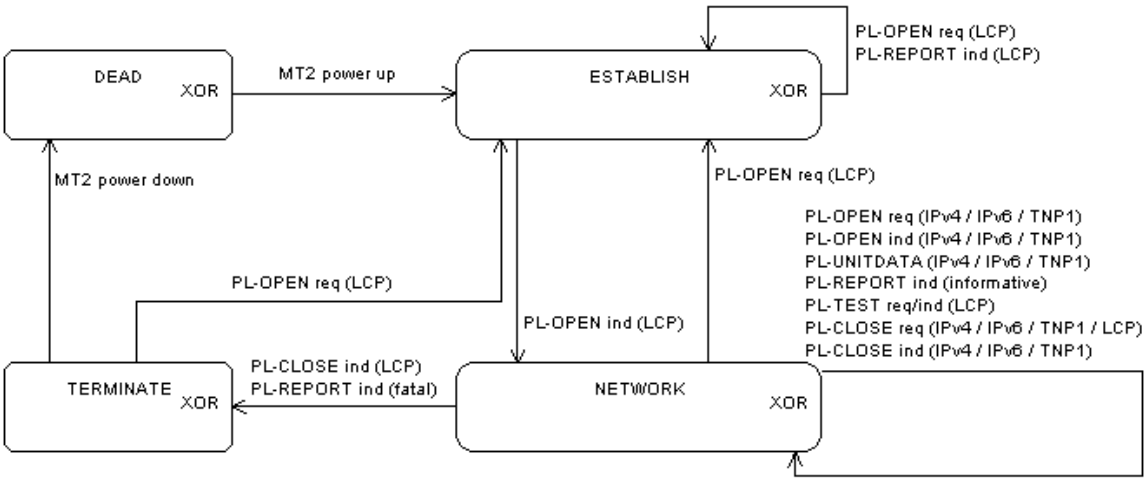


Figure 11: Service states of PL-SAP

8.4 PEI DLL protocols

8.4.1 Introduction

The Point-to-Point Protocol (PPP) defined in RFC 1661 [13] provides a standard method for transporting multi-protocol datagrams over point-to-point links. PPP, conforming to the guidelines defined in this subclause, shall be used as the PEI Data Link Layer (PEI DLL) protocol for IP version 4 and 6, and TNP1 protocols.

PPP is comprised of three main components:

- a method for encapsulating multi-protocol datagrams, that enables parallel execution of IP and TNP1 protocols over PEI;

- a Link Control Protocol (LCP) for establishing, configuring, and testing the data-link connection;

- a family of NCPs for establishing and configuring different network layer protocols. RFC 1332 [12] defines the Internet Protocol Control Protocol (IPCP) and RFC 2023 defines IPV6CP that are the PPP NCPs to be used for IPv4 and IPv6 in PEI, respectively.

Further, two different framing methods are currently defined for PPP by IETF and documented in RFC 1662 [14] and RFC 1663 [15], and shall be the framing methods used in PEI DLL. Of these, framing defined in RFC 1663 [15] is optional.

This subclause defines necessary specifications and amendments to provide unambiguous application of RFC 1661 [13], RFC 1662 [14] and RFC 1663 [15] to PEI DLL.

Implementation of any NCP is optional and required only when the corresponding Network Layer protocol is implemented.

8.4.2 Protocol encapsulation and protocol numbers

The protocol encapsulation defined in clause 2 of RFC 1661 [13] shall apply, with amendments defined in this subclause. Protocol numbers used with PEI DLL are listed in table 37.

Table 37: Protocol numbers applicable in PEI

Protocol	Protocol Number (hex)	Remark
Internet Protocol version 4	0021	
Van Jacobson Compressed TCP/IP	002d	
Van Jacobson Uncompressed TCP/IP	002f	
IP6 Header Compression	004f	note
Internet Protocol version 6	0057	note
Internet Protocol Control Protocol	8021	
IP6 Header Compression Control Protocol	804f	note
IPv6 Control Protocol	8057	note
Link Control Protocol	c021	
TETRA Network Protocol Type 1	<tbd>	
TNP1 Control Protocol	<tbd>	
NOTE: Usage will be defined in more detail in later versions of this ETS.		

The default value to Maximum Receive Unit (MRU) shall be 1 500 octets.

Padding of the Information field is strongly discouraged.

8.4.3 Framing

RFC 1662 [14] defines the use of an unacknowledged, HDLC-like framing for PPP encapsulated packets. This framing method shall be called "Unnumbered mode" in this ETS as in RFC 1662 [14]. RFC 1663 [15] defines a reliable HDLC link based on the ISO 7776 [17] (LAPB) standard for use with PPP. This framing method shall be called "Numbered mode" in this ETS, as in RFC 1663 [15]. Both framing methods may be used to transmit any PEI Network Layer Protocol, as specified in RFC 1332 [12]. However, because TNP1 transmits call signalling and other information that requires reliable transmission over the underlying Data Link even in hostile environments like vehicle and plant installations, use of Numbered mode should be considered for TNP1.

Clause 2 of RFC 1663 [15] requires the provision of control signals from Physical Layer to indicate Up and Down events of the Data Link. However, as ISO 7776 [17] does not require any equivalent to such control signals, implementation of these as hardware signals is left as an option in this ETS.

8.4.4 PPP Link Control Protocol (LCP)

The PPP LCP comprises the Option Negotiation Automaton and LCP packets defined in RFC 1661 [13], clauses 4 and 5, respectively. The LCP packets are interchangeably called in this ETS as LCP PDUs. Following LCP PDUs shall be implemented:

- Configure-Request;
- Configure-Ack;
- Configure-Nak;
- Configure-Reject;
- Terminate-Request;
- Terminate-Ack;
- Code-Reject;
- Protocol-Reject;
- Echo-Request;
- Echo-Reply;
- Discard-Request.

8.4.4.1 LCP configuration options

Following LCP configuration options shall apply, as specified in table 38.

Table 38: LCP configuration options applicable in PEI

Type	LCP Configuration Option	Unnumbered Mode	Numbered Mode	Default value	Remark
1	Maximum-Receive-Unit	Mandatory	Mandatory	1 500	
4	Quality-Protocol	Optional	Mandatory		
5	Magic-Number	Optional	Mandatory		
7	Protocol-Field-Compression	Optional	No		
8	Address-and-Control-Field-Compression	Optional	No		
11	Numbered-Mode	Optional	-		Shall be implemented if "Numbered Mode" is supported

Default values apply at both peer entities upon startup. Changes to option values shall be negotiated to both directions separately.

8.4.4.2 LCP protocol states

Clause 4 of RFC 1661 [13] shall apply, with following amendments:

- the implementation option defined for state "Stopped" shall be implemented, as the Physical Layer of PEI is a dedicated circuit;

- the "This-Layer-Up" and "This-Layer-Down" actions related to the "Opened" state shall be signalled to the Network Layer using the PL-OPEN indication (LCP) and PL-CLOSE indication (LCP) service primitives, respectively;

- counters and timers that shall be implemented and their default values are listed below:

    - Restart timer, 3 s;
    - Max-Terminate, 2 transmissions;
    - Max-Configure, 10 transmissions;
    - Max-Failure, 5 transmissions.

8.4.4.3 LCP procedures

This subclause assumes that there exist administrative entities at TE2 and MT2 ends, below denoted "TE2 administrative entity" and "MT2 administrative entity", responsible for administrating the PEI Data Link.

8.4.4.3.1 Opening and configuring the Data Link

Opening and configuration of the Data Link shall be initiated at the TE2 and MT2 ends as defined in the RFC 1661 [13]. Upon successful open, a "Configure-Ack" PDU is received by the PEI DLL entity, whereas receipt of a "Configure-Nak" or a "Configure-Reject" PDU indicates failure of the open procedure. Success/failure of the configuration handshaking is indicated to both peer entities with the parameter "Success-Code" of PL-OPEN indication. See figures 11 and 12 for examples. Note that the administrative open by PL-OPEN reg (LCP) may be replaced by a lower layer "up" event as well.

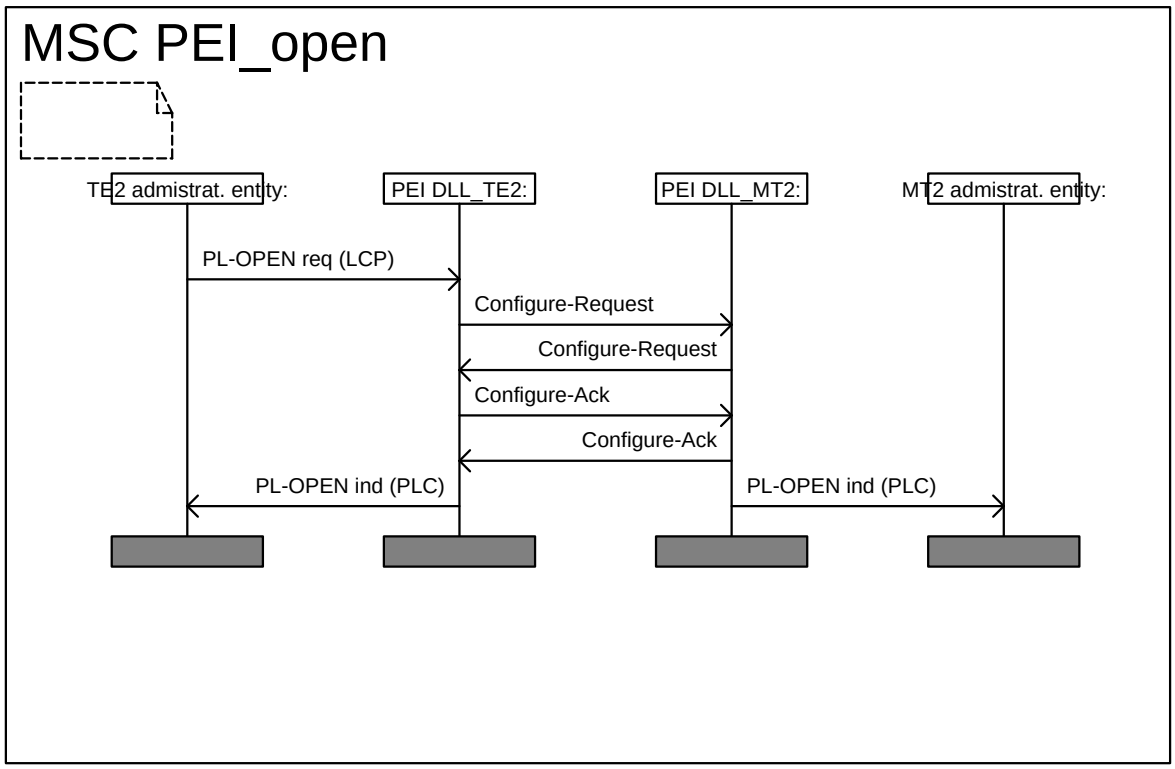


Figure 12: Successful open and configuration of the Data Link

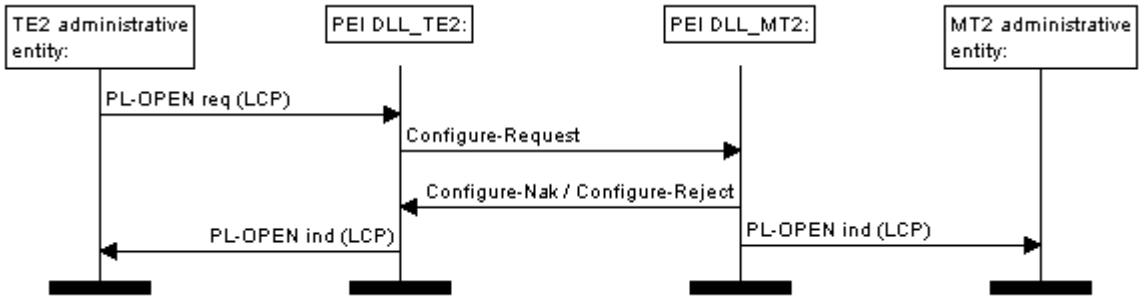


Figure 13: Failure at the Data Link open

8.4.4.3.2 Closing the Data Link

The Data Link can be closed at either end. Figure 14 describes the closing procedure initiated at the TE2 end and figure 15 initiated at the MT2 end. Closing the Data Link shall be indicated to all peer entities that use the Data Link service at the moment of closure, by issuing them PL-CLOSE indications.

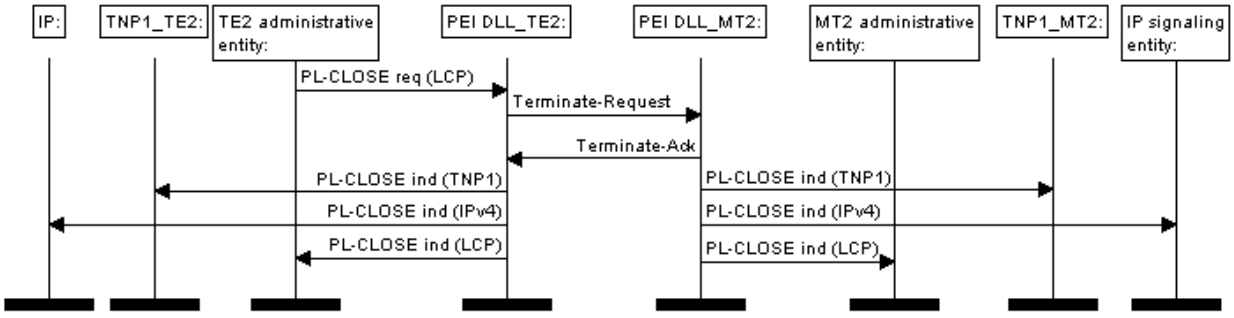


Figure 14: Successful closure of the Data Link, TE2 originated

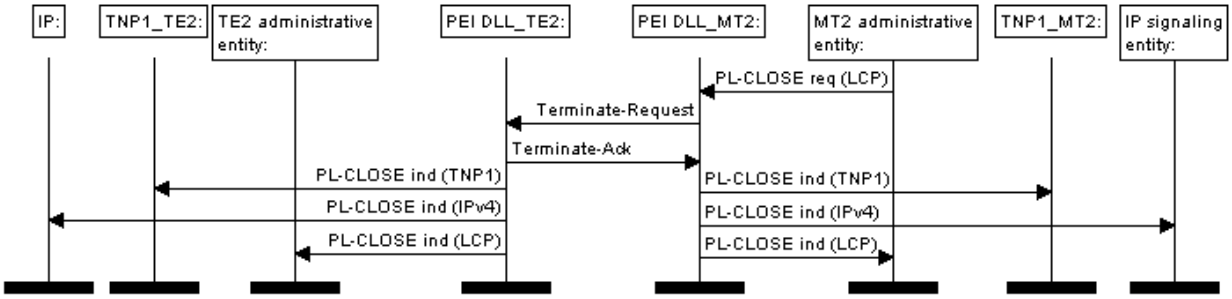


Figure 15: Successful closure of the Data Link, MT2 originated

8.4.4.3.3 Reopening the Data Link

Reopen and an implicit reset of the Data Link is caused by submitting PL-OPEN request for LCP. Reopen shall be indicated to all peer entities that use the Data Link service at the moment of closure, by issuing them PL-CLOSE indications, see figure 16.

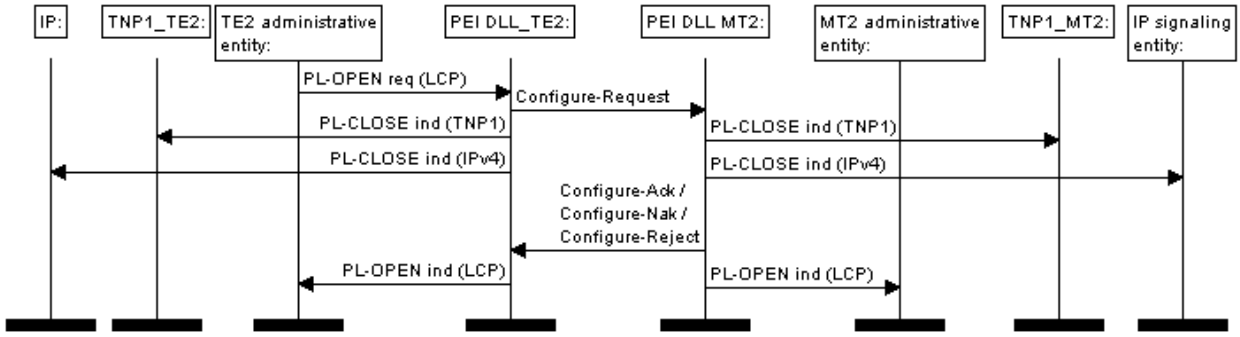


Figure 16: Reopening the Data Link

8.4.4.3.4 Abnormal closing of the Data Link

When a PEI DLL peer entity encounters a fatal condition, it shall indicate the condition to the administrative entity of the same end by issuing a PL-REPORT indication. Subsequently, it shall try to orderly close the peer entity by sending a "Terminate-Request" PDU. Moreover, the entities at the same end using the services of PEI DLL shall be informed of the lost link by issuing them PL-REPORT indications, see figures 16 and 17.

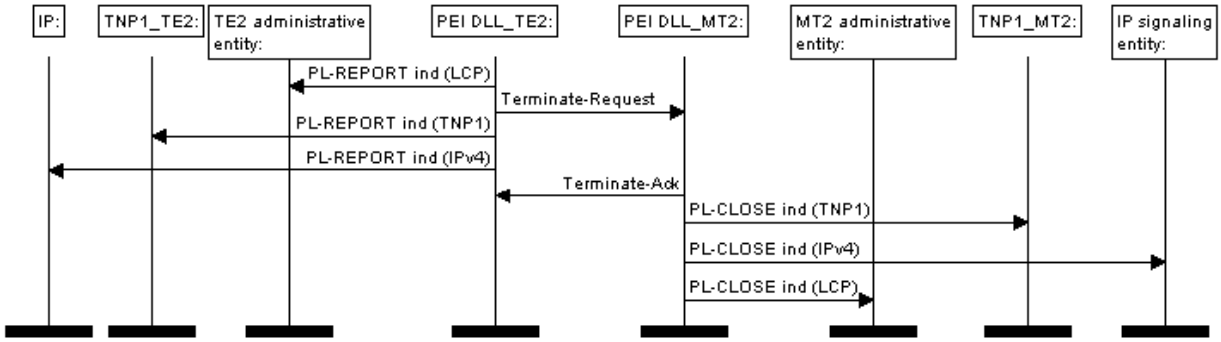


Figure 17: Abnormal closing of the Data Link, TE2 originated

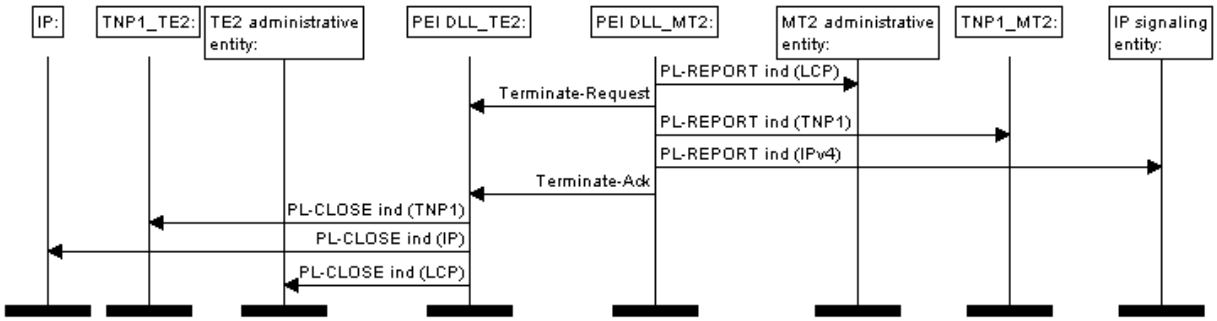


Figure 18: Abnormal closing of the Data Link, MT2 originated

8.4.4.3.5 Informative report indications

A PEI DLL entity may issue an informative PL-REPORT indication at any moment. The receiving entity is defined by the "Protocol Number" parameter carried by the PL-REPORT indication.

8.4.4.3.6 Link testing procedures

A loopback test is initiated submitting a PL_TEST request and requiring loopback with the "Loopback" parameter, see figure 19. Echo-Request and Echo-Reply PDUs will be exchanged.

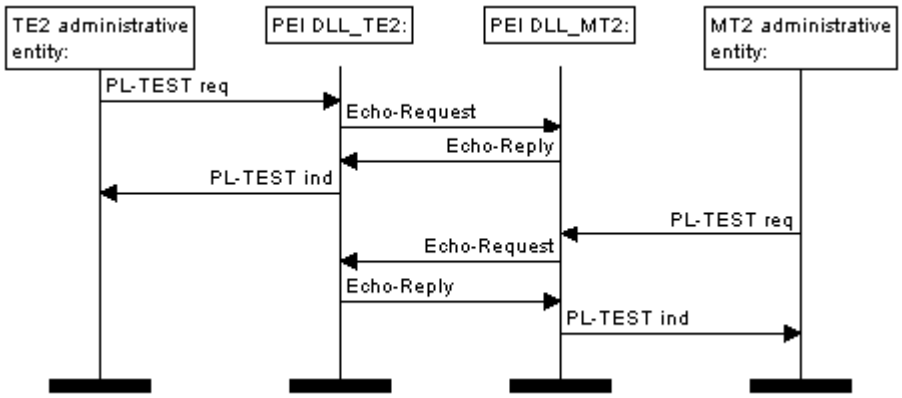


Figure 19: Loopback test of the Data Link

Testing in the PEI DLL entity in sink mode shall be selectable, where the Cancel-Request PDU is sent and discarded in the receiving end, see figure 20.

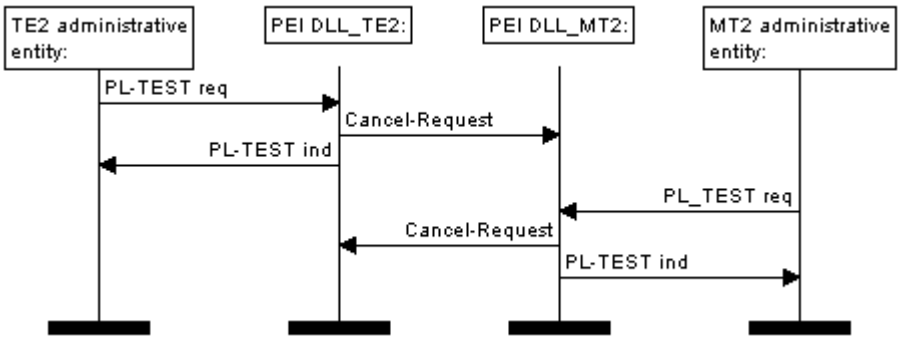


Figure 20: Sink test of the Data Link

8.4.5 PPP Internet Protocol Control Protocol (IPCP)

The PPP IPCP comprises the Option Negotiation Automaton and IPCP packets defined in RFC 1661 [13] clause 4 and in RFC 1332 [12] clause 2, respectively. The IPCP packets are interchangeably called in this

ETS as IPCP PDUs. IPCP PDUs are defined in RFC 1332 as a subset of LCP PDUs, including following PDUs:

- Configure-Request;
- Configure-Ack;
- Configure-Nak;
- Configure-Reject;
- Terminate-Request;
- Terminate-Ack;
- Code-Reject.

IPCP shall be used in PEI to open and close the Data Link for IPv4, and to negotiate the related IP address and quality of service parameters.

8.4.5.1 IPCP configuration options

Following IPCP configuration options shall apply, as specified in subsequent subclauses and table 39.

Table 39: IPCP configuration options applicable in PEI

IPCP Configuration Option			Remark
IP-Compression Protocol	Optional		If this configuration option is implemented, then implementation of the van Jacobson TCP/IP compression defined in RFC 1144 [16] becomes mandatory.
IP-Address	Mandatory		

8.4.5.2 IPCP protocol states

Clause 4 of RFC 1661 [13] shall apply.

8.4.5.3 IPCP procedures

Before any IPCP procedures can be performed, the PPP Data Link shall be successfully opened and functional.

8.4.5.3.1 Opening, reopening and resetting the Data Link for IPv4

Opening the Data Link for IPv4 traffic is typically initiated by the TE2, but may be initiated by MT2, depending of the implementation. In general, the readiness to transmit IPv4 traffic by performing the opening procedure described in this subclause is limited to the local link between TE2 and MT2, but may be linked to the service state of the MT2 interpreting the PL-OPEN indication to an IP Signalling Entity as a call establishment or alike.

Depending on the reply (Configure-Ack / Configure-Nak / Configure-Reject), the open is either successful or subsequent negotiations are needed, see figure 21.

Parameters "IP-Compression-Protocol" shall be used to negotiate IP compression at the local connection between TE2 and MT2.

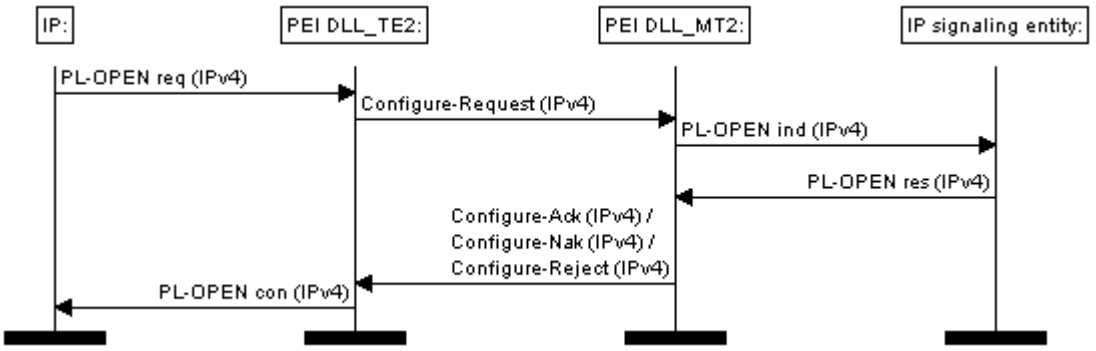


Figure 21: Opening the Data Link for IPv4

Renegotiating the IPCP options and implicit reset of the IPv4 traffic over PEI is caused by issuing a PL-OPEN request for IPCP when the Data Link is already opened for IPv4 traffic.

8.4.5.3.2 Closing the Data Link to IPv4

The Data Link is closed to IPv4 traffic by issuing a PL-CLOSE request with appropriate value of the "Control-Protocol-Number", see figure 22.

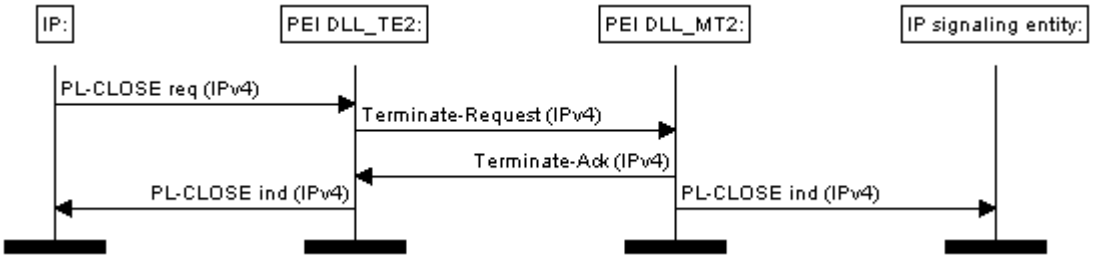


Figure 22: Closing the Data Link to IPv4

8.4.5.3.3 Abnormal termination of the IP transmission

A PEI DLL entity may issue an PL-REPORT indication for IPCP protocol at any moment when the link is in the "Opened" state. Depending on the value of the parameter "Cause", it may indicate either a recoverable failure (e.g. "PDU silently discarded") or a fatal one (e.g. "Link closed"). After a fatal failure, the IPv4 traffic shall be closed and a reopen is required to restart it.

8.4.6 TNP1 Control Protocol (TNP1CP)

The TNP1CP comprises the Option Negotiation Automaton and TNP1CP packets defined in RFC 1661 [13] clause 4 and in this ETS, respectively. The TNP1CP packets are interchangeably called in this ETS as TNP1CP PDUs. TNP1CP PDUs are defined in this ETS as a subset of LCP PDUs, including following PDUs:

- Configure-Request;
- Configure-Ack;
- Configure-Nak;
- Configure-Reject;
- Terminate-Request;
- Terminate-Ack;
- Code-Reject.

TNP1CP shall be used in PEI to open and close the Data Link for TNP1.

8.4.6.1 TNP1CP configuration options

There are no TNP1 specific configuration options.

8.4.6.2 TNP1CP protocol states

Clause 4 of RFC 1661 [13] shall apply.

8.4.6.3 TNP1CP procedures

Before any TNP1CP procedures can be performed, the PPP Data Link shall be in the "Opened" state.

8.4.6.3.1 Opening, reopening and resetting the Data Link for TNP1

Opening the Data Link for TNP1 is always initiated by the TE2 by issuing a PL-OPEN request.

Depending on the reply (Configure-Ack / Configure-Nak / Configure-Reject), the open is either successful or subsequent negotiations are needed, see figure 23.

No configuration options are negotiated during link establishment for TNP1.

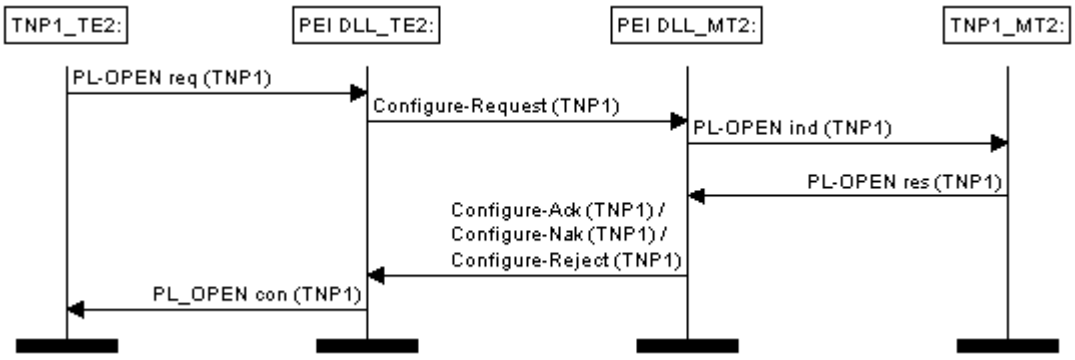


Figure 23: Opening the Data Link for TNP1

Reset of the TNP1 traffic over PEI is caused by issuing a PL-OPEN request for TNP1CP when the Data Link is already opened for TNP1 traffic.

8.4.6.3.2 Closing the Data Link to TNP1

The Data Link is closed to TNP1 traffic by issuing a PL-CLOSE request with appropriate value of the "Control-Protocol-Number", see figure 24.

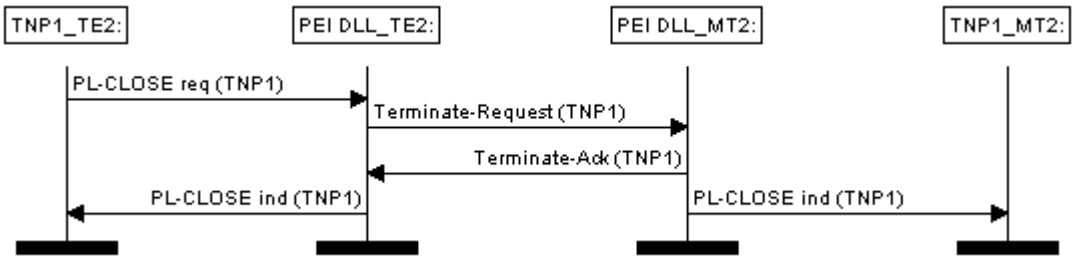


Figure 24: Closing the Data Link to TNP1

8.4.6.3.3 Abnormal termination of the TNP1 transmission

A PEI DLL entity may issue an PL-REPORT indication for TNP1CP protocol at any moment when the link is in the "Opened" state. Depending on the value of the parameter "Cause", it may indicate either a recoverable failure (e.g. "PDU silently discarded") or a fatal one (e.g. "Link closed"). After a fatal failure, the TNP1 traffic shall be closed and a reopen is required to restart it.

8.4.7 Network layer protocols over PEI DLL

The Network Layer protocols meant here are IPv4 and TNP1.

8.4.7.1 Introduction

For IP, an IP signalling entity and an IP relay entity capable of communicating with IP shall be present in the MT2. Functions of the IP signalling entity are:

- to control MT2 originated link establishment and release for IP between MT2 and TE2;

- to forward link establishment request to the MT2 AI protocol stack.

Function of the IP relay entity is to mediate the IP datagrams between the PEI and AI protocol stacks.

For TNP1, a Network Layer protocol entity TNP1_MT2, capable of communicating with TNP1 shall be present in the MT2. Functions of the TNP1_MT2 entity with respect to PEI DLL are:

- to handle the TNP1 related service requests within MT2 and convert them to appropriate protocol sequences over PEI DLL;

- to receive TNP1 related service requests from PEI DLL and handle them properly.

8.4.7.2 Basic procedures

The IP and TNP1 datagrams are transmitted over the PEI Data Link after it is opened for IP and/or TNP1 traffic with the IPCP and/or TNP1CP, respectively. IP and TNP1 traffic over the Data Link is full duplex. No acknowledgements are provided, see figure 25. Sufficient reliability is a matter of the chosen PEI DLL framing method as stated elsewhere in this ETS.

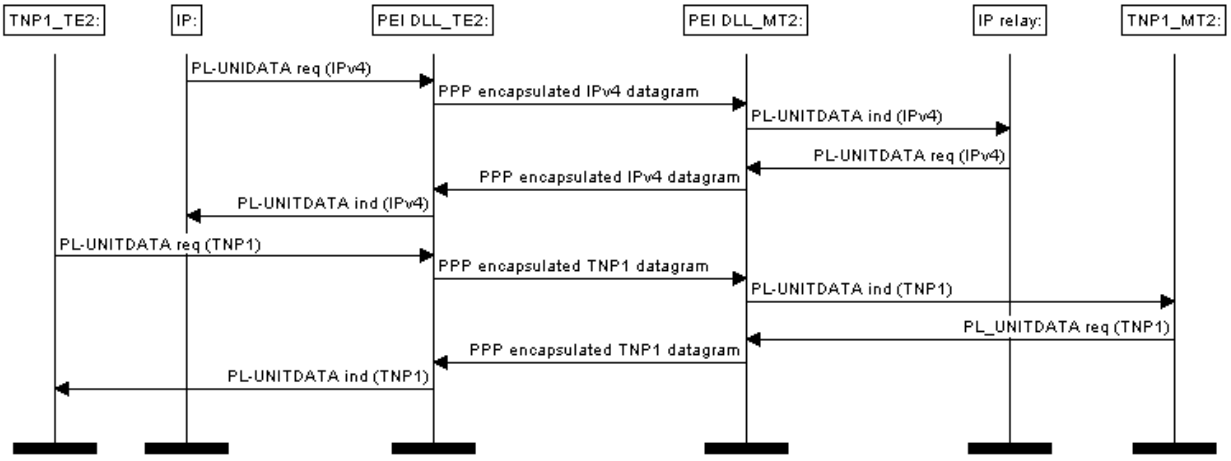


Figure 25: Transmitting IP and TNP1 datagrams over PEI Data Link

9 Overview of TETRA Network Protocol type 1 (TNP1)

9.1 Introduction

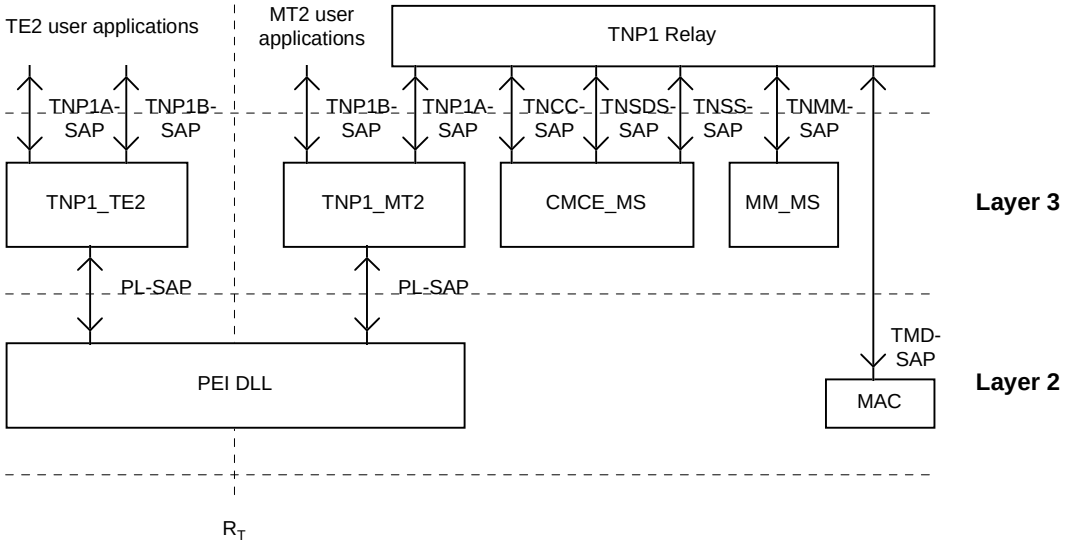
TNP1 is a TETRA specific Network Layer protocol. It may optionally be used in PEI to provide the user applications located in a TE2:

- access to the services of CMCE and MM;
- communication with peer user applications located in MT2;
- access to circuit mode services of AI Layer 2.

TNP1 itself is a connectionless, unreliable and unacknowledged Network Layer protocol. Required reliability to successfully perform e.g. call signalling with TNP1 should be enforced by the underlyingprotocol layers.

9.2 TNP1 context

Figure 26 specifies the communication routes between a TNP1 Protocol Entity and surrounding entities in TE2 and MT2.



TNP1_TE2	TNP1 Protocol Entity, Type 2 Terminal Equipment
TNP1_MT2	TNP1 Protocol Entity, Type 2 Mobile Termination
CMCE_MS	Circuit Mode Control Entity, Mobile Station
MM_MS	Mobility Management, Mobile Station
PEI DLL	Peripheral Equipment Interface, Data Link Layer Entity
TNP1A-SAP	TNP1 Service Access Point A, CMCE and MM Services
TNP1B-SAP	TNP1 Service Access Point A, MT2 Application Access
TNCC-SAP	TETRA Network - Call Control Service Access Point
TNSDS-SAP	TETRA Network - Short Data Service Service Access Point
TNSS-SAP	TETRA Network - Supplementary Service Service Access Point
TNMM-SAP	TETRA Network - Mobility Management Service Access Point
TMD-SAP	TETRA Network - MAC Service Access Point for Circuit Mode Traffic
PL-SAP	PEI Data Link Layer, Service Access Point

Figure 26: TNP1 reference architecture

TNP1 services are provided to the TE2 user applications at TNP1A-SAP and TNP1B-SAP. The communicating peers for TE2 user applications are MT2 user applications and TNP1 Relay entity. TE2 user applications shall communicate with the TNP1 Relay through TNP1A-SAP and with the MT2 user applications through TNP1B-SAP.

Functions of the TNP1 Relay entity are:

- provides relaying of service requests between TNP1 entity and CMCE entity;

- provides relaying of service requests between TNP1 entity and MM entity.

TNP1 Relay is defined in clause 12.

As an underlying Data Link service, TNP1 Protocol Entity shall use the PEI Data Link Layer (PEI DLL) as defined in clause 8. The service required by TNP1 from PEI DLL shall be those defined at PL-SAP.

10 TNP1 service description

10.1 Introduction

TNP1 service is a connectionless, unreliable and unacknowledged Network Layer service. It provides service for TE2 applications

- at TNP1A-SAP, for conveying PDUs containing parameters required to invoke CMCE and MM service primitives, and to access circuit mode services of MAC;

- at TNP1B-SAP, for communicating with user applications located in MT2.

The general availability of TNP1 services to the service users is defined by the link establishment status of the underlying PEI DLL service defined in subclause 8.3. Furthermore, guarantee of delivery and sequencing should be enforced by PEI DLL.

There shall exist only one instance of TNP1A-SAP and TNP1B-SAP at a given point of time. No service access point identifier (SAPI) is provided, but the PDUs shall be routed to the right SAPs according to their PDU types.

Opening/closing of either of the TNP1A-SAP or TNP1B-SAP at either of the TNP1 peer entities will imply opening/closing of the same SAP at the peer entity and implicitly opening/closing the accompanying SAP.

10.2 Service primitives at the TNP1A-SAP

TNP1-SERVICE ACCESS request/indication: These primitives shall be used to extend the access to CMCE and MM services to the user applications located in TE2.

TNP1-SERVICE PROFILE request/indication/response/confirm: These primitives shall be used by the user applications located in TE2 to specify which capabilities of the CMCE and MM entities shall be available for them.

TNP1-UNITDATA request/indication: These primitives shall be used to send and receive U-plane circuit mode traffic to/from TMD-SAP.

TNP1-UNITDATA REPORT indication: This primitive shall be used deliver indications from U-plane circuit mode traffic.

10.3 Service primitives at the TNP1B-SAP

TNP1-CAPABILITY request/indication/response/confirm: These primitives shall be used to query the essential capabilities of a MT2 by user applications located in a TE2.

TNP1-IDENTIFICATION request/indication/response/confirm: These primitives shall be used to query the essential identification data of a MT2 by user applications located in a TE2.

TNP1-OPERATION request/indication: These primitives shall be used for proprietary communication purposes between user applications located in MT2 and TE2.

TNP1-STATE request/indication/response/confirm: These primitives shall be used to query basic information of the operational state of a MT2 by user applications located in a TE2.

10.4 Service primitives at TNP1A-SAP and TNP1B-SAP

TNP1-CLOSE request/indication: These primitives shall be used to close the communication between peer TNP1 entities.

TNP1-OPEN request/indication: These primitives shall be used to close the communication between peer TNP1 entities.

TNP1-REPORT indication: This primitive shall be used to inform the user application about abnormal conditions within TNP1 and PEI DLL.

10.5 Primitive descriptions

10.5.1 TNP1-CAPABILITY

TNP1-CAPABILITY request shall be used by a TE2 user application to request capability information.

TNP1-CAPABILITY indication shall indicate a capability information request to the MT2 application in charge of providing the capability information.

TNP1-CAPABILITY response shall be used to initiate the capability information delivery by the MT2 application in charge of providing the capability information.

TNP1-CAPABILITY confirm shall be used to deliver the capability information to an MT2 application.

The parameters of the primitives shall be as defined in table 40.

Table 40: Parameters for the primitive TNP1-CAPABILITY

Parameter	Request	Indication	Response	Confirm
Circuit Mode Services	-	-	M	M
Encryption	-	-	M	M
Packet Mode Services	-	-	M	M

10.5.2 TNP1-IDENTIFICATION

TNP1-IDENTIFICATION request shall be used by a TE2 user application to request identification information.

TNP1-IDENTIFICATION indication shall indicate an identification information request to the MT2 application in charge of providing the identification information.

TNP1-IDENTIFICATION response shall be used to initiate the identification information delivery by the MT2 application in charge of providing the identification information.

TNP1-IDENTIFICATION confirm shall be used to deliver the identification information to the requesting MT2 application.

The parameters of the primitives shall be as defined in table 41.

Table 41: Parameters for the primitive TNP1-IDENTIFICATION

Parameter	Request	Indication	Response	Confirm
Manufacturer ID	-	-	M	M
Model	-	-	M	M
Software Version	-	-	M	M
Hardware Version	-	-	O	O
Product Serial No	-	-	O	O
ISO Global Object ID	-	-	O	O

10.5.3 TNP1-OPERATION

TNP1-OPERATION request shall be used to initiate information delivery belonging to a transaction occurring between a TE2 and a MT2 user application.

TNP1-OPERATION indication shall be used to deliver information to a user application as part of a transaction occurring between a TE2 and a MT2 user application.

The parameters of the primitives shall be as defined in table 42.

Table 42: Parameters for the primitive TNP1-OPERATION

Parameter	Request	Indication
Sending Application Identifier	C	C
Receiving Application Identifier	C	C
Function	C	C
Facility	O	O

10.5.4 TNP1-REPORT

PL-REPORT indication This primitive shall be used to inform the user application about abnormal conditions within TNP1 and PEI DLL.

The parameters of the primitives shall be as defined in table 43.

Table 43: Parameters for the primitive TNP1-REPORT

Parameter	Indication
Reason	M
Cause	O (note)
Result	O (note)
NOTE: Shall be present only when Reason indicates a "PEI DLL failure". Cause and Result shall be given the values of the corresponding PL-REPORT indication.	

10.5.5 TNP1-SERVICE ACCESS

TNP1-SERVICE ACCESS request shall be used to initiate transmission of a TNP1 PDU to the peer entity. The PDU that shall be generated and transmitted, shall be defined by the parameter "PDU Type".

TNP1-SERVICE ACCESS indication shall be used to transfer the values of the information elements of a received TNP1 PDU to the service user.

The parameters of the primitives are defined in table 44.

Table 44: Parameters for the primitive TNP1-SERVICE ACCESS

Parameter	Request	Indication
PDU Type	M	M
PDU Parameters	M (note)	M (note)
NOTE: Depending on the MT2 service. Some service primitives do not require any parameters.		

10.5.6 TNP1-SERVICE PROFILE

TNP1-SERVICE PROFILE request shall be used by a TE2 user application to set the service profile of TE2 user applications for CMCE and MM access or to get the current state of the profile. The operation is selected with parameter Service Profile Operation.

TNP1-SERVICE PROFILE indication shall indicate the TNP1 Relay a service profile configuration request .

TNP1-SERVICE PROFILE response shall be used by the TNP1 Relay to initiate a service profile delivery to TE2 user application.

TNP1-SERVICE PROFILE confirm shall indicate the delivery of the service profile information to the TE2 user application.

The parameters of the primitives shall be as defined in table 45.

Table 45: Parameters for the primitive TNP1-SERVICE PROFILE

Parameter	Request	Indication	Response	Confirm
Service Profile Operation	M	M	-	-
CC Profile	O (note)	O (note)	M	M
Status Profile	O (note)	O (note)	M	M
SDS User Data 1 Profile	O (note)	O (note)	M	M
SDS User Data 2 Profile	O (note)	O (note)	M	M
SDS User Data 3 Profile	O (note)	O (note)	M	M
SDS User Data 4 Profile	O (note)	O (note)	O	O
SS Profile	O (note)	O (note)	M	M
MM Profile	O (note)	O (note)	M	M
NOTE: Not relevant when Service Profile Operation = Get Service Profile.				

10.5.7 TNP1-STATE

TNP1-STATE request shall be used by a TE2 user application to request basic information of the operational state of MT2.

TNP1-STATE indication shall indicate a state information request to the MT2 user application in charge of providing information of the operational state of MT2.

TNP1-STATE response shall be used to initiate the state information delivery by the MT2 application in charge of providing the state information.

TNP1-STATE confirm shall be used to deliver the state information to a TE2 application.

The parameters of the primitives shall be as defined in table 46.

Table 46: Parameters for the primitive TNP1-STATE

Parameter	Request	Indication	Response	Confirm
Battery Charge	-	-	M	M
Field Strength	-	-	O	O
Bit Error Ratio	-	-	O	O

10.5.8 TNP1-UNITDATA

TNP1-UNITDATA request shall be used to send U-plane circuit mode traffic through TMD-SAP.

TNP1-UNITDATA indication shall be used to receive U-plane circuit mode traffic from TMD-SAP.

The parameters of the primitives are defined in table 47.

Table 47: Parameters for the primitive TNP1-UNITDATA

Parameter	Request	Indication
PDU Type	M	M
Stolen	M	M
Data Indicator	M	M
User Data	M	M

10.6 Parameter description

Battery Charge =

0 Empty;
...
100 Full.

Bit Error Ratio =

0 < 0,01 %;
1 0,01 % to less than 0,1%;
2 0,1 % to less than 0,5 %;
3 0,5 % to less than 1,0 %;
4 1,0 % to less than 2,0 %;
5 2,0 % to less than 4,0 %;
6 4,0 % to less than 8,0 %;
7 ≥ 8,0 %;
99 Not known or not detectable.

Packet Mode Services =

This parameter shall list the packet mode capabilities of the MT2. It shall not give any information of the capabilities of the underlying network. Each "1" in the bit map shall indicate a supported service. The binary values listed below shall be added together to form the parameter value:

00000000001_2 Status
00000000010_2 SDS Type 1
00000000100_2 SDS Type 2
00000001000_2 SDS Type 3
00000010000_2 SDS Type 4
00000100000_2 SDS message stack in MT2
00001000000_2 SCLNS
00010000000_2 IPv4
00100000000_2 IPv6
01000000000_2 ISO IP
10000000000_2 CONS

Cause =

Definition of subclause 8.2.2 shall apply.

CC Profile =

0 No incoming CC PDUs shall be relayed to TE2, CC PDUs originating from TE2 shall be rejected by TETRA Network Protocol 1 Relay (TNP1R);
1 Incoming CC PDUs shall be relayed to TE2, TNP1R shall relay CC PDUs originating from TE2 to CC entity.

Circuit Mode Services =

This parameter shall list the circuit mode capabilities of the MT2. It shall not give any information of the capabilities of the underlying network. Each "1" in the bit map shall indicate a supported service. The binary values listed below shall be added together to form the parameter value:

000000001_2 TETRA encoded speech
000000010_2 7,2 kbit/s unprotected data
000000100_2 7,2 kbit/s non-TETRA encoded speech
000001000_2 Low protection 4,8 kbit/s, interleaving depth = 1
000010000_2 Low protection 4,8 kbit/s, interleaving depth = 4
000100000_2 Low protection 4,8 kbit/s, interleaving depth = 8
001000000_2 Low protection 2,4 kbit/s, interleaving depth = 1

010000000_2 Low protection 2,4 kbit/s, interleaving depth = 4
100000000_2 Low protection 2,4 kbit/s, interleaving depth = 8

Data Indicator =

0 Data available;
1 No data available.

Encryption =

0 No encryption supported;
1 Air interface encryption;
2 End-to-end encryption for circuit mode traffic;
3 Air interface encryption; End-to-end encryption for circuit mode traffic.

Facility =

Free form parameter that can logically contain several parameters. Mapping of the Facility parameter to the Type 3 Facility Information Element of a TEMTA-OPERATION shall be defined case by case.

Field Strength =

0 Parameter not available;
99 Not known or not detectable;
1 -115 dBm;
2 -114 dBm;
etc.
65 -51 dBm;
66 -50 dBm;
67 more than -50 dBm.

Function =

0 - 127 Available for proprietary user applications;
128 - 255 Reserved.

Hardware Version =

The total number of characters, including line terminators, in the information text shall not exceed 2 048 characters. Characters of International Reference Alphabet (IRA) defined in ITU-T T.50 [11] shall be used.

ISO Global Object ID =

The total number of characters, including line terminators, in the information text shall not exceed 2 048 characters. Characters of IRA defined in ITU-T T.50 [11] shall be used.

Manufacturer ID =

The total number of characters, including line terminators, in the information text shall not exceed 2 048 characters. Characters of IRA characters defined in ITU-T T.50 [11] shall be used.

MM Profile =

0 No incoming MM PDUs shall be relayed to TE2, MM PDUs originating from TE2 shall be rejected by TNP1R;
1 Incoming MM PDUs shall be relayed to TE2, TNP1R shall relay MM PDUs originating from TE2 to MM entity.

Model =

Up to 20 characters. Characters of IRA defined in ITU-T T.50 [11] shall be used.

PDU Parameters =

A set of parameters required to fill the information elements of the PDU defined by the parameter MT2 service. Each parameter shall be equally enumerated and its values shall have equal interpretation as the corresponding PDU information element. Parameters for filling the PDU information elements shall be available in the following manner:

- One parameter for each Mandatory information element of the PDU;
- One parameter for each Optional information element required in the specific use of the PDU;
- One parameter for each Conditional information element required by the existence of a determining Optional information element in the PDU.

PDU Type =

The parameter defines:

- the PDU that shall be generated as a consequence of a service request, or;
- the indication type service primitive that shall be generated as a response to a received PDU.

The values of PDU Type and their interpretation shall be equal to the values and interpretation of PDU Type information element encoding defined in subclause 11.7.57.

Product Serial No =

The total number of characters, including line terminators, in the information text shall not exceed 2 048 characters. Characters of IRA defined in ITU-T T.50 [11] shall be used.

Reason =

0	PEI DLL failure;
1	Unrecognized PDU;
2	Facility or addressing not supported;
3	Protocol state mismatch detected;
4	Illegal PDU structure;
5	Illegal value of an information element;
6 - 63	Reserved;
64 - 127	Proprietary.

Result =

Definition of subclause 8.2.2 shall apply.

Receiving Application Identifier =

0 - 127	Available for proprietary user applications;
128 - 255	Reserved.

SDS Profile =

0	No incoming SDS PDUs of the given type shall be relayed to TE2, SDS PDUs originating from TE2 shall be rejected by TNP1R;
1	Incoming SDS PDUs of the given type shall be relayed to TE2, TNP1R shall relay SDS PDUs originating from TE2 to SDS entity.

SDS Protocol Identifier =

Any valid SDS Type 4 protocol identifier available to user applications, except OTAR. Access to SDS messages passing air interface key values shall be denied from the TE2 user applications.

SDS User Data 1 Profile = SDS Profile

SDS User Data 2 Profile = SDS Profile

SDS User Data 3 Profile = SDS Profile

SDS User Data 4 Profile =

SDS Protocol Identifier;
SDS Profile.

The pair "Protocol Identifier" and "SDS Profile" shall be repeatable, so that the "SDS User Data 4 Profile" subparameter" consists of zero or more such pairs. Each "Protocol Identifier" shall identify a different protocol.

Sending Application Identifier =

0 - 127 Available for proprietary user applications;
128 - 255 Reserved.

Service Profile Operation =

0 Get service profile;
1 Set service profile.

Software Version =

The total number of characters, including line terminators, in the information text shall not exceed 2 048 characters. Characters IRA defined in ITU-T T.50 [11] shall be used.

SS Profile =

0 No incoming SS PDUs shall be relayed to TE2, SS PDUs originating from TE2 shall be rejected by TNP1R;
1 Incoming SS PDUs shall be relayed to TE2, TNP1R shall relay SS PDUs originating from TE2 to SS entity.

Status Profile = SDS Profile

Stolen =

0 User Data originates from a normal slot;
1 User Data originates from a stolen slot;
2 User Data is to be delivered in a normal slot;
3 User Data is to be delivered in a stolen slot.

User Data =

User Data to be delivered to / originating from a MAC slot.

10.7 Service states for TNP1A-SAP

CLOSED: The services of the TNP1A-SAP are not available to the service users. No service requests shall be issued.

IDLE: Services of TNP1A-SAP are available to the service users.

PROFILE CHANGE: Change of the service profile is requested. No other services shall be accessed while the profile change is in progress.

The state diagram is in figure 27.

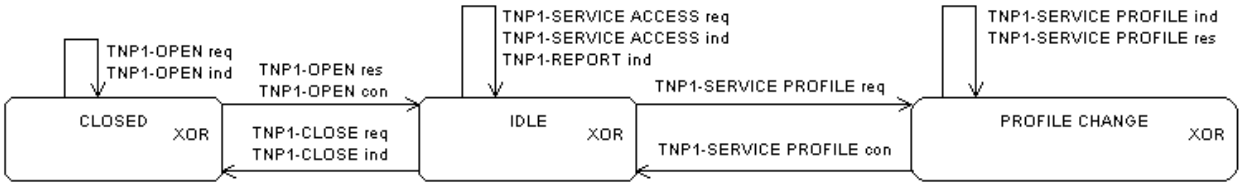


Figure 27: Service states at TNP1A-SAP

10.8 Service states for TNP1B-SAP

CLOSED: The services of the TNP1B-SAP are not available to the service users. No service requests shall be issued.

IDLE: Services of TNP1B-SAP are available to the service users.

The state diagram is in figure 28.

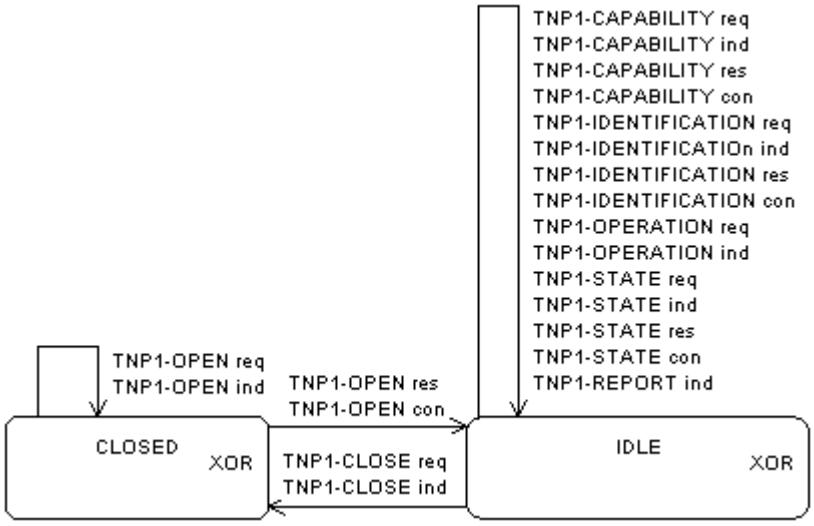


Figure 28: Service states at TNP1B-SAP

11 TNP1 protocol

11.1 Introduction

This clause defines the TETRA Network Layer Protocol type 1 (TNP1) protocol for the MT2 and TE2. TNP1 shall be used to provide access to a subset of CMCE and MM services. TNP1 and the AT command defined in clause x shall be the only methods to provide access for TE2 to user applications and functions local to MT2 over the reference point R_T.

This clause specifies the structure and encoding of the TNP1 Protocol Data Units (PDUs). The relationship between TNP1 Service Data Units (SDUs) and PDUs is defined in clause 12.

Procedures for CC, Supplementary Services (SSs), short data messaging, MM and MT2 user application access available at the TNP1-SAP by means of the TNP1 protocol are defined in subclause 11.3.

Implementation of any of the PDUs is optional.

11.2 Services required by TNP1 entity

In order to transfer messages over the PEI, TNP1 shall use the services of the PEI DLL. The PEI DLL service primitives that shall be available to TNP1 are:

- PL-OPEN request/indication/response/confirm;
- PL-CLOSE request/indication;
- PL-REPORT indication;
- PL-UNITDATA request/indication.

11.3 Procedures

11.3.1 Establishing TNP1 communication between TE2 user applications and MT2

The TNP1 communication is always initiated by some of the TE2 user applications by issuing TNP1-OPEN request. This causes TNP1_TE2 to issue PL-OPEN request that is responded by the MT2 TNP1 peer entity with a PL-OPEN response. PL-OPEN response shall trigger the MT2 TNP1 entity to submit a TNP1-OPEN indication to an MT2 entity (in figure 29 the TNP1 Relay) that is responsible for monitoring the state of the TNP1 communication. Further, a TNP1-OPEN indication is submitted to the TE2 user application that initiated the procedure, as a result of receiving the PL-OPEN confirm.

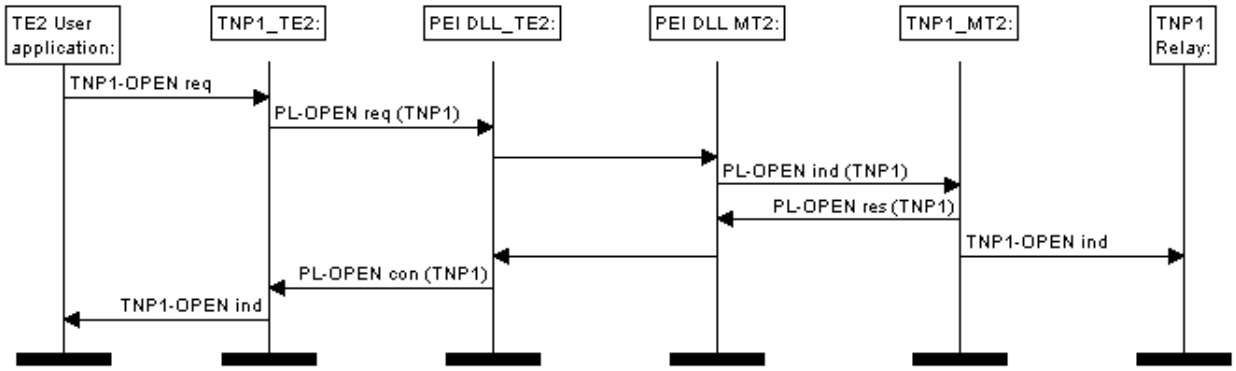


Figure 29: Establishment of TNP1 communication

11.3.2 Closing the TNP1 communication

The TNP1 communication can be closed at either end. Figure 30 defines the case of a TE2 User Application initiated closing procedure.

A TNP1-CLOSE request initiated by a TE2/MT2 entity causes the corresponding TNP1 entity to issue a PL-CLOSE request. The TNP1 entities at the communicating peers shall issue a TNP1-CLOSE indication to the corresponding application level entities as a response to PL-CLOSE indications.

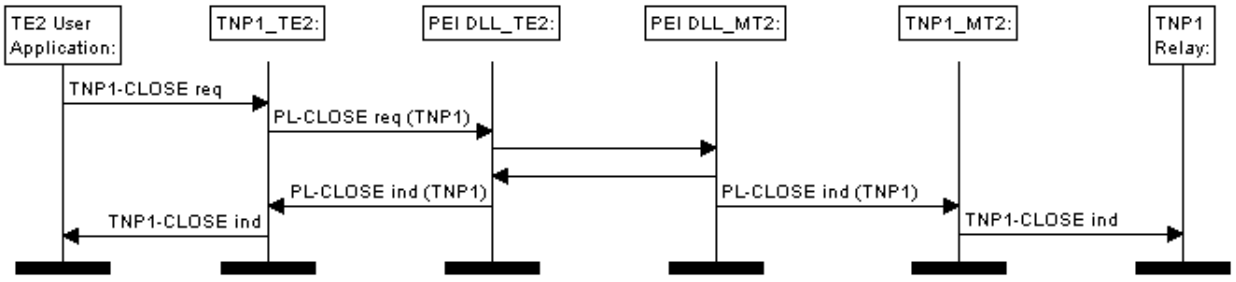


Figure 30: Closing the TNP1 communication

11.3.3 Reporting abnormal events

At any moment when the TNP1 communication is established, the application level entities may receive TNP1-REPORT indications that inform about abnormal events within the PEI DLL or the TNP1 peer entity. Both TE2 and MT2 TNP1 entities may report failures, see figures 30 and 31.

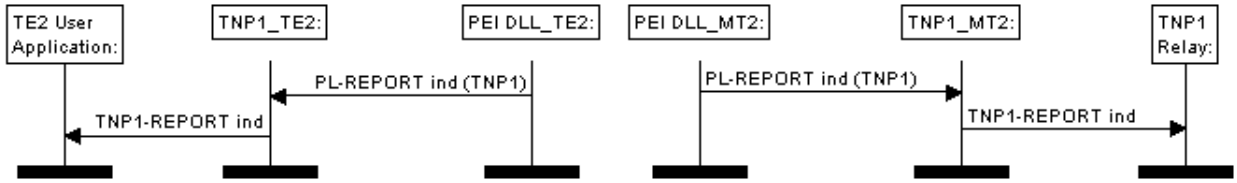


Figure 31: Reporting abnormal events from PEI DLL

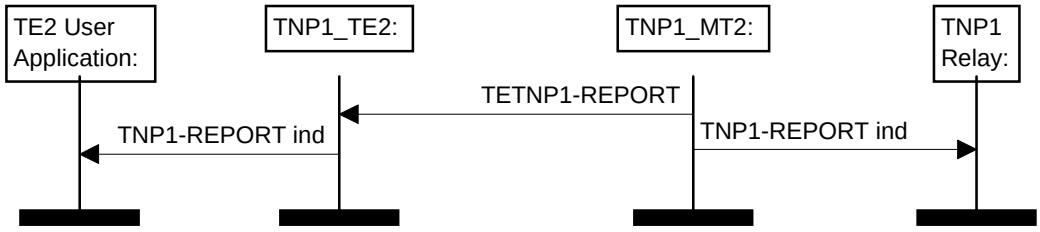


Figure 32: Reporting abnormal events from TNP1 peer entity, MT2 end

11.3.4 Querying MT2 identification information

To query the MT2 identification information, a TE2 user application may issue a TNP1-IDENTIFICATION request. There shall be an application present in MT2 that responds to a TNP1-IDENTIFICATION indication with a TNP1-IDENTIFICATION response, refer figure 33.

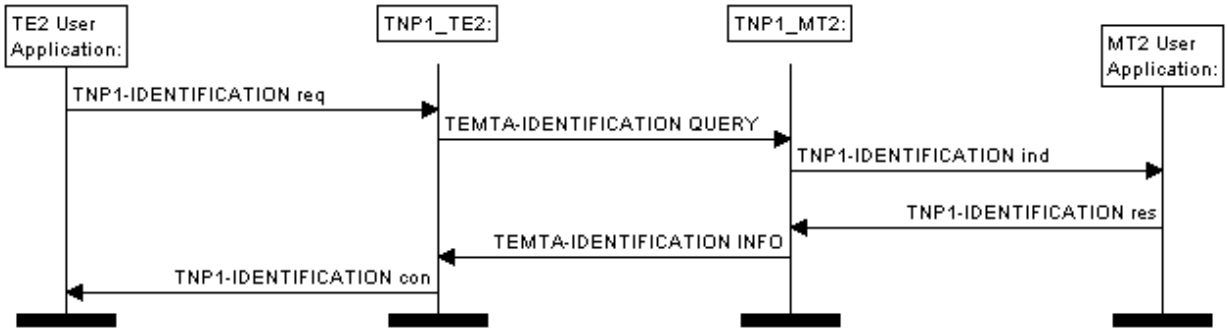


Figure 33: Querying MT2 identification information

11.3.5 Querying MT2 capabilities

To query the MT2 capabilities, a TE2 user application may issue a TNP1-CAPABILITY request. There shall be an application present in MT2 that responds to a TNP1-CAPABILITY indication with a TNP1-CAPABILITY response, see figure 34.

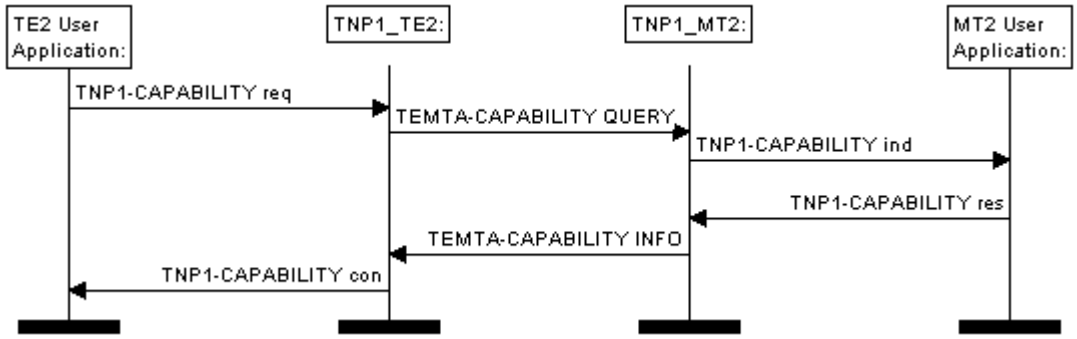


Figure 34: Querying MT2 capabilities

11.3.6 Querying MT2 state

To query current state of the MT2, a TE2 user application may issue a TNP1-STATE request. There shall be an application present in MT2 that responds to a TNP1-STATE indication with a TNP1-STATE response, see figure 35.

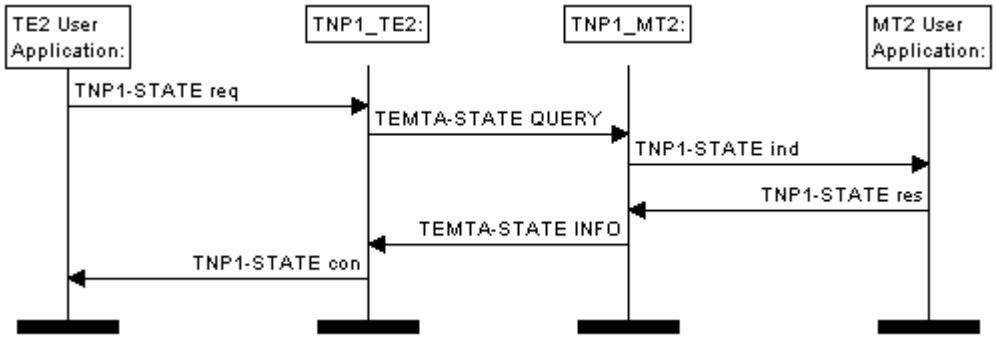


Figure 35: Querying MT2 state

11.3.7 Communication between TE2 and MT2 user applications

TNP1-OPERATION request/indication primitives shall be used to establish communication between TE2 and MT2 user applications. TEMTA-OPERATION PDU shall be used to convey the information, see figure 36.

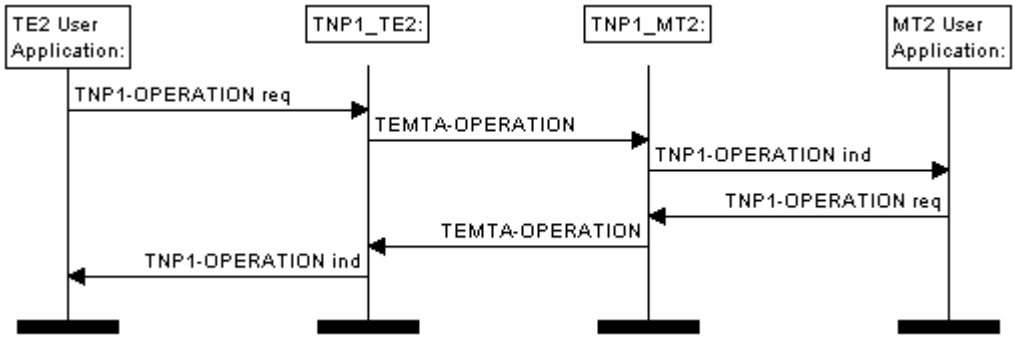


Figure 36: Communication between TE2 and MT2 user applications

11.3.8 Setting/getting the service profile

To get or set the current state of the MT2, a TE2 user application may issue a TNP1-SERVICE PROFILE request. The selection between "get" and "set" operations shall be done with parameter Service Profile Operation. For both operations, there shall be an application present in MT2 that responds to a TNP1-SERVICE PROFILE indication with a TNP1-SERVICE PROFILE response, see figure 37.

The application shall:

- optionally maintain a service profile according to successive "set" operations;

- return the service profile as a response to "get" and "set" operations. The response to "set" shall indicate the profile after the "set" operation.

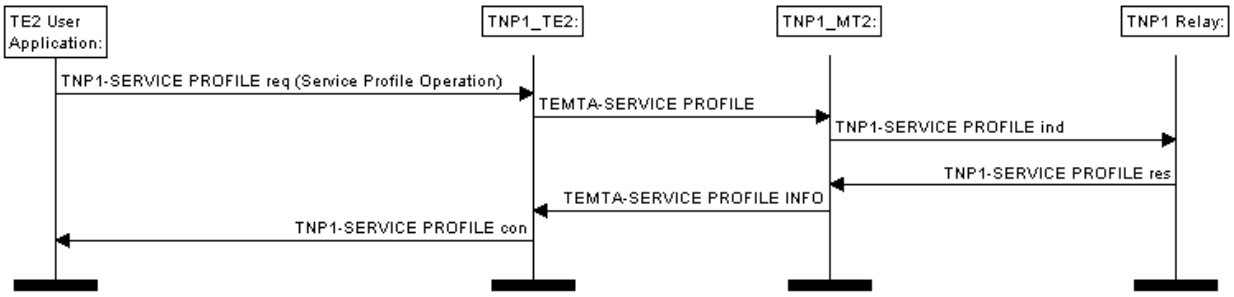


Figure 37: Setting/getting the service profile

11.3.9 Accessing CMCE and MM services

User applications in TE2 shall access CMCE and MM services by issuing the TNP1-SERVICE ACCESS request, see figure 38. The PDU type parameter submitted as part of the request shall determine:

- translation of the PDU as a request or response;
- peer entity for the request/response. The peer entity is either CMCE or MM located in MT2.

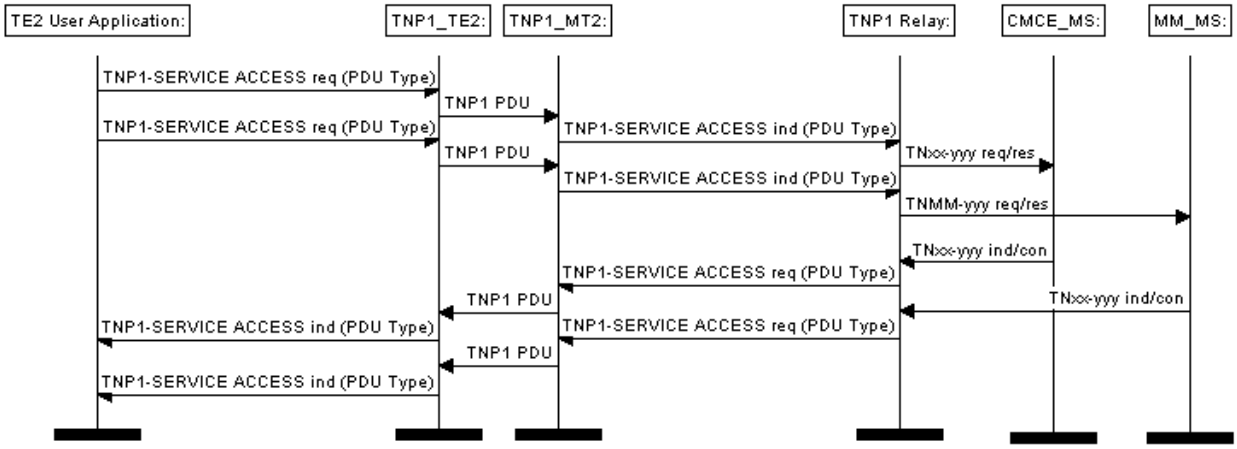


Figure 38: Accessing CMCE and MM services

The CC, SDS, SS and MM procedures are defined in detail in clauses 14 and 16 of ETS 300 392-2 [2].

11.3.10 Circuit mode data

Within the context of TNP1, circuit mode data may be transmitted either in-band using the TEMAC-UNITDATA PDU together with the TNP1-UNITDATA request and indication primitives, or out-of-band using a separate independent and transparent U-plane. An independent U-plane may be realized for instance by including separate electric interfaces in the MT2 for TNP1 and U-plane.

11.4 Protocol timers

As the main function of TNP1 protocol is to provide access to CMCE services and procedures, the timers defined in subclause 14.6 of ETS 300 392-2 [2] shall apply.

11.5 PDU structure

The boundaries of TNP1 PDUs are aligned to octet boundaries to ease handling and to be suitable for transmission over an underlying octet-oriented serial link.

The PDU structure is defined so that it offers the same functionality as the structures of CMCE and MM PDUs defined in ETS 300 392-2 [1] subclauses 14.7 and 16.9.1. This eases the encoding of information elements of SS PDUs and other information elements left generic in the PDUs defined this clause.

Two length values are specified for each information element. The length in octets ($Length_8$) defines the number of octets that shall be reserved for the element. The length in bits ($Length_2$) defines the number of bits within the octets of the information element that are used for encoding the value carried by the element.

The generic TNP1 PDU layout shall be as defined in table 48.

Table 48: TNP1 PDU layout

Information element	$Length_2$	$Length_8$
PDU Type	8	1
Type 1 element (1)	constant	constant
Type 1 element (2)	constant	constant
... etc.	... etc.	... etc.
Type 1 element (n)	constant	constant
Type 2 element (1)	constant	constant
Type 2 element (2)	constant	constant
... etc.	... etc.	... etc.
Type 2 element (n)	constant	constant
Type 3 element identifier (1)	4	2
Type 3 element (1)	varies	varies
Type 3 element identifier (2)	4	2
Type 3 element (2)	varies	varies
... etc.	... etc.	... etc.
Type 3 element identifier (n)	4	2
Type 3 element (n)	varies	varies

The first information element of each PDU shall be the PDU type.

The PDU type may be followed by a variable number of type 1 elements. Type 1 elements are either mandatory or conditional to a type 1 or type 2 element and they shall be placed within the PDU in a fixed order as specified in the PDU description tables. Lengths of type 1 element are constant. A conditional type 1 element shall be present only as defined by the element on which it is conditional. When a type 2 element is not present, then also all other elements conditional on it shall not be present.

Type 2 elements are optional and shall be placed within the PDU in a fixed order as specified in the PDU description tables. Lengths of type 2 element are constant. The presence of a Type 2 element is indicated with a Presence bit (P-bit) as defined in subclause 11.5.2.

NOTE 1: The order of type 1, 2 and 3 information elements is not as strict as in the AI protocol as in the non-presence of a type 2 information element there is a place holder of equal length.

The type 1 and/or type 2 elements may be followed by a variable number of type 3 elements. A type 3 element is always preceded with a type 3 element identifier information element that defines presence and length of the subsequent type 3 element. Type 3 Elements are optional and shall be normally placed within the PDU in numerical order as specified within the type 3 element identifier information element. The presence of a Type 3 element is indicated with a presence bit (M-bit) as defined in subclause 11.5.3. In specific cases a type 3 information element may be in the middle of type 1 or type 2 information elements. If in that case the type 3 element is not present, then the type 3 element identifier shall be included in the PDU as a placeholder and the length indicator shall be set to zero. Type 3 element coding can contain sub-elements which can be either of type 1, 2 or 3.

Type 3 element identifiers are not shown in the PDU description tables, nor is their length taken into account in the PDU descriptions.

NOTE 2: The last existing information element whether type 1, 2 or 3 is not followed either by an O, P or M-bit in contrary to the AI PDU encoding.

The octet and bit ordering within each information element shall be as defined in figure 39. When an information element contains more than one octet, the most significant octet (octet 1) containing the Most

Significant Bit (MSB) b_n of the information element shall be transmitted first. The MSB of an information element can be any of the bits in that octet. If the MSB of the information element is not bit number 8, then all bits having a higher bit number shall be set to zero. The Least Significant Bit (LSB) b_1 of the information element shall be transmitted as the first bit of the least significant octet (octet n). The bits are numbered within each octet as defined in figure 39. The bit 1 of an octet shall be transmitted first.

8	7	6	5	4	3	2	1	bit number
b_n (MSB)	b_{n-1}	b_{n-2}	b_{n-3}	b_{n-4}	b_{n-5}	b_{n-6}	b_{n-7}	octet 1 (most significant octet)
...	...	...	...	...	...	...	...	...
b_{16}	b_{15}	b_{14}	b_{13}	b_{12}	b_{11}	b_{10}	b_9	octet n-1
b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1 (LSB)	octet n (least significant octet)

Figure 39: Octet and bit order in information elements of TNP1 PDUs

11.5.1 Structure and encoding of Type 1 elements

Each type 1 Element has a fixed length within a PDU. The length of the type 1 Element ($Length_8$) in bytes is derived from the length of the associated information element ($Length_2$) with the following formula:

$$Length_8 = 1 + ((Length_2 - 1) \text{ div } 8)$$

The bits of the associated information element are right aligned to the octets of type 1 element, the least signalled bit positioned to the bit 1 of the least significant octet. Unused bits of the most significant octet are set to zero.

11.5.2 Structure and encoding of Type 2 elements

Each type 2 Element has a fixed length within a PDU. The length of the type 2 element ($Length_8$) in bytes is derived from the length of the associated information element ($Length_2$) with the following formula:

$$Length_8 = 1 + ((Length_2) \text{ div } 8)$$

The bits of the associated information element are right aligned to the octets of the type 2 element, the least signalled bit positioned to the bit 1 of the least significant octet.

The presence of a valid value in the type 2 element is indicated with a Presence bit (P-bit). The P-Bit is positioned in the most significant bit of the most significant octet (b_1 of the information element). The P-bit shall be set to "1" to indicate a present value and "0" to indicate a non-present value. Unused bits of the most significant octet are set to "0".

For a non-present type 2 element, the mapping shall result in $Length_8$ placeholder octet with all bits set to "0".

11.5.3 Structure and encoding of Type 3 elements

11.5.3.1 Type 3 element identifier

The M-bit, type 3 element identifier and Length Indicator (LI) of a type 3 element shall be mapped to a two octet type 3 element identifier preceding the actual type 3 information element as depicted in figure 40.

8	7	6	5	4	3	2	1	bit
M-bit	Type 3 element identifier				LI_{11}	LI_{10}	LI_9	octet 1
LI_8	LI_7	LI_6	LI_5	LI_4	LI_3	LI_2	LI_1	octet 2

Figure 40: Structure of type 3 Element Identifier

The presence of a type 3 element is indicated with a More bit (M-bit) placed in bit 8 of octet 1. M-bit shall be set to "1" if a type 3 element exists and to "0" for a non-existent type 3 element. If M-bit is set to "0", then all other bits of the type 3 element Identifier shall be set to zero, too.

The Length Indicator (LI) is an eleven bit integer value defining the length of the subsequent type 3 element in bits. The most significant bit LI_{11} of the Length Indicator is mapped in bit 3 of octet 1 and the least significant bit LI_1 in bit 1 of octet 2.

11.5.3.2 Type 3 element

The length of the type 3 element in octes ($Length_8$) is derived from the length of the associated information element in bits ($Length_2$), using the following formula:

$$Length_8 = 1 + ((Length_2 - 1) \text{ div } 8)$$

The bits of the associated information element are right aligned to the octets of the type 3 element, the least significant bit positioned to the bit 1 of the least significant octet. Unused bits of the most significant octet are set zo zero.

If the type 3 element is not present as indicated by the M-bit set to "0" in the type 3 element identifier, then the $Length_8$ shall be zero as also indicated by the Length Indicator element.

Type 3 element coding of a PDU can contain sub-elements which can be either of Type 1, 2 or 3. When sub-elements exist, the value of Length Indicator in associated Type 3 element identifier shall be set to indicate the total number of bits contained in the octet-mapped sub-elements, i.e. the value of Length Indicator is the number of octets times 8.

11.6 TNP1 PDU descriptions

11.6.1 CC PDUs

11.6.1.1 TECC-ALERT IND

This PDU shall be used to convey the parameters of TNCC-ALERT indication from MT2 to TE2 as defined in table 49.

Table 49: TECC-ALERT IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Simplex/duplex selection	1	1	1	M	
Basic service information	8	2	2	O	note
Call status	3	1	2	O	
Proprietary			3	O	
NOTE: If different from requested.					

11.6.1.2 TECC-COMPLETE CON

This PDU shall be used to convey the parameters of TNCC-COMPLETE confirm from MT2 to TE2 as defined in table 50.

Table 50: TECC-COMPLETE CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Call time-out	4	1	1	M	
Transmission grant	2	1	1	M	
Transmission request permission	1	1	1	M	
Proprietary			3	O	

11.6.1.3 TECC-COMPLETE IND

This PDU shall be used to convey the parameters of TNCC-COMPLETE indication from MT2 to TE2 as defined in table 51.

Table 51: TECC-COMPLETE IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Call time-out	4	1	1	M	
Transmission grant	2	1	1	M	
Transmission request permission	1	1	1	M	
Proprietary			3	O	

11.6.1.4 TECC-COMPLETE REQ

This PDU shall be used to convey the parameters of TNCC-COMPLETE request from TE2 to MT2 as defined in table 52.

Table 52: TECC-COMPLETE REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Proprietary			3	O	

11.6.1.5 TECC-DTMF IND

This PDU shall be used to convey the parameters of TNCC-DTMF indication from MT2 to TE2 as defined in table 53.

Table 53: TECC-DTMF IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
DTMF digits			3	O	
Proprietary			3	O	

11.6.1.6 TECC-DTMF REQ

This PDU shall be used to convey the parameters of TNCC-DTMF request from TE2 to MT2 as defined in table 54.

Table 54: TECC-DTMF REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Access priority	2	1	2	O	
Traffic stealing	1	1	2	O	
DTMF digits			3	O	note
Proprietary			3	O	
NOTE: There shall at least one DTMF digit included in the information element.					

11.6.1.7 TECC-MODIFY IND

This PDU shall be used to convey the parameters of TNCC-MODIFY indication from MT2 to TE2 as defined in table 55.

Table 55: TECC-MODIFY IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Basic service information	8	2	2	O	
Simplex/duplex selection	1	1	2	O	
Call time-out	4	1	2	O	
Proprietary			3	O	

11.6.1.8 TECC-MODIFY REQ

This PDU shall be used to convey the parameters of TNCC-MODIFY request from TE2 to MT2 as defined in table 56.

Table 56: TECC-MODIFY REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Basic service information	8	2	2	O	
Simplex/duplex selection	1	1	2	O	
Call time-out	4	1	2	O	
Access priority	2	1	2	O	
Traffic stealing	1	1	2	O	
Proprietary			3	O	

11.6.1.9 TECC-NOTIFY IND

This PDU shall be used to convey the parameters of TNCC-NOTIFY indication from MT2 to TE2 as defined in table 57.

Table 57: TECC-NOTIFY IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	note 1
Call status	3	1	2	O	
Call time-out, set-up phase	3	1	2	O	
Poll request	1	1	2	O	note 2
Poll response	1	1	2	O	
Poll response percentage	6	1	2	O	note 3
Poll response number	6	1	2	O	note 3
Poll response addresses			3	O	note 3
Proprietary			3	O	
NOTE 1: If the message is sent connectionless the call identifier shall be a dummy call identifier. NOTE 2: Shall be valid for acknowledged group call only. For other types of calls it shall be set to "0". NOTE 3: Shall be valid for acknowledged group call only.					

11.6.1.10 TECC-PROCEED IND

This PDU shall be used to convey the parameters of TNCC-PROCEED indication from MT2 to TE2 as defined in table 58.

Table 58: TECC-PROCEED IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Basic service information	8	2	2	O	note
Call status	3	1	2	O	
Hook method selection	1	1	2	O	
Simplex/duplex selection	1	1	2	O	
Proprietary			3	O	
NOTE: If different from requested.					

11.6.1.11 TECC-RELEASE CON

This PDU shall be used to convey the parameters of TNCC-RELEASE confirm from MT2 to TE2 as defined in table 59.

Table 59: TECC-RELEASE CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Disconnect cause	5	1	1	M	
Proprietary			3	O	

11.6.1.12 TECC-RELEASE IND

This PDU shall be used to convey the parameters of TNCC-RELEASE indication from MT2 to TE2 as defined in table 60.

Table 60: TECC-RELEASE IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Disconnect cause	5	1	1	M	
Proprietary			3	O	

11.6.1.13 TECC-RELEASE REQ

This PDU shall be used to convey the parameters of TNCC-RELEASE request from TE2 to MT2 as defined in table 61.

Table 61: TECC-RELEASE REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Disconnect cause	5	1	1	M	
Proprietary			3	O	

11.6.1.14 TECC-SETUP CON

This PDU shall be used to convey the parameters of TNCC-SETUP confirm from MT2 to TE2 as defined in table 62.

Table 62: TECC-SETUP CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Basic service information	8	1	1	M	note
Call time-out	4	1	1	M	
Hook method selection	1	1	1	M	
Transmission grant	2	1	1	M	
Transmission request permission	1	1	1	M	
Call ownership	1	1	1	M	
Call priority	4	1	2	O	
Simplex/duplex selection	1	1	2	O	
Port selection	3	1	2	O	
Proprietary			3	O	
NOTE: If different from requested.					

11.6.1.15 TECC-SETUP IND

This PDU shall be used to convey the parameters of TNCC-SETUP indication from MT2 to TE2 as defined in table 63.

Table 63: TECC-SETUP IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Hook method selection	1	1	1	M	
Simplex/duplex selection	1	1	1	M	
Basic service information	8	1	1	M	
Transmission grant	2	1	1	M	
Transmission request permission	1	1	1	M	
Call priority	4	1	1	M	
Call time-out	4	1	1	M	
Called party type identifier	2	1	1	M	
Called party SSI	24	3	1	C	note 1
Called party extension	24	3	1	C	note 1
Calling party type identifier	2	1	2	O	
Calling party SSI	24	3	1	C	note 2
Calling party extension	24	3	1	C	note 2
External subscriber number			3	O	
Port selection	3	1	2	O	
Proprietary			3	O	
NOTE 1: Shall be conditional on the value of Called Party Type Identifier (CPTI): CPTI = 01_2; Called Party SSI; CPTI = 10_2; Called Party SSI + Called Party Extension. NOTE 2: Shall be conditional on the value of Calling Party Type Identifier (CGPTI): CGPTI = 01_2; Calling Party SSI; CGPTI = 10_2; Calling Party SSI + Calling Party Extension.					

11.6.1.16 TECC-SETUP REQ

This PDU shall be used to convey the parameters of TNCC-SETUP request from TE2 to MT2 as defined in table 64.

Table 64: TECC-SETUP REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Hook method selection	1	1	1	M	
Simplex/duplex selection	1	1	1	M	
Basic service information	8	1	1	M	
Request to transmit/send data	1	1	1	M	
Call priority	4	1	1	M	
Called party type identifier	2	1	1	M	SNA/SSI/TSI
Called party SNA	8	1	1	C	note 1
Called party SSI	24	3	1	C	note 1
Called party extension	24	3	1	C	note 1
Area selection	4	1	1	O	note 2
Access priority	2	1	2	O	note 3
Traffic stealing	1	1	2	O	note 4
External subscriber number			3	O	
Port selection	3	1	2	O	
Proprietary			3	O	

NOTE 1: Shall be conditional on the value of Called Party Type Identifier (CPTI):
CPTI = 00_2; Called Party SNA;
CPTI = 01_2; Called Party SSI;
CPTI = 10_2; Called Party SSI + Called Party Extension.
NOTE 2: If not used then the MT2 should use value "not defined".
NOTE 3: If not used then the MT2 should use value "low priority".
NOTE 4: If not used then the MT2 should use value "no stealing".

11.6.1.17 TECC-SETUP RES

This PDU shall be used to convey the parameters of TNCC-SETUP response from TE2 to MT2 as defined in table 65.

Table 65: TECC-SETUP RES PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Hook method selection	1	1	1	M	
Request to transmit/send data	1	1	1	M	
Simplex/duplex selection	1	1	2	O	
Basic service information	8	2	2	O	
Access priority	2	1	2	O	note 1
Traffic stealing	1	1	2	O	note 2
Port selection	3	1	2	O	
Proprietary			3	O	

NOTE 1: If not used then the MT2 should use value "low priority".
NOTE 2: If not used then the MT2 should use value "no stealing".

11.6.1.18 TECC-TX CON

This PDU shall be used to convey the parameters of TNCC-TX confirm from MT2 to TE2 as defined in table 66.

Table 66: TECC-TX CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Transmission grant	2	1	1	M	
Transmission request permission	1	1	1	M	
Encryption control	1	1	1	M	
Speech service	1	1	1	M	
Proprietary			3	O	

11.6.1.19 TECC-TX IND

This PDU shall be used to convey the parameters of TNCC-TX indication from MT2 to TE2 as defined in table 67.

Table 67: TECC-TX IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Transmission grant	2	1	1	M	
Transmission request permission	1	1	1	M	
Encryption control	1	1	1	M	
Speech service	1	1	1	M	
Transmitting party type identifier	2	1	2	O	
Transmitting party SSI	24	3	1	C	note
Transmitting party extension	24	3	1	C	note
Proprietary			3	O	
NOTE: Shall be conditional on the value of Transmitting Party Type Identifier (TPTI): TPTI = 01_2; Transmitting Party SSI; TPTI = 10_2; Transmitting Party SSI + Transmitting Party Extension.					

11.6.1.20 TECC-TX REQ

This PDU shall be used to convey the parameters of TNCC-TX request from TE2 to MT2 as defined in table 68.

Table 68: TECC-TX REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identifier	14	2	1	M	
Transmission condition	1	1	1	M	
TX demand priority	2	1	2	C	note 1
Encryption control	1	1	2	C	note 1
Speech service	1	1	2	C	note 1
Access priority	2	1	2	O	note 2
Traffic stealing	1	1	2	O	note 3
Proprietary			3	O	
NOTE 1: Shall be conditional on the value of Transmission Condition: Transmission Condition = 0_2 (Request to transmit): shall be defined; Transmission Condition = 1_2 (Transmission ceased): shall not be defined. NOTE 2: If not used then the MT2 should use value "low priority". NOTE 3: If not used then the MT2 should use value "no stealing".					

11.6.2 PDUs for circuit mode data

11.6.2.1 TEMAC-FLOW CONTROL PDU for circuit mode data

This PDU shall be used to control circuit mode data rate between TE2 application and MT2 as defined in table 69.

Table 69: TEMAC-FLOW CONTROL PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Max data	8	1	1	M	

11.6.2.2 TEMAC-UNITDATA

This PDU shall be used to transmit circuit mode data between TE2 application and MT2 as defined in table 70.

Table 70: TEMAC-UNITDATA PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Call identity	14	2	1	M	
Traffic stealing	1	1	1	M	
Circuit mode data			3	C	

11.6.3 MM PDUs

11.6.3.1 TEMM-ATTACH DETACH GROUP IDENTITY CON

This PDU shall be used to convey the parameters of TNMM-ATTACH DETACH GROUP IDENTITY confirm from MT2 to TE2 as defined in table 71.

Table 71: TEMM-ATTACH DETACH GROUP IDENTITY CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Group identity acknowledgement type	1	1	1	M	
Proprietary			3	O	
Group identity uplink			3	O	Repeatable

11.6.3.2 TEMM-ATTACH DETACH GROUP IDENTITY IND

This PDU shall be used to convey the parameters of TNMM-ATTACH DETACH GROUP IDENTITY indication from MT2 to TE2 as defined in table 72.

Table 72: TEMM-ATTACH DETACH GROUP IDENTITY IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Group identity report	1	1	1	M	
Group identity acknowledgement request	1	1	1	M	
Group identity attach/detach mode	1	1	1	M	
Proprietary			3	O	
Group identity downlink			3	O	Repeatable

11.6.3.3 TEMM-ATTACH DETACH GROUP IDENTITY REQ

This PDU shall be used to convey the parameters of TNMM-ATTACH DETACH GROUP IDENTITY request from TE2 to MT2 as defined in table 73.

Table 73: TEMM-ATTACH DETACH GROUP IDENTITY REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Group Identity Report	1	1	1	M	
Group Identity Attach/Detach Mode	1	1	1	M	
Proprietary			3	O	
Group identity Uplink			3	O	Repeatable

11.6.3.4 TEMM-DISABLING IND

This PDU shall be used to convey the parameters of TNMM-DISABLING indication from MT2 to TE2 as defined in table 74.

Table 74: TEMM-DISABLING IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Disabling type	1	1	1	M	

11.6.3.5 TEMM-ENABLING IND

This PDU shall be used to convey the parameters of TNMM-ENABLING indication from MT2 to TE2 as defined in table 75.

Table 75: TEMM-ENABLING IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	

11.6.3.6 TEMM-ENERGY SAVING REQ

This PDU shall be used to convey the parameters of TNMM-ENERGY SAVING request from TE2 to MT2 as defined in table 76.

Table 76: TEMM-ENERGY SAVING REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Energy saving mode	3	1	1	M	

11.6.3.7 TEMM-ENERGY SAVING CON

This PDU shall be used to convey the parameters of TNMM-ENERGY SAVING confirm from MT2 to TE2 as defined in table 77.

Table 77: TEMM-ENERGY SAVING CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Energy saving mode	3	1	1	M	
Status	3	1	1	M	

11.6.3.8 TEMM-ENERGY SAVING REQ

This PDU shall be used to convey the parameters of TNMM-ENERGY SAVING request from TE2 to MT2 as defined in table 78.

Table 78: TEMM-ENERGY SAVING REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Energy saving mode	3	1	1	M	

11.6.3.9 TEMM-REPORT IND

This PDU shall be used to convey the parameters of TNMM-REPORT indication from MT2 to TE2 as defined in table 79.

Table 79: TEMM-REPORT IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Status	3	1	1	M	

11.6.3.10 TEMM-REGISTRATION IND

This PDU shall be used to convey the parameters of TNMM-REGISTRATION indication from MT2 to TE2 as defined in table 80.

Table 80: TEMM-REGISTRATION IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Registration status	1	1	1	M	
Reject cause	5	1	2	C	note
NOTE: Shall be present if "Registration status" = Failure					

11.6.3.11 TEMM-REGISTRATION CON

This PDU shall be used to convey the parameters of TNMM-REGISTRATION confirm from MT2 to TE2 as defined in table 81.

Table 81: TEMM-REGISTRATION CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Registration status	1	1	1	M	

11.6.3.12 TEMM-SERVICE IND

This PDU shall be used to convey the parameters of TNMM-SERVICE indication from MT2 to TE2 as defined in table 82.

Table 82: TEMM-SERVICE IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Status	3	1	1	M	
Disabling type	1	1	1	M	

11.6.4 MT Application PDUs

11.6.4.1 TEMTA-CAPABILITY INFO

This PDU shall be used to convey the parameters of TNP1-CAPABILITY response from MT2 to TE2 as defined in table 83.

Table 83: TEMTA-CAPABILITY INFO PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Circuit Mode Services	9	2	1	M	
Encryption	2	1	1	M	
Packet Mode Services	10	2	1	M	
Proprietary			3	O	

11.6.4.2 TEMTA-CAPABILITY QUERY

This PDU shall be used to convey the parameters of TNP1-CAPABILITY request from TE2 to MT2 as defined in table 84.

Table 84: TEMTA-CAPABILITY QUERY PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	

11.6.4.3 TEMTA-IDENTIFICATION INFO

This PDU shall be used to convey the parameters of TNP1-IDENTIFICATION response from MT2 to TE2 as defined in table 85.

Table 85: TEMTA-IDENTIFICATION INFO PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Terminal Equipment Identity	120	15	1	M	
Manufacturer ID			3	M	
Model			3	M	
Software Version			3	M	
Hardware Version			3	O	
Product Serial No			3	O	
ISO Global Object ID			3	O	
Proprietary			3	O	

11.6.4.4 TEMTA-IDENTIFICATION QUERY

This PDU shall be used to convey the parameters of TNP1-IDENTIFICATION request from TE2 to MT2 as defined in table 86.

Table 86: TEMTA-IDENTIFICATION QUERY PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1		M	

11.6.4.5 TEMTA-SDS DELETE MESSAGES REQ

This PDU shall be used to delete from an MT2 a list of SDS messages in the SDS message stack as defined in table 87.

Table 87: TEMTA-SDS DELETE MESSAGES REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Range for deleted SDS messages	5	1	1	M	
SDS message index	7	1	1	M	note
NOTE: Shall be repeated as defined by the Range for deleted SDS messages information element.					

11.6.4.6 TEMTA-SDS LIST MESSAGES ERROR

This PDU shall be a response from the MT2 to list SDS message errors in the SDS message stack as defined in table 88.

Table 88: TEMTA-SDS LIST MESSAGES ERROR PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Range for requested SDS messages	5	1	1	M	
SDS message index	7	1	1	M	note
SDS error	7	1	1	M	note
NOTE: Shall be repeated as a set as defined by the Range for requested SDS messages information element.					

11.6.4.7 TEMTA-SDS LIST MESSAGES IND

This PDU shall be used to convey a list of SDS messages in the SDS message stack from MT2 to TE2 as defined in table 89.

Table 89: TEMTA-SDS LIST MESSAGES IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Range for listed SDS messages	5	1	1	M	
SDS message index	7	1	1	M	note 1
SDS message status	7	1	1	C	note 1
Calling party type identifier	2	1	1	M	note 1, note 2
Calling party SSI	24	3	1	C	note 1, note 2
Calling party extension	24	3	1	C	note 1, note 2
External subscriber number			3	O	note 1
Short data type identifier	2	1	1	M	note 1
User defined data-1	16	2	1	C	note 1, note 3
User defined data-2	32	4	1	C	note 1, note 3
User defined data-3	64	8	1	C	note 1, note 3
Length indicator	11	2	1	C	note 1, note 3
User defined data-4			3	C	note 1, note 3 and note 4
Network time	24	3	1	M	note 1, note 5

NOTE 1: Shall be repeated as a set as defined by the Range for listed SDS messages information element. Value "0" shall indicate that no SDS message is stored.
NOTE 2: Shall be conditional on the value of Calling Party Type Identifier (CPTI):
CPTI = 0; reserved;
CPTI = 1; Called Party SSI;
CPTI = 2; Called Party SSI + Calling Party Extension.
NOTE 3: Shall be conditional on the value of Short Data Type Identifier (SDTI):
SDTI = 0; User Defined Data-1;
SDTI = 1; User Defined Data-2;
SDTI = 2; User Defined Data-3;
SDTI = 3; Length indicator + User Defined Data-4.
NOTE 4: The length of this information element shall be as defined by the Length information element.
NOTE 5: Shall be as defined in ETS 300 392-2 [2] subclause 18.5.24. If the network time is not available then $FFFFFF_{16}$ shall be used. The information in the local time offset information element is not used.

11.6.4.8 TEMTA-SDS LIST MESSAGES REQ

This PDU shall be used to request from a MT2 a list of SDS messages in the SDS message stack as defined in table 90.

Table 90: TEMTA-SDS LIST MESSAGES REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Range for requested SDS messages	5	1	1	M	
SDS message index	7	1	1	M	note
NOTE: Shall be repeated as defined by the Range for requested SDS messages information element.					

11.6.4.9 TEMTA-OPERATION

This PDU shall be used to convey unspecific information between communicating TE2 and MT2 user applications as defined in table 91. Communicating user applications may be linked with the Sending Application and Receiving Application information elements. The user application operation may be identified with the value of Function information element. Parameters of the function shall be placed in Facility information element. Coding of Function and Facility are partly manufacturer specific.

Table 91: TEMTA-OPERATION PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Sending Application Identifier	7	1	1	C	
Receiving Application Identifier	7	1	1	C	
Function	7	1	1	C	
Facility			3	O	

11.6.4.10 TEMTA-SERVICE PROFILE INFO

This PDU shall be used to convey the parameters of TNP1-SERVICE PROFILE response from MT2 to TE2 as defined in table 92.

Table 92: TEMTA-SERVICE PROFILE INFO PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
CC Profile	7	1	1	M	
SS Profile	7	1	1	M	
MM Profile	7	1	1	M	
Status Profile	7	1	1	M	
SDS User Data 1 Profile	7	1	1	M	
SDS User Data 2 Profile	7	1	1	M	
SDS User Data 3 Profile	7	1	1	M	
Number of SDS User Data 4 Profiles	4	1	1	M	
SDS User Data 4 Profile	15	2	2	C	note
NOTE: This information element shall be repeated as indicated by the Number of SDS User Data 4 Profiles information element. All SDS protocols which have any function in the MT2 information exchange and that have a profile defined at the moment of information request shall be listed.					

11.6.4.11 TEMTA-SERVICE PROFILE REQ

This PDU shall be used to request the parameters of TNP1-SERVICE PROFILE from TE2 to MT2 as defined in table 93.

Table 93: TEMTA-SERVICE PROFILE REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	

11.6.4.12 TEMTA-SERVICE PROFILE SET

This PDU shall be used to convey the parameters of TNP1-SERVICE PROFILE request from TE2 to MT2 as defined in table 94.

Table 94: TEMTA-SERVICE PROFILE SET PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
CC Profile	7	1	2	O	note 1
SS Profile	7	1	2	O	note 1
MM Profile	7	1	2	O	note 1
Status Profile	7	1	2	O	note 1
SDS User Data 1 Profile	7	1	2	O	note 1
SDS User Data 2 Profile	7	1	2	O	note 1
SDS User Data 3 Profile	7	1	2	O	note 1
Number of SDS User Data 4 Profiles	4	1	1	M	
SDS User Data 4 Profile	15	2	2	O	note 1, note 2
NOTE 1: If a profile is not defined in this PDU then there shall be no change on that profile. NOTE 2: This information element shall be repeated as indicated by the Number of SDS User Data 4 Profiles information element. All SDS protocols which have any function in the MT2 information exchange and where SDS Profile is defined at the moment of setting the service profile shall be listed.					

11.6.4.13 TEMTA-STATE INFO

This PDU shall be used to convey the parameters of TNP1-STATE response from MT2 to TE2 as defined in table 95.

Table 95: TEMTA-STATE INFO PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	5	1	1	M	
Battery Charge	8	1	1	M	
Field Strength	10	2	1	M	
Bit Error Ratio	8	1	1	M	
Proprietary			3	O	

11.6.4.14 TEMTA-STATE QUERY

This PDU shall be used to convey the parameters of TNP1-STATE request from TE2 to MT2 as defined in table 96.

Table 96: TEMTA-STATE QUERY PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	

11.6.5 SDS PDUs

These SDS PDUs are used to convey information TE2 and TNSDS service access point in the MT2. For an SDS message stack support TEMTA PDUs are defined in subclause 11.6.4.

11.6.5.1 TESDS-REPORT IND

This PDU shall be used to convey the parameters of TNSDS-REPORT indication from MT2 to TE2 as defined in table 97.

Table 97: TESDS-REPORT IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Called party type identifier	2	1	1	M	
Called party SNA	8	1	1	C	note
Called party SSI	24	3	1	C	note
Called party extension	24	3	1	C	note
External subscriber number			3	O	
SDS Transfer result	8	1	1	M	
NOTE: Shall be conditional on the value of Called Party Type Identifier (CPTI): CPTI = 00_2; Called Party SNA; CPTI = 01_2; Called Party SSI; CPTI = 10_2; Called Party SSI + Called Party Extension.					

11.6.5.2 TESDS-STATUS IND

This PDU shall be used to convey the parameters of TNSDS-STATUS indication from MT2 to TE2 as defined in table 98.

Table 98: TESDS-STATUS IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Called party type identifier	2	1	1	M	
Called party SSI	24	3	1	C	note 1
Called party extension	24	3	1	C	note 1
Calling party type identifier	2	1	1	M	
Calling party SSI	24	3	1	C	note 2
Calling party extension	24	3	1	C	note 2
External subscriber number			3	O	
Status number	16	2	1	M	
NOTE 1: Shall be conditional on the value of Called Party Type Identifier (CDPTI): CDPTI = 01_2; Called Party SSI; CDPTI = 10_2; Called Party SSI + Called Party Extension. NOTE 2: Shall be conditional on the value of Calling Party Type Identifier (CGPTI): CGPTI = 01_2; Calling Party SSI; CGPTI = 10_2; Calling Party SSI + Calling Party Extension.					

11.6.5.3 TESDS-STATUS REQ

This PDU shall be used to convey the parameters of TNSDS-STATUS request from TE2 to MT2 as defined in table 99.

Table 99: TESDS-STATUS REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Access priority	2	1	2	O	
Traffic stealing	1	1	2	O	
Area selection	4	1	2	O	
Called party type identifier	2	1	1	M	
Called party SNA	8	1	1	C	note
Called party SSI	24	3	1	C	note
Called party extension	24	3	1	C	note
External subscriber number			3	O	
Status number	16	2	1	M	

NOTE: Shall be conditional on the value of Called Party Type Identifier (CPTI):
CPTI = 00_2; Called Party SNA;
CPTI = 01_2; Called Party SSI;
CPTI = 10_2; Called Party SSI + Called Party Extension.

11.6.5.4 TESDS-UNITDATA IND

This PDU shall be used to convey the parameters of TNSDS-UNITDATA indication from MT2 to TE2 as defined in table 100.

Table 100: TESDS-UNITDATA IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Called party type identifier	2	1	1	M	
Called party SSI	24	3	1	C	note 1
Called party extension	24	3	1	C	note 1
Calling party type identifier	2	1	1	M	
Calling party SSI	24	3	1	C	note 2
Calling party extension	24	3	1	C	note 2
External subscriber number			3	O	
Short data type identifier	2	1	1	M	
User defined data-1	16	2	1	C	note 3
User defined data-2	32	4	1	C	note 3
User defined data-3	64	8	1	C	note 3
Length indicator	11	2	1	C	note 3
User defined data-4			1	C	note 3, note 4

NOTE 1: Shall be conditional on the value of Called Party Type Identifier (CDPTI):
CDPTI = 01_2; Called Party SSI;
CDPTI = 10_2; Called Party SSI + Called Party Extension.
NOTE 2: Shall be conditional on the value of Calling Party Type Identifier (CGPTI):
CGPTI = 01_2; Calling Party SSI;
CGPTI = 10_2; Calling Party SSI + Calling Party Extension.
NOTE 3: Shall be conditional on the value of Short Data Type Identifier (SDTI):
SDTI = 0; User Defined Data-1;
SDTI = 1; User Defined Data-2;
SDTI = 2; User Defined Data-3;
SDTI = 3; Length indicator + User Defined Data-4.
NOTE 4: The length of this information element shall be as defined by the Length information element.

11.6.5.5 TESDS-UNITDATA REQ

This PDU shall be used to convey the parameters of TNSDS-UNITDATA request from TE2 to MT2 as defined in table 101.

Table 101: TESDS-UNITDATA REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Access priority	2	1	2	O	
Traffic stealing	1	1	2	O	
Area selection	4	1	2	O	
Called party type identifier	2	1	1	M	
Called party SNA	8	1	1	C	note 1
Called party SSI	24	3	1	C	note 1
Called party extension	24	3	1	C	note 1
External subscriber number			3	O	
Short data type identifier	2	1	1	M	
User defined data-1	16	2	1	C	note 2
User defined data-2	32	4	1	C	note 2
User defined data-3	64	8	1	C	note 2
Length indicator	11	2	1	C	note 2
User defined data-4			1	C	note 2, note 3

NOTE 1: Shall be conditional on the value of Called Party Type Identifier (CPTI):
CPTI = 0; Called Party SNA;
CPTI = 1; Called Party SSI;
CPTI = 2; Called Party SSI + Called Party Extension.

NOTE 2: Shall be conditional on the value of Short Data Type Identifier (SDTI):
SDTI = 0; User Defined Data-1;
SDTI = 1; User Defined Data-2;
SDTI = 2; User Defined Data-3;
SDTI = 3; Length indicator + User Defined Data-4.

NOTE 3: The length of this information element shall be as defined by the Length information element.

11.6.6 SS PDUs

11.6.6.1 TESS-FACILITY CON

This PDU shall be used to convey the parameters of TNSS-FACILITY confirm from MT2 to TE2 as defined in table 102.

Table 102: TESS-FACILITY CON PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
SS type	6	1	1	M	
SS PDU type			3	M	
SS facility parameters			3	O	

11.6.6.2 TESS-FACILITY IND

This PDU shall be used to convey the parameters of TNSS-FACILITY indication from MT2 to TE2 as defined in table 103.

Table 103: TESS-FACILITY IND PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
SS type	6	1	1	M	
SS PDU type			3	M	
SS facility parameters			3	O	

11.6.6.3 TESS-FACILITY REQ

This PDU shall be used to convey the parameters of TNSS-FACILITY request from TE2 to MT2 as defined in table 104.

Table 104: TESS-FACILITY REQ PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
SS type	6	1	1	M	
SS PDU type			3	M	
SS facility parameters			3	O	

11.6.6.4 TESS-FACILITY RES

This PDU shall be used to convey the parameters of TNSS-FACILITY response from TE2 to MT2 as defined in table 105.

Table 105: TESS-FACILITY RES PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
SS type	6	1	1	M	
SS PDU type			3	M	
SS facility parameters			3	O	

11.7 TETNP1-REPORT PDU for protocol layer management

This PDU shall be used to transmit information about protocol failures detected at the peer protocol entity as defined in table 106.

Table 106: TETNP1-REPORT PDU contents

Information element	$Length_2$	$Length_8$	Type	C/O/M	Remark
PDU type	8	1	1	M	
Reason	1	1	1	M	

11.8 Information elements coding

Any of the following elements can be coded as TNP1 Type 1, 2 or 3 depending on the PDU.

The lengths (Length) of the information elements and their sub-elements are defined as number of bits.

All information element values not explicitly defined are reserved and shall not be used in this version of the protocol.

Most of the information elements defined in this subclause are also defined for TETRA AI protocols in ETS 300 392-2 [2]. Whenever the definition of the present document and ETS 300 392-2 [2] differ, ETS 300 392-2 [2] takes precedence.

11.8.1 Access Priority (AP)

The AP element shall indicate to the accessed entity urgency of the service request as defined in table 107.

Table 107: Access Priority element contents

Information element	$Length_2$	Value	Remark
Access Priority	2	00_2	Low priority
		01_2	High priority
		10_2	Emergency priority

11.8.2 Area Selection (AS)

The AS element shall indicate to the SwMI the distribution of the call as defined in table 108.

Table 108: Area Selection element contents

Information element	$Length_2$	Value	Remark
Area Selection	4	0000_2	Area not defined
		0001_2	Area 1
		0010_2	Area 2
		...etc.	...etc.
		1110_2	Area 14
		1111_2	All Areas this system

11.8.3 Basic service information

The Basic Service Information element shall inform the SwMI what basic service is requested as defined in table 109. The total element length of the information element is 8 bits.

Table 109: Basic Service Information element contents

Information subelement	$Length_2$	Value	Remark
Circuit Mode Type (see note 1)	3	000_2	Speech: TCH/S
		001_2	Unprotected: TCH/7.2
		010_2	Low Protection: TCH/4.8, N = 1
		011_2	Low Protection: TCH/4.8, N = 4
		100_2	Low Protection: TCH/4.8, N = 8
		101_2	High Protection: TCH/2.4, N = 1
		110_2	High Protection: TCH/2.4, N = 4
		111_2	High Protection: TCH/2.4, N = 8
Encryption Flag (see note 2)	1	0	Clear Mode
		1	TETRA end-to-end encryption
Communication Type	2	00_2	Point-to-point
		01_2	Point-to-multipoint
		10_2	Point-to-multipoint Acknowledged
		11_2	Broadcast
Slots per frame (see note 3)	2	00_2	One slot
		01_2	Two slots
		10_2	Three slots
		11_2	Four slots

NOTE 1: Indicates the traffic channel (TCH) type and the interleaving depth N.
NOTE 2: Indicates whether the circuit mode speech or data is end-to-end encrypted.
NOTE 3: Indicates the required bit rate for a circuit mode data call. For TCH/7.2, TCH/4.8 and TCH/2.4 the resulting bit rate is the TCH bit rate multiplied by the number of slots per frame. (For example, TCH/7.2 in four time slots per frame gives a circuit mode data rate of 28,8 kbit/s.) For TCH/S this element shall be present (set to 0).

11.8.4 Battery charge

The Battery Charge element shall indicate the charging state of the MT2 battery as defined in table 110.

Table 110: Battery Charge element contents

Information element	$Length_2$	Value	Remark
Battery charge	8	0	Empty
		... etc ...	
		100_{10}	Full

11.8.5 Bit error ratio

The Bit Error Ratio element shall indicate the bit error ratio detected by the MT2 in the AI as defined in table 111.

Table 111: Bit Error Ratio element contents

Information element	$Length_2$	Value	Remark
Bit error ratio	8	0	BER < 0,01 %
		1_{10}	0,01 % to less than 0,1 %
		2_{10}	0,1 % to less than 0,5 %
		3_{10}	0,5 % to less than 1,0 %
		4_{10}	1,0 % to less than 2,0%
		5_{10}	2,0 % to less than 4,0 %
		6_{10}	4,0 % to less than 8,0 %
		7_{10}	≥ 8,0 %
		99_{10}	Not known or detectable

11.8.6 Called party type identifier

The Called Party Type Identifier element shall indicate the type of address which shall follow in the PDU as defined in table 112.

Table 112: Called Party Type Identifier element contents

Information element	$Length_2$	Value	Remark
Called Party Type Identifier	2	00_2	Short Number Address (SNA)
		01_2	Short Subscriber Identity (SSI)
		10_2	Tetra Subscriber Identity (TSI = MNI+SSI)
		11_2	None

11.8.7 Called party short number address

The Called Party Short Number Address element shall indicate to the SwMI the Short Number address of the called user as defined in table 113.

Table 113: Called Party Short Number Address element contents

Information element	$Length_2$	Value	Remark
Called Party Short Number Address	8	$0 - 255_{10}$	See ETS 300 392-1 [1] clause 7

11.8.8 Called party extension

The Called Party Extension element shall indicate to the SwMI the extended part of the TSI address of the called user as defined in table 114.

Table 114: Called Party Extension element contents

Information subelement	$Length_2$	Value	Remark
Country Code	10		See ETS 300 392-1 [1] clause 7
Network Code	14		See ETS 300 392-1 [1] clause 7

11.8.9 Called party short subscriber identity (SSI)

The Called Party Short Subscriber Identity element shall indicate to the SwMI the Short Subscriber Identity (SSI) address of the called user as defined in table 115.

Table 115: Called Party Short Subscriber Identity element contents

Information element	$Length_2$	Value	Remark
Short subscriber identity	24		See ETS 300 392-1 [1] clause 7

11.8.10 Call identifier

The Call Identifier element shall uniquely identify a specific call as defined in table 116.

Table 116: Call Identifier element contents

Information element	$Length_2$	Value	Remark
Call identifier	14	0	dummy call identifier
		1_{10} - 16 383_{10}	identifies call uniquely

11.8.11 Calling party extension

The Calling Party Extension element shall indicate the extended part of the TSI address of the calling user as defined in table 117.

Table 117: Calling Party Extension element contents

Information subelement	$Length_2$	Value	Remark
Country Code	10		See ETS 300 392-1 [1] clause 7
Network Code	14		See ETS 300 392-1 [1] clause 7

11.8.12 Calling party Short Subscriber Identity (SSI)

The Calling Party Short Subscriber Identity element shall indicate the Short Subscriber Identity (SSI) address of the calling user as defined in table 118.

Table 118: Calling Party Short Subscriber Identity element contents

Information element	$Length_2$	Value	Remark
Short subscriber identity	24		See ETS 300 392-1 [1] clause 7

11.8.13 Calling party type identifier

The Calling Party Type Identifier element coding shall indicate the type of address which shall follow in the PDU as defined in table 119.

Table 119: Calling Party Type Identifier element contents

Information element	$Length_2$	Value	Remark
Calling Party Type Identifier	2	00_2	Reserved
		01_2	Short Subscriber Identity (SSI)
		10_2	Tetra Subscriber Identity (TSI = MNI + SSI)
		11_2	None

11.8.14 Call ownership

The Call Ownership element in group call shall indicate to the MS whether it is capable to disconnect the call or not as defined in table 120. In individual call it shall indicate to both parties if it is a normal call set up or if it is amalgamated call.

Table 120: Call Ownership element contents

Information element	$Length_2$	Value	Remark
Call ownership	1	0	Not a call owner (Group call) Normal call set up (Individual call)
		1	A call owner (Group call) Amalgamated call (Individual call)

11.8.15 Call priority

The Call Priority element shall inform the SwMI or the MS/LS about the call priority as defined in table 121.

Table 121: Call Priority element contents

Information element	$Length_2$	Value	Remark
Call Priority	4	0000_2	Priority not defined
		0001_2	Priority 1 (Lowest Priority)
		0010_2	Priority 2
		...etc.	...etc.
		1011_2	Priority 11
		1100_2	Pre-emptive priority 1
		1101_2	Pre-emptive priority 2
		1110_2	Pre-emptive priority 3
		1111_2	Pre-emptive priority 4 (Emergency)

11.8.16 Call queued

The Call Queued element shall inform the calling MS/LS that the call has been put in queue as defined in table 122.

Table 122: Call Queued element contents

Information element	$Length_2$	Value	Remark
Call queued	1	0	Call is not queued
		1	Call is queued

11.8.17 Call status

The Call Status element shall inform the MS/LS about the status of the call as defined in table 123.

Table 123: Call Status element contents

Information element	$Length_2$	Value	Remark
Call Status	3	000_2	Call is progressing
		001_2	Call is queued
		010_2	Requested subscriber is paged
		011_2	Call Continue
		100_2	Hang time expired
		101_2	Reserved
		110_2	Reserved
		111_2	Reserved

11.8.18 Call time-out

The Call Time-Out element shall set the maximum call time (T310) as defined in table 124.

Table 124: Call Time-Out element contents

Information element	$Length_2$	Value	Remark
Call Time-Out	4	0000_2	Infinite Time
		0001_2	30 seconds
		0010_2	45 seconds
		0011_2	60 seconds
		0100_2	2 minutes
		0101_2	3 minutes
		0110_2	4 minutes
		0111_2	5 minutes
		1000_2	6 minutes
		1001_2	8 minutes
		1010_2	10 minutes
		1011_2	12 minutes
		1100_2	15 minutes
		1101_2	20 minutes
		1110_2	30 minutes
		1111_2	Reserved

11.8.19 Call time-out, set-up phase

The Call Time-Out, Set-Up Phase element (T301 and T302) shall set the maximum set-up time valid for the call set up phase as defined in table 125.

Table 125: Call Time-Out, Set-Up Phase element contents

Information element	$Length_2$	Value	Remark
Call Time Out, Set-Up Phase	3	000_2	Use predefined value (note)
		001_2	1 second
		010_2	2 seconds
		011_2	5 seconds
		100_2	10 seconds
		101_2	20 seconds
		110_2	30 seconds
		111_2	60 seconds
NOTE: This value shall indicate that the MS/LS shall use a predefined value for the timer.			

11.8.20 CC profile

The CC Profile element shall define operation of the TNP1 Relay for CC signalling messages as defined in table 126.

Table 126: CC Profile element contents

Information element	$Length_2$	Value	Remark
CC profile	7	0000000_2	No incoming CC PDUs shall be relayed to TE2, CC PDUs originating from TE2 shall be rejected by TNP1R
		0000001_2	Incoming CC PDUs shall be relayed to TE2, TNP1R shall relay CC PDUs originating from TE2 to CC entity

11.8.21 Circuit mode data

The Circuit Mode Data element shall carry data related to circuit mode traffic as defined in table 127.

Table 127: Circuit Mode Data element contents

Information element	$Length_2$	Value	Remark
Circuit Mode Data	varies		

11.8.22 Circuit mode services

The Circuit Mode Services element shall list the circuit mode capabilities of the MT2 as defined in table 128. It shall not give any information of the capabilities of the underlying network. This element shall contain sub-elements so that the total $length_2$ is 9 bits, which are encoded into two octets in the PDUs.

Table 128: Circuit Mode Services sub-element contents

Information element	$Length_2$	Value	Remark
TETRA encoded speech	1	0_2	Not capable
		1_2	Capable
7,2 kbit/s unprotected data/speech	1	0_2	Not capable
		1_2	Capable
7,2 kbit/s non-TETRA encoded speech	1	0_2	Not capable
		1_2	Capable
4,8 kbit/s unprotected data/speech, interleaving depth = 1	1	0_2	Not capable
		1_2	Capable
4,8 kbit/s unprotected data/speech, interleaving depth = 4	1	0_2	Not capable
		1_2	Capable
4,8 kbit/s unprotected data/speech, interleaving depth = 8	1	0_2	Not capable
		1_2	Capable
2,4 kbit/s unprotected data/speech, interleaving depth = 1	1	0_2	Not capable
		1_2	Capable
2,4 kbit/s unprotected data/speech, interleaving depth = 4	1	0_2	Not capable
		1_2	Capable
2,4 kbit/s unprotected data/speech, interleaving depth = 8	1	0_2	Not capable
		1_2	Capable

11.8.23 Continue

The Continue element shall inform the MS/LS if it shall continue after a pause in the same state as before the pause as defined in table 129.

Table 129: Continue element contents

Information element	$Length_2$	Value	Remark
Continue	1	0	Not continue
		1	Continue

11.8.24 Disabling type

The Disabling Type element shall indicate which of the disabling types (i.e. temporary or permanent) is requested as defined in table 130.

Table 130: Disabling Type element contents

Information element	$Length_2$	Value	Remark
Disabling Type	1	0	Temporary
		1	Permanent

11.8.25 Disconnect cause

The Disconnect Cause element shall inform the MS/LS or the infrastructure OF the reason for the release/disconnection as defined in table 131.

Table 131: Disconnect Cause element contents

Information element	$Length_2$	Value	Remark
Disconnect cause	5	00000_2	Cause not defined or unknown
		00001_2	User requested disconnect
		00010_2	Called party busy
		00011_2	Called party not reachable
		00100_2	Called party does not support encryption
		00101_2	Congestion in infrastructure
		00110_2	Not allowed traffic case
		00111_2	Incompatible traffic case
		01000_2	Requested service not available
		01001_2	Pre-emptive use of resource
		01010_2	Invalid Call Identifier
		01011_2	Call Rejected by the called party
		01100_2	No idle CC entity
		01101_2	Expiry of timer
		01110_2	SwMI requested Disconnection
		01111_2	Acknowledged Service not completed
		10000_2	Reserved
		...etc.	...etc.
		11111_2	Reserved

11.8.26 DTMF

The DTMF element shall allow the transfer of DTMF digits (n digits where n shall be less than or equal to 255) to another user application. Each digit shall be encoded as defined in table 132.

Table 132: DTMF element contents

Information element	$Length_2$	Value	Remark
DTMF digit	4	0000_2	Digit "0"
		0001_2	Digit "1"
		0010_2	Digit "2"
		0011_2	Digit "3"
		0100_2	Digit "4"
		0101_2	Digit "5"
		0110_2	Digit "6"
		0111_2	Digit "7"
		1000_2	Digit "8"
		1001_2	Digit "9"
		1010_2	Digit "*"
		1011_2	Digit "#"
		1100_2	Digit "A"
		1101_2	Digit "B"
		1110_2	Digit "C"
		1111_2	Digit "D"

11.8.27 Encryption

The Encryption element shall indicate the encryption capabilities of MT2 as defined in table 133.

Table 133: Encryption element contents

Information element	$Length_2$	Value	Remark
Encryption	2	00_2	No encryption supported
		01_2	Air interface encryption
		10_2	End-to-end encryption for circuit mode traffic
		11_2	Air interface encryption; End-to-end encryption for circuit mode traffic

11.8.28 Encryption control

The Encryption Control element shall request for encryption/clear mode and inform about the granting result of this request as defined in table 134.

Table 134: Encryption Control element contents

Information element	$Length_2$	Value	Remark
Encryption control	1	0	clear
		1	encrypted

11.8.29 Energy saving mode

The Energy Saving Mode element shall be used to indicate which energy saving scheme is requested (if any) as defined in table 135.

Table 135: Energy Saving Mode element contents

Information element	$Length_2$	Value	Remark
Energy Saving Mode	3	000_2	Stay Alive
		001_2	Economy Mode 1 (EG1)
		010_2	Economy Mode 2 (EG2)
		011_2	Economy Mode 3 (EG3)
		100_2	Economy Mode 4 (EG4)
		101_2	Economy Mode 5 (EG5)
		110_2	Economy Mode 6 (EG6)
		111_2	Economy Mode 7 (EG7)

11.8.30 Error parameter

The Error Parameter element shall provide additional information about the error. The reasons for errors shall be either reject reason or operational problem as defined in table 136.

Table 136: Error Parameter element contents

Information element	$Length_2$	Value	Remark
Error parameter	varies		Values depend on the supplementary service

11.8.31 Error value

The Error Value element shall identify the error that occurred during the execution of the operation as defined in table 137.

Table 137: Error Value element contents

Information element	$Length_2$	Value	Remark
Error value	varies		Values depend on the supplementary service

11.8.32 External Subscriber Number

The External Subscriber Number element shall allow the transfer of an External Subscriber Number from a Tetra subscriber to a gateway. The External subscriber number information element can consist of n digits where n shall be less than or equal to 24. Each digit shall be encoded as defined in table 138.

Table 138: External subscriber number element contents

Information element	$Length_2$	Value	Remark
External subscriber number digit	4	0000_2	Digit "0"
		0001_2	Digit "1"
		0010_2	Digit "2"
		0011_2	Digit "3"
		0100_2	Digit "4"
		0101_2	Digit "5"
		0110_2	Digit "6"
		0111_2	Digit "7"
		1000_2	Digit "8"
		1001_2	Digit "9"
		1010_2	Digit "*"
		1011_2	Digit "#"
		1100_2	Digit "A"
		1101_2	Digit "B"
		1110_2	Digit "C"
		1111_2	Digit "D"

11.8.33 Facility

The Facility element is an optional variable length element and shall be used to send and receive SS information appended to the PDUs which can carry the facility element.

The size and the structure of the facility element is dependent on each individual SS and shall be further detailed in the SS protocol clauses.

There can be multiple Facility elements in the same PDU.

11.8.34 Field strength

The Field Strength element shall indicate the current field strength detected by the MT2 as defined in table 139. See ETS 300 392-2 [2] subclause 10.3.

Table 139: Field Strength element contents

Information element	$Length_2$	Value	dBm	Remark
Field strength	7	99_{10}	-	Not know or not detectable
		1_{10}	-115	
		2_{10}	-114	
		etc.	etc.	
		65_{10}	-51	
		66_{10}	-50	
		67_{10}	more than -50	
		0	-	Parameter not available

11.8.35 Function

The Function element shall associate a predefined function to the PDU as defined in table 140.

Table 140: Function element contents

Information element	$Length_2$	Value	Remark
Function	7	00000000_2 - 01111111_2	Available for proprietary user applications
		10000000_2 - 11111111_2	Reserved

11.8.36 Group identity acknowledgement request

The Group Identity Acknowledgement Request element shall indicate the MS response to the infrastructure initiated attachment/detachment of group identities as defined in table 141.

Table 141: Group Identity Acknowledgement Request element contents

Information element	$Length_2$	Value	Remark
Group Identity Acknowledgement Request	1	0	Acknowledgement not requested
		1	Acknowledgement requested

11.8.37 Group identity acknowledgement type

The Group Identity Acknowledgement Type element shall indicate the MS response type to the infrastructure initiated attachment/detachment of group identities as defined in table 142.

Table 142: Group Identity Acknowledgement Type element contents

Information element	$Length_2$	Value	Remark
Group Identity Acknowledgement Type	1	0	Attachment/detachment accepted
		1	Attachment(s) rejected, the reject cause is indicated in the group identity uplink element

11.8.38 Group identity attach/detach mode

The Group Identity Attach/Detach Mode element shall indicate the mode of the attachment/detachment of group identities as defined in table 143.

Table 143: Group Identity Attach/Detach Mode element contents

Information element	$Length_2$	Value	Remark
Group Identity Attach/Detach Mode	1	0	Amendment
		1	Detach all currently active group identities and attach group identities defined in the group identity (downlink/uplink) element (if any)

11.8.39 Group identity downlink

The Group Identity Downlink element shall be used to join the parameters for a group identity attachment/detachment used by the infrastructure as defined in table 144.

Table 144: Group Identity Downlink element contents

Information subelement	$Length_2$	$Length_8$	Type	C/O/M	Remark
Group Identity Attach/Detach Type Identifier	1	1	1	M	
Group Identity Attachment	5	1	1	C	note 1
Group Identity Detachment Downlink	2	1	1	C	note 1
Group Identity Address Type	2	1	1	M	
GSSI	24	3	1	C	note 2
Address Extension	24	3	1	C	note 2
Visitor Group Short Subscriber Identity	24	3	1	C	note 2
NOTE 1: Shall be conditional on the value of Group Identity Attach/Detach Type Identifier (GIADTI): GIADTI = 0; Group Identity Attachment; GIADTI = 1; Group Identity Detachment Downlink. NOTE 2: Shall be conditional on the value of Group Identity Address Type (GIAT): GIAT = 0; GSSI; GIAT = 1; GSSI + Address Extension (GTSI); GIAT = 2; Visitor Group Short Subscriber Identity ((V)GSSI); GIAT = 3; GSSI + Extension + Visitor Group Short Subscriber Identity (GTSI-V(GSSI)).					

11.8.40 Group identity report

The Group Identity Report element shall indicate whether all MS's active group identities shall be reported as defined in table 145.

Table 145: Group Identity Report element contents

Information element	$Length_2$	Value	Remark
Group Identity Report	1	0	Not report request
		1	Report request

11.8.41 Group identity uplink

The Group Identity Uplink element shall be used to join the parameters for a group identity attachment/detachment used by the MS as defined in table 146.

Table 146: Group Identity Uplink element contents

Information subelement	$Length_2$	$Length_8$	Type	C/O/M	Remark
Group Identity Attach/Detach Type Identifier	1	1	1	M	
Class of Usage	3	1	1	C	note 1
Group Identity Detachment Uplink	2	1	1	C	note 1
Group Identity Address Type	2	1	1	M	
GSSI	24	3	1	C	note 2
Address Extension	24	3	1	C	note 2
Visitor Group Short Subscriber Identity	24	3	1	C	note 2
NOTE 1: Shall be conditional on the value of Group Identity Attach/Detach Type Identifier (GIADTI): GIADTI = 0; Class of Usage; GIADTI = 1; Group Identity Detachment uplink. NOTE 2: Shall be conditional on the value of Group Identity Address Type (GIAT): GIAT = 0; GSSI; GIAT = 1; GSSI + Address Extension (GTSI); GIAT = 2; Visitor Group Short Subscriber Identity ((V)GSSI); GIAT = 3; Reserved.					

11.8.42 Hardware version

The Hardware version element shall inform the TE2 user application about the MT2 hardware version as defined in table 147. The 7-bit IRA defined in ITU-T T.50 [11] shall be used. The characters shall be aligned sequentially. The total number of characters, including line terminators, shall not exceed 2 048 characters (14 336 bits).

Table 147: Hardware version element contents

Information element	$Length_2$	Value	Remark
Hardware version	n * 7		

11.8.43 Hook method selection

The Hook Method Selection element shall inform the infrastructure and the called user(s) of the preferred hook method as defined in table 148.

Table 148: Hook Method Selection element contents

Information element	$Length_2$	Value	Remark
Hook method selection	1	0	No hook signalling (direct through-connect)
		1	Hook on/Hook off signalling

11.8.44 Invoke-ID

The Invoke-ID element shall carry identification information of a request/response SERVICE/INFO service invocation as defined in table 149 and shall be used to correlate this request/response with the corresponding replies (TNSS-ERROR, TNSS-SERVICE and TNSS-INFO services).

This parameter shall distinguish several requests/responses of the service the requester may have in progress. The requester may begin to reuse invoke-ID values whenever it chooses, subject to the constraint that it shall not reuse an invoke-ID value that was previously assigned to a request/response of the service for which it expects, but has not yet received, an indication/confirm.

Table 149: Invoke-ID element contents

Information element	$Length_2$	Value	Remark
Invoke-ID	16	0 - 65 535	

11.8.45 ISO Global Object ID

The ISO Global Object ID element shall inform the TE2 user application about the MT2 identification in terms of global ISO definition as defined in table 150.The 7-bit IRA defined in ITU-T Recommendation T.50 [11] shall be used. The characters shall be aligned sequentially. The total number of characters, including line terminators, shall not exceed 2 048 characters (14 336 bits).

Table 150: ISO Global Object ID element contents

Information element	$Length_2$	Value	Remark
ISO Global Object ID	n * 7		

11.8.46 Length indicator

The Length Indicator element shall define the length of the User defined data-4 as defined in table 151.

Table 151: Length Indicator element contents

Information element	$Length_2$	Value	Remark
Length indicator	11	0	0 bits
		1	1 bit
		...etc.	...etc.
		$(2^{11}-1)$	2 047 bits

11.8.47 Manufacturer ID

The Manufacturer ID element shall inform the TE2 user application about the manufacturer of the MT2 as defined in table 152. The 7-bit IRA defined in ITU-T Recommendation T.50 [11] shall be used. The characters shall be aligned sequentially. The total number of characters, including line terminators, shall not exceed 2 048 characters (14 336 bits).

Table 152: Manufacturer ID element contents

Information element	$Length_2$	Value	Remark
Manufacturer ID	n * 7		

11.8.48 Max data

The Max data element shall indicate how much data MT2 can accept from TE2 as defined in table 153. The amount of data shall be measured in timeslots as used in the current circuit mode type.

Table 153: Length Indicator element contents

Information element	$Length_2$	Value	Remark
Max data	8	0	No data
		1	1 timeslot
		2	2 timeslots
		...etc.	...etc.
		$(2^{8}-1)$	255 timeslots

11.8.49 MM profile

The CC Profile element shall define operation of the TNP1 Relay for MM signalling messages as defined in table 154.

Table 154: MM Profile element contents

Information element	$Length_2$	Value	Remark
MM profile	7	0000000_2	No incoming MM PDUs shall be relayed to TE2, MM PDUs originating from TE2 shall be rejected by TNP1R
		0000001_2	Incoming MM PDUs shall be relayed to TE2, TNP1R shall relay MM PDUs originating from TE2 to MM entity

11.8.50 Model

The Model element shall inform the TE2 user application about the MT2 model as defined in table 155. The 7-bit IRA defined in ITU-T Recommendation T.50 [11] shall be used. The characters shall be aligned sequentially. The total number of characters, including line terminators, shall not exceed 2 048 characters (14 336 bits).

Table 155: Model element contents

Information element	$Length_2$	Value	Remark
Model	n * 7		

11.8.51 Modify

The Modify element shall be used to change an ongoing call either to a new basic service or the behaviour from simplex to duplex or reverse as defined in table 156.

Table 156: Modify element contents

Information subelement	$Length_2$	Value	Remark
Simplex/Duplex selection	1		See Description of "Simplex/Duplex selection" element
Basic Service Information	8		See Description of "Basic Service Information" element

11.8.52 Network time

The Network time shall be used to indicate approximate reception time of the SDS message as defined in table 157.

Table 157: Network time element contents

Information subelement	$Length_2$	Value	Remark
Network time	24	note	note
NOTE: The element values shall be as defined in ETS 300 392-2 [2] subclause 18.5.24. Value $FFFFFF_{16}$ shall be used to indicate that the time is not available.			

11.8.53 New call identifier

The New Call Identifier element coding shall be the same as for the call identifier element.

11.8.54 Notification indicator

The Notification Indicator element shall be used in SSs by the SwMI to inform a MS/LS of various events as presented in table 158 and defined in ETS 300 392-9 [21] subclause 7.2.

Table 158: Notification Indicator element contents

Information element	$Length_2$	Value	Remark
Notification indicator	6	$0 - 63_{10}$	See ETS 300 392-9 [21]

11.8.55 Number of SDS User Data 4 Profiles

This information element shall indicate the number of the User Data 4 profiles to follow as defined in table 159.

Table 159: Number of SDS User Data 4 Profiles element contents

Information element	$Length_2$	Value	Remark
Number of the User Data 4 profiles	4	0	Reserved
		1	One user data 4 profile
		etc.	
		15	15 use data 4 profiles

11.8.56 Packet Mode Services

The Call Types element shall list the packet mode capabilities of the MT2. It shall not give any information of the capabilities of the underlying network as defined in table 160.

Table 160: Packet Mode Services

Information element	$Length_2$	Value	Remark
Status	1	0_2	Not capable
		1_2	Capable
SDS Type 1	1	0_2	Not capable
		1_2	Capable
SDS Type 2	1	0_2	Not capable
		1_2	Capable
SDS Type 3	1	0_2	Not capable
		1_2	Capable
SDS Type 4	1	0_2	Not capable
		1_2	Capable
IPv4	1	0_2	Not capable
		1_2	Capable
IPv6	1	0_2	Not capable
		1_2	Capable
ISO IP	1	0_2	Not capable
		1_2	Capable
CONS	1	0_2	Not capable
		1_2	Capable

11.8.57 PDU type

The PDU Type element shall identify the type of TNP1 PDU sent over the AI as defined in table 161.

The first three bits from the left of each PDU Type value indicates the entity or subentity of the AI protocol stack that the PDU is related to. The coding shall be as defined in table 162.

Table 161: PDU Type element contents

Information element	$Length_2$	Value	Remark
PDU Type	8	00000001_2	TECC-ALERT IND
		00000010_2	TECC-COMPLETE CON
		00000011_2	TECC-COMPLETE IND
		00000100_2	TECC-COMPLETE REQ
		00000101_2	TECC-DTMF IND
		00000110_2	TECC-DTMF REQ
		00000111_2	TECC-MODIFY IND
		00001000_2	TECC-MODIFY REQ
		00001001_2	TECC-NOTIFY IND
		00001010_2	TECC-PROCEED IND
		00001011_2	TECC-RELEASE CON
		00001100_2	TECC-RELEASE IND
		00001101_2	TECC-RELEASE REQ
		00001110_2	TECC-SETUP CON
		00001111_2	TECC-SETUP IND
		00010000_2	TECC-SETUP REQ
		00010001_2	TECC-SETUP RES
		00010010_2	TECC-TX CON
		00010011_2	TECC-TX IND
		00010100_2	TECC-TX REQ
		00100000_2	TESS-FACILITY CON
		00100001_2	TESS-FACILITY IND
		00100010_2	TESS-FACILITY REQ
		00100011_2	TESS-FACILITY RES
		01000000_2	TESDS-REPORT IND
		01000001_2	TESDS-STATUS IND
		01000010_2	TESDS-STATUS REQ
		01000011_2	TESDS-UNITDATA IND
		01000100_2	TESDS-UNITDATA REQ
		01100000_2	TEMM-ATTACH DETACH GROUP IDENTITY CON
		01100001_2	TEMM-ATTACH DETACH GROUP IDENTITY IND
		01100010_2	TEMM-ATTACH DETACH GROUP IDENTITY REQ
		01100011_2	TEMM-DISABLING IND
		01100100_2	TEMM-ENABLING IND
		01100101_2	TEMM-ENERGY SAVING CON
		01100110_2	TEMM-ENERGY SAVING REQ
		01100111_2	TEMM-REPORT IND
		01101000_2	TEMM-REGISTRATION C0N
		01101001_2	TEMM-REGISTRATION IND
		01101010_2	TEMM-SERVICE IND
		10000000_2	TEMAC-FLOW CONTROL
		10000001_2	TEMAC-UNITDATA
		10100000_2	TEMTA-CAPABILITY QUERY
		10100001_2	TEMTA-CAPABILITY INFO

(continued)

Table 161 (concluded): PDU Type element contents

Information element	$Length_2$	Value	Remark
		10100010_2	TEMTA-IDENTIFICATION INFO
		10100011_2 10100100_2	TEMTA-IDENTIFICATION QUERY TEMTA-SDS DELETE MESSAGES REQ
		10100101_2	TEMTA-SDS LIST MESSAGES ERROR
		10100110_2	TEMTA-SDS LIST MESSAGES IND
		10100111_2	TEMTA-SDS LIST MESSAGES REQ
		10101000_2	TEMTA-OPERATION
		10101001_2	TEMTA-SERVICE PROFILE INFO
		10101010_2	TEMTA-SERVICE PROFILE REQ
		10101011_2	TEMTA-SERVICE PROFILE SET
		10101100_2	TEMTA-STATE INFO
		10101101_2	TEMTA-STATE QUERY
		11000001_2	TETNP1-REPORT

Table 162: Indication of the AI stack entity in the PDU Type value

Information element	$Length_2$	Value	Remark
PDU Type	8	$000xxxxx_2$	CMCE CC related PDUs
		$001xxxxx_2$	CMCE SS related PDUs
		$010xxxxx_2$	CMCE SDS related PDUs
		$011xxxxx_2$	MM related PDUs
		$100xxxxx_2$	Circuit mode traffic related PDUs
		$101xxxxx_2$	MT2 user application related PDUs
		$110xxxxx_2$	Layer management related PDUs
		$111xxxxx_2$	Reserved

11.8.58 Poll request

This Poll Request element shall be used by the SwMI to request a poll response back from the MS/LS when an acknowledged group call has been initiated as defined in table 163.

Table 163: Poll Request element contents

Information element	$Length_2$	Value	Remark
Poll Request	1	0	No Poll answer requested
		1	Poll answer requested

11.8.59 Poll response

This Poll Response element shall be used by the MS/LS to respond to a poll request in an acknowledged group call from the SwMI as defined in table 164.

Table 164: Poll Response element contents

Information element	$Length_2$	Value	Remark
Poll Response	1	0	No Poll response
		1	Poll response

11.8.60 Poll response addresses

The Poll Response Addresses element shall provide the addresses on responding group members in an acknowledged group call as defined in table 165.

Table 165: Poll Response Addresses element contents

Information element	$Length_2$	Value	Remark
1st TSI address	48		For TSI address definition see [11] clause 7
2nd TSI address	48		
...etc.	...etc.		
nth TSI address	48		

11.8.61 Poll response number

The Poll Response Number element shall provide the number of responding group members in an acknowledged group call as defined in table 166.

Table 166: Poll Response Number element contents

Information element	$Length_2$	Value	Remark
Number of responding group members	6	$0 - 63_{10}$	

11.8.62 Poll response percentage

The Poll Response Percentage element shall provide the percentage of responding group members in an acknowledged group call as defined in table 167.

Table 167: Poll Response Percentage element contents

Information element	$Length_2$	Value	Remark
Percentage of responding number of group members	6	0	0 %
		1	2 %
		...etc.	...etc.
		50_{10}	100 %
		51_{10}	Reserved
		...etc.	...etc.
		63_{10}	Reserved

11.8.63 Port selection

The Port selection element shall define which port is selected for the circuit mode service as defined in table 168. It is outside the scope of the present document which port, if any, is selected, if the indicated port is not available.

Table 168: Indication of the AI stack entity in the PDU Type value

Information element	$Length_2$	Value	Remark
Port selection	3	000_2	Port 0 in the MT2 side
		001_2	Port 1 in the MT2 side
		010_2	Port 2 in the MT2 side
		011_2	Port 3 in the MT2 side
		100_2	Port 0 in the TE2 side
		101_2	Port 1 in the TE2 side
		110_2	Port 2 in the TE2 side
		111_2	Port 3 in the TE2 side

11.8.64 Pre-coded status

The Pre-coded Status element shall define general purpose status messages known to all TETRA systems as defined in table 169.

Table 169: Pre-coded Status element contents

Information element	$Length_2$	Value	Remark
Pre-coded status	16	0	Emergency
		1	Reserved
		...etc.	...etc.
		$32\ 767_{10}$	Reserved
		$32\ 768_{10}$	Available for TETRA network and user specific definitions
		...etc.	...etc.
		$65\ 535_{10}$	Available for TETRA network and user specific definitions

11.8.65 Product Serial No

The Product Serial No element shall inform the TE2 user application about the MT2 production number as defined in table 170. The 7-bit IRA defined in ITU-T Recommendation T.50 [11] shall be used. The characters shall be aligned sequentially. The total number of characters, including line terminators, shall not exceed 2 048 characters (14 336 bits).

Table 170: Product Serial No element contents

Information element	$Length_2$	Value	Remark
Product Serial No	n * 7		

11.8.66 Proprietary

Proprietary is an optional, variable length element and shall be used to send and receive proprietary defined information appended to the PDUs. The proprietary element is terminated in MT2.

The first information element following the type 3 CMCE element identifier "proprietary" shall be a Manufacturer identifier information element and the subsequent information elements are manufacturer-specific. The Manufacturer identifier is defined in table 171.

Table 171. Manufacturer identifier definition

Information element	$Length_2$	Value	Remarks
Manufacturer identifier	8	0	Reserved
		1 - 255	To be allocated to manufactures

The use, the size and the rest of the structure of the Proprietary element is outside the scope of the present document.

11.8.67 Range for deleted SDS messages

This information element shall indicate how many times the following SDS message references are repeated. See subclause 11.8.70 for encoding rules.

11.8.68 Range for listed SDS messages

This information element shall indicate how many times the following SDS message references, addresses and data are repeated. See subclause 11.8.70 for encoding rules.

11.8.69 Range for requested SDS messages

This information element shall indicate how many times the following SDS message references are repeated. See subclause 11.8.70 for encoding rules.

11.8.70 Range type information element

The range type information element preceding an information element (or set of information elements) shall indicate whether the information element in question is a single value present at all, present only once or repeated. If repeated it allows it to take , a list of up to 30 values (or sets of values) or a range of values. This range shall be defined by a lower and a upper bound of values of: either

- the information element to be repeated if there is only one; or

- the "significant" information element in the set of information elements to be repeated.

Where the range type refers to a set of information elements, the information elements in each repeated set shall be in the order specified for the SS PDU. The range type information element shall be as specified in table 172.

Table 172: Range type information element contents

Information element	Length	Value	Remarks
Range type	5	00000_2	No element (note 1)
		00001_2	One element
		00010_2	List of elements (note 2)
		00011_2	List of elements (note 2)
		..	List of elements (note 2)
		11110_2	List of elements (note 2)
		11111_2	Range of elements (note 3)
NOTE 1: The value 0 shall indicate that the SS PDU does not include any repeatable information element (or set of information elements) for which the range type information element applies.			
NOTE 2: The number of repeated information elements or sets of information elements shall be equal to the value number.			
NOTE 3: For the binary value 11111 two elements shall follow, the first element shall be the lower bound of the range, the second element the upper bound.			

11.8.71 Reason

The Reason element shall indicate what is the reason for the event report as defined in table 173.

Table 173: Reason element contents

Information element	$Length_2$	Value	Remark
Reason	7	0000000_2	PEI DLL failure
		0000001_2	Unrecognized PDU
		0000010_2	Facility or addressing not supported
		0000011_2	Protocol state mismatch detected
		0000100_2	Illegal PDU structure
		0000101_2	Illegal value of an information element
		0000110_2	Reserved
		...etc.	...etc.
		0111111_2	Reserved
		1000000_2	Proprietary
		...etc.	...etc.
		1111111_2	Proprietary

11.8.72 Receiving Application Identifier

The Receiving Application Identifier element shall link communicating TE2 and MT2 user applications together by defining the receiving user application as defined in table 174.

Table 174: Receiving Application Identifier element contents

Information element	$Length_2$	Value	Remark
Receiving Application Identifier	7	00000000_2 - 01111111_2	Available for proprietary user applications
		10000000_2 - 11111111_2	Reserved

11.8.73 Reject cause

The Reject Cause element shall indicate what type of rejection has been detected as defined in table 175.

Table 175: Reject Cause element contents

Information element	$Length_2$	Value	Remark
Reject Cause	5	00000_2	Reserved
		00001_2	ITSI unknown
		00010_2	Illegal MS
		00011_2	Location Area not allowed
		00100_2	Location Area unknown
		00101_2	Network failure
		00110_2	Congestion
		00111_2	Service not supported
		01000_2	Service not subscribed
		01001_2	Mandatory element error
		01010_2	Message consistency error
		01011_2	Roaming not supported
		01100_2	Migration not supported
		01101_2	No cipher KSG
		01110_2	Identified cipher KSG not supported
		01111_2	Requested cipher key type not available
		10000_2	Identified cipher key not available
		10001_2	Incompatible service
		10010_2	Reserved
		...etc.	...etc.
		11111_2	Reserved

11.8.74 Registration status

The Registration Status element shall indicate the success/failure of the most recent registration attempt as defined in table 176.

Table 176: Registration Status element contents

Information element	$Length_2$	Value	Remark
Registration Status	1	0	Success
		1	Failure

11.8.75 Request to transmit/send data

The Request To Transmit/Send Data element shall inform the infrastructure about immediate request to transmit or data transmission at through-connection as defined in table 177.

Table 177: Request to Transmit/Send Data element contents

Information element	$Length_2$	Value	Remark
Request to transmit/send data	1	0	Request to transmit/send data
		1	Request that other MS/LS may transmit/send data

11.8.76 Reset call time-out timer (T310)

The Reset Call Time-Out Timer element shall reset and start the overall call length timer T310 in the MS/LS. The timer shall be started with the current value as defined in table 178.

Table 178: Reset Call Time-Out Timer element contents

Information element	$Length_2$	Value	Remark
Reset Call Time-Out value	1	0	No reset of call time-out timer T310
		1	Reset call time-out timer T310

11.8.77 SDS error

The SDS error element shall indicate reason for unsuccessful result as defined in table 179.

Table 179: SDS error element contents

Information element	$Length_2$	Value	Remark
SDS error	3	000_2	Request failed for undefined reason
		001_2	Request not supported
		010_2	SDS message not available

11.8.78 SDS message index

The SDS message index element shall point to an SDS message in the MT2 SDS message stack as defined in table 180. The numerical value of the SDS message index shall be defined by the MT2 and it shall be different for each stored message.

Table 180: SDS message index element contents

Information element	$Length_2$	Value	Remark
SDS message index	7	0 - 127	

11.8.79 SDS message status

The SDS message status element shall indicate status of the SDS message in the MT2 SDS message stack as defined in table 181.

Table 181: SDS message status element contents

Information element	$Length_2$	Value	Remark
SDS message status	3	000_2	Received unread message
		001_2	Received read message
		010_2	Stored unsent message (note 1)
		011_2	Stored sent message (note 2)
		100_2	Reserved for "All"
		101_2	Transmission of SDS message failed (note 3)
		111_2	SDS message not available
NOTE 1: It is optional to store messages into a user accessible stack before sending those over the AI.			
NOTE 2: It is optional to store messages into a user accessible stack after sending those over the AI.			
NOTE 3: It is optional to store information about messages into a user accessible stack after sending messages over the AI.			

11.8.80 SDS User Data 1/2/3 Profile

The SDS User Data 1/2/3 Profile element shall define operation of the TNP1 Relay for SDS type 1/2/3 messages as defined in table 182.

Table 182: SDS User Data 1/2/3 Profile element contents

Information element	$Length_2$	Value	Remark
SDS user data 1/2/3 Profile	7	0000000_2	TNP1R shall relay incoming SDS type 1/2/3 PDUs to SDS message stack; and TNP1R shall relay SDS type 1/2/3 PDUs originating from TE2 to SDS entity
		0000001_2	TNP1R shall relay incoming SDS type 1/2/3 PDUs to TE2, when MT-TE link is available and discard them, when MT-TE link is not available; and TNP1R shall relay SDS type 1/2/3 PDUs originating from TE2 to SDS entity
		0000010_2	TNP1R shall relay incoming SDS type 1/2/3 PDUs to TE2, when MT-TE link is available and to SDS message stack, when MT-TE link is not available; and TNP1R shall relay SDS type 1/2/3 PDUs originating from TE2 to SDS entity
		0000011_2	Same as value 0000001_2
		0000100_2	No incoming SDS type 1/2/3 PDUs shall be relayed to TE2, SDS type 1/2/3 PDUs originating from TE2 shall be rejected by TNP1R

11.8.81 SDS User Data 4 Profile

The SDS User Data 4 Profile element shall define operation of the TNP1 Relay for SDS type 4 messages of a certain SDS type 4 protocol as defined in table 183.

Table 183: SDS User Data 4 Profile element contents

Information element	$Length_2$	Value	Remark
SDS user data 4 Profile	7	0000000_2	TNP1R shall relay incoming SDS type 4 PDUs to SDS message stack; and TNP1R shall relay SDS type 4 PDUs originating from TE2 to SDS entity
		0000001_2	TNP1R shall relay incoming SDS type 4 PDUs to TE2, when MT-TE link is available and discard them, when MT-TE link is not available; and TNP1R shall relay SDS type 4 PDUs originating from TE2 to SDS entity
		0000010_2	TNP1R shall relay incoming SDS type 4 PDUs to TE2, when MT-TE link is available and to SDS message stack, when MT-TE link is not available; and TNP1R shall relay SDS type 4 PDUs originating from TE2 to SDS entity
		0000011_2	Same as value 0000001_2
		0000100_2	No incoming SDS type 4 PDUs shall be relayed to TE2 or SDS message stack; and SDS type 4 PDUs originating from TE2 shall be rejected by TNP1R
SDS Protocol Identifier	8		
NOTE: The two elements of the SDS User Data 4 Profile element form in the encoding of the PDU a single 15 bits long element.			

11.8.82 Sending Application Identifier

The Sending Application Identifier element shall link communicating TE2 and MT2 user applications together by defining the sending user application as defined in table 184.

Table 184: Sending Application Identifier element contents

Information element	$Length_2$	Value	Remark
Sending Application Identifier	7	00000000_2 - 01111111_2	Available for proprietary user applications
		10000000_2 - 11111111_2	Reserved

11.8.83 Service profile operation

The Service Profile Operation element shall specify the operation performed on the TNP1 Relay service profile as defined in table 185.

Table 185: Service Profile Operation element contents

Information element	$Length_2$	Value	Remark
Service Profile Operation	1	0	Get service profile
		1	Set service profile

11.8.84 Short data type identifier

The Short Data Type Identifier element shall identify the length of the user defined data sent to or received from the SwMI as defined in table 186.

Table 186: Short Data Type Identifier element contents

Information element	$Length_2$	Value	Remark
Short Data Type Identifier	2	00_2	User Defined Data 1 element is 16 bits long
		01_2	User Defined Data 2 element is 32 bits long
		10_2	User Defined Data 3 element is 64 bits long
		11_2	User Defined Data 4 element is 0 - 2 047 bits long (variable length)

11.8.85 Simplex/duplex selection

The Simplex/Duplex Selection element shall inform the infrastructure the preferred mode of operation as defined in table 187.

Table 187: Simplex/Duplex Selection element contents

Information element	$Length_2$	Value	Remark
Simplex/Duplex selection	1	0	Simplex requested
		1	Duplex requested

11.8.86 Software version

The Software Version element shall inform the TE2 user application about the MT2 software version as defined in table 188.The 7-bit IRA defined in ITU-T Recommendation T.50 [11] shall be used. The characters shall be aligned sequentially. The total number of characters, including line terminators, shall not exceed 2 048 characters (14 336 bits).

Table 188: Software Version element contents

Information element	$Length_2$	Value	Remark
Software version	n * 7		

11.8.87 Speech service

The Speech Service element shall change between TETRA standard speech and non-TETRA speech as defined in table 189. It shall be ignored for data bearer services.

Table 189: Speech Service element contents

Information element	$Length_2$	Value	Remark
Speech Service	1	0	TETRA encoded speech
		1	7,2 kbit/s non-TETRA encoded speech (note)
NOTE: This service shall carry a non-TETRA encoded speech and channel coding.			

11.8.88 SS profile

The SS profile element shall define operation of the TNP1 Relay for MM signalling messages as defined in table 190.

Table 190: SS profile element contents

Information element	$Length_2$	Value	Remark
SS profile	7	0000000_2	No incoming SS PDUs shall be relayed to TE2, SS PDUs originating from TE2 shall be rejected by TNP1R
		0000001_2	Incoming SS PDUs shall be relayed to TE2, TNP1R shall relay SS PDUs originating from TE2 to SS entity

11.8.89 SS type

The SS type element shall specify the SS in question. The information element encoding shall be as defined in ETS 300 392-9 [21] subclause 8.1 for the SS type information element.

11.8.90 Status

The Status element shall give information on execution status of an action as defined in table 191.

Table 191: Status element content

Information element	$Length_2$	Value	Remark
Status	3	000_2	Reserved
		001_2	Change of energy saving mode request (MS)
		010_2	Change of energy saving mode successful (SwMI)
		011_2	ITSI detach confirmation (SwMI)
		100_2	Failure
		101_2	Reserved
		110_2	Reserved
		111_2	Reserved

11.8.91 Status number

The Status Number element shall define general purpose status messages known to all TETRA systems as defined in ETS 300 392-2 [2] and repeated in table 192.

Table 192: Status Number element contents

Information element	$Length_2$	Value	Remark
Status Number	16	0	Emergency
		1	Reserved
		...etc.	...etc.
		$32\ 767_{10}$	Reserved
		$32\ 768_{10}$	Available for TETRA network and user specific definitions
		...etc.	...etc.
		$65\ 535_{10}$	Available for TETRA network and user specific definitions

11.8.92 Sub-primitive parameters

The Sub-primitive Parameters element shall contain the parameters of an SS PDU as its sub-elements. The contents of this element are defined in detail in ETS 300 392-12 [3] and repeated in principle in table 193.

Table 193: Sub-primitive Parameters element contents

Information element	$Length_2$	Value	Remark
Sub-primitive Parameters	varies		

11.8.93 Temporary address

The Temporary Address element coding shall be the same as for the SSI element .

11.8.94 Terminal Equipment Identity (TEI)

TEI element shall contain the TEI value of the MT2 as defined in ETS 300 392-1 [1] subclause 7.5 and repeated in table 194.

Table 194: TEI element contents

Information element	$Length_2$	Value	Remark
Type Approval Code (TAC)	24		8 characters (note)
Final Assembly Code (FAC)	8		3 characters (note)
Electronic Serial Number (ESN)	24		8 characters (note)
Spare (SPR)	4		Reserved
NOTE: Each information element is a binary number and its values shall be presented as printable ASCII characters from "0" to "9", most significant digit placed first.			

11.8.95 Traffic stealing

The Traffic Stealing element shall inform the MS/LS about preferred stealing policy as defined in table 195.

Table 195: Traffic Stealing element contents

Information element	$Length_2$	Value	Remark
Traffic Stealing	1	0_2	Do not steal traffic
		1_2	Steal traffic

11.8.96 SDS Transfer result

The SDS Transfer Result element shall inform the TE2 user application about the success of the SDS transmittal as defined in table 196.

Table 196: SDS Transfer Result element contents

Information element	$Length_2$	Value	Remark
SDS Transfer Result	8	00000000_2	Failed for undefine reason
		00000001_2	Success
		00000010_2	Requested service not supported

11.8.97 Transmission condition

The Transmission Condition element shall inform the MS/LS about requested transmission condition as defined in table 197.

Table 197: Transmission Condition element contents

Information element	$Length_2$	Value	Remark
Traffic Condition	1	0_2	Request to transmit
		1_2	Transmission ceased

11.8.98 Transmission grant

The Transmission Grant element shall inform the MS/LS about permission to transmit as defined in table 198.

Table 198: Transmission Grant element contents

Information element	$Length_2$	Value	Remark
Transmission Grant	2	00_2	Transmission granted
		01_2	Transmission not granted
		10_2	Transmission request queued
		11_2	Transmission granted to another user

11.8.99 Transmission request permission

The Transmission Request Permission element shall inform the MS/LS if it is allowed to request for transmit permission as defined in table 199.

Table 199: Transmission Request Permission element contents

Information element	$Length_2$	Value	Remark
Transmission request permission	1	0	Allowed to request for transmission
		1	Not allowed to request for transmission

11.8.100 Transmitting party type identifier

The Transmitting Party Type Identifier element coding shall indicate the type of address which shall follow in the PDU as defined in table 200.

Table 200: Transmitting Party Type Identifier element contents

Information element	$Length_2$	Value	Remark
Transmitting Party Type Identifier	2	00_2	Reserved
		01_2	Short Subscriber Identity (SSI)
		10_2	Tetra Subscriber Identity (TSI)
		11_2	Reserved

11.8.101 Transmitting party extension

The Transmitting Party Extension element shall indicate the extended part of the TSI address of the transmitting user as defined in table 201.

Table 201: Transmitting Party Extension element contents

Information subelement	$Length_2$	Value	Remark
Country Code	10		See ETS 300 392-1 [1] clause 7
Network Code	14		See ETS 300 392-1 [1] clause 7

11.8.102 Transmitting party Short Subscriber Identity (SSI)

The Transmitting Party Short Subscriber Identity element shall indicate the Short Subscriber Identity (SSI) address of the transmitting user as defined in table 202.

Table 202: Transmitting Party Short Subscriber Identity element contents

Information element	$Length_2$	Value	Remark
Short subscriber identity	24		See ETS 300 392-1 [1] clause 7

11.8.103 TX demand priority

The Tx Demand Priority element shall inform the SwMI about the importance of a TX-Demand as defined in table 203.

Table 203: Tx Demand Priority element contents

Information element	$Length_2$	Value	Remark
TX Demand Priority	2	00_2	Low Priority level
		01_2	High Priority level
		10_2	Pre-emptive Priority level
		11_2	Emergency Pre-emptive Priority level

11.8.104 Type 3 CMCE element identifier

The Type 3 CMCE element identifier element shall indicate the type of the following Type 3 element in the PDU as defined in table 204.

Table 204: Type 3 CMCE element identifier element contents

Information element	$Length_2$	Value	Remark
Type 3 CMCE element identifier	4	0000_2	Reserved
		0001_2	DTMF
		0010_2	External Subscriber number
		0011_2	Facility
		0100_2	Poll Response Addresses
		0101_2	Proprietary
		0110_2	Reserved for any future specified Type 3 element
		...etc.	...etc.
		1111_2	Reserved for any future specified Type 3 element

11.8.105 Type 3 MM element identifier

The Type 3 MM element identifier element shall indicate the type of the following Type 3 element in the PDU as defined in table 205.

Table 205: Type 3 MM element identifier element contents

Information element	Length	Value	Remark
Type 3 MM element identifier	4	0000_2	Reserved
		0001_2	Group identity location demand ack
		0010_2	New registered area
		0011_2	Group identity location demand
		0100_2	Proprietary
		0101_2	Group identity location accept
		0110_2	Security
		0111_2	Group identity downlink
		1000_2	Group identity uplink
		1001_2	Reserved for any future specified Type 3 element
		...etc.	...etc.
		1111_2	Reserved for any future specified Type 3 element

11.8.106 User defined data-1

The User Defined Data-1 element shall enable the user applications to determine their own interpretation of the SDS message as defined in table 206.

Table 206: User Defined Data-1 element contents

Information element	$Length_2$	Value	Remark
User Defined Data-1	16	0 - $(2^{16}-1)$	All values available for the user application

11.8.107 User defined data-2

The User Defined Data-2 element shall enable the user applications to determine their own interpretation of the SDS message as defined in table 207.

Table 207: User Defined Data-2 element contents

Information element	$Length_2$	Value	Remark
User Defined Data-2	32	0 - $(2^{32}-1)$	All values available for the user application

11.8.108 User defined data-3

The User Defined Data-3 element shall enable the user applications to determine their own interpretation of the SDS message as defined in table 208.

Table 208: User Defined Data-3 element contents

Information element	$Length_2$	Value	Remark
User Defined Data-3	64	0 - $(2^{64}-1)$	All values available for the user application

11.8.109 User defined data-4

The User Defined Data-4 element shall enable the user applications to determine their own interpretation of the SDS message as defined in table 209.

Table 209: User Defined Data-4 element contents

Information element	$Length_2$	Value	Remark
Protocol Identifier	8		Any valid User Defined Data-4 protocol identifier available to user applications
User Defined Data-4	varies 0 - (2 047-8) bits	varies	All bits available for the user application

12 TNP1 Relay (TNP1R)

12.1 Introduction

This clause defines the TNP1 Relay (TNP1R) Functional Entity (FE) that shall be the MT2 peer entity for a TNP1 service user located at TE2. Functions of TNP1R shall be:

- relaying service requests between TNP1-SAP and TNCC-SAP, TNSDS-SAP and TNSS-SAP of CMCE;

- relaying service requests between TNP1-SAP and TNMM-SAP of MM;

- relaying service requests between TNP1-SAP and TNP1R-SAP.

Routing of service requests between MT2 user applications and CMCE and MM entities is not within the scope of this ETS. Similarly, rules for decision of which user application, located either in MT2 or ET2, shall handle the indication and confirm type service primitives originating from CMCE and MM entities are note defined in this ETS.

TNP1R is defined in order to clarify the relationship between the TNP1 protocol and MT2 services. The TNP1R-SAP is not intended to be a testable boundary.

12.2 Service primitives at the TNP1R-SAP

TNP1R provides services at TNP1R-SAP for MT2 user applications that enable communication with the applications located in TE2.

Following primitives shall be available:

TNP1R-OPERATION request shall be used to initiate information transfer to the peer user application in TE2. The request shall result in a TNP1-SERVICE ACCESS request with parameter value PDU Type set to 10000001_2, indicating TEMTA-OPERATION PDU.

TNP1R-OPERATION indication shall be used to convey the information of a TNP1-SERVICE ACCESS indication with parameter value PDU Type set to 10000001_2, indicating TEMTA-OPERATION PDU, to the TNP1-SAP service users.

12.3 Underlying services required

TNP1R shall have full access to the services of TNP1, CMCE and MM entities.

12.4 Procedures

12.4.1 General

The procedures of TNP1R shall be as defined below, see figure 41.

Case 1: TNP1-SERVICE ACCESS request conveying a TEMTA-OERATION PDU results in TNP1R-OPERATION indication with equal information contents.

Case 2: TNP1-SERVICE ACCESS request conveying a CMCE related PDU, results in a CMCE service request or response, depending on the PDU Type.

Case 3: TNP1-SERVICE ACCESS request conveying a MM related PDU, results in a MM service request or response, depending on the PDU Type.

Case 4: TNP1-SERVICE ACCESS request conveying a TEMTA-OERATION PDU results in TNP1-OPERATION indication with equal information contents.

Case 5: A CMCE service indication or confirmation results in a TNP1-SERVICE ACCESS indication conveying a PDU related to the service primitive.

Case 6: A MM service indication or confirmation results in a TNP1-SERVICE ACCESS indication conveying a PDU related to the service primitive.

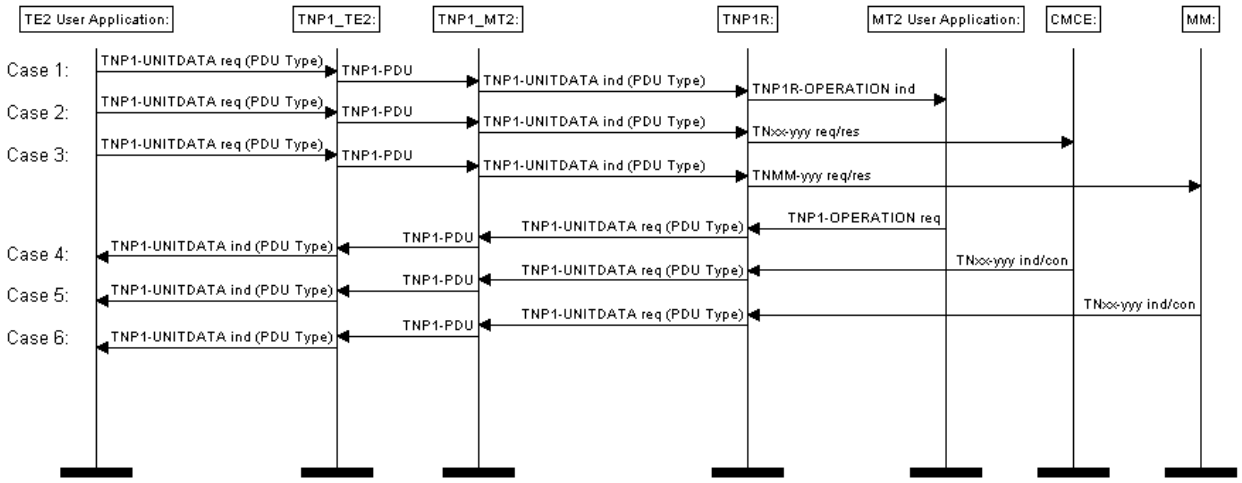


Figure 41: Signalling between TE2 user applications and MT2 peers

12.4.2 Mapping of the TNP1 PDUs and MT2 service primitives

This subclause defines the mapping between TNP1 PDUs and service primitives available at TNP1A-SAP, TNP1B-SAP, TNCC-SAP, TNSS-SAP, TNSDS-SAP and TNMM-SAP. The mapping shall be applied in the TNP1R procedures defined in this clause and table 210.

Table 210: Mapping between TNP1 PDUs and MT2 service primitives

TNP1 PDU	Service Primitive
TECC-ALERT IND	TNCC-ALERT indication
TECC-COMPLETE REQ	TNCC-COMPLETE request
TECC-COMPLETE IND	TNCC-COMPLETE indication
TECC-COMPLETE CON	TNCC-COMPLETE confirm
TECC-DTMF REQ	TNCC-DTMF request
TECC-DTMF IND	TNCC-DTMF indication
TECC-MODIFY REQ	TNCC-MODIFY request
TECC-MODIFY IND	TNCC-MODIFY indication
TECC-NOTIFY IND	TNCC-NOTIFY indication
TECC-PROCEED IND	TNCC-PROCEED indication
TECC-RELEASE REQ	TNCC-RELEASE request
TECC-RELEASE IND	TNCC-RELEASE indication
TECC-RELEASE CON	TNCC-RELEASE confirm
TECC-SETUP REQ	TNCC-SETUP request
TECC-SETUP IND	TNCC-SETUP indication
TECC-SETUP RES	TNCC-SETUP response
TECC-SETUP CON	TNCC-SETUP confirm
TECC-TX REQ	TNCC-TX request
TECC-TX IND	TNCC-TX indication
TECC-TX CON	TNCC-TX confirm
TESS-ERROR IND	TNSS-ERROR indication
TESS-INFO REQ	TNSS-INFO request
TESS-INFO IND	TNSS-INFO indication
TESS-INFO RES	TNSS-INFO response
TESS-INFO CON	TNSS-INFO confirm
TESS-SERVICE REQ	TNSS-SERVICE request
TESS-SERVICE IND	TNSS-SERVICE indication
TESS-SERVICE RES	TNSS-SERVICE response
TESS-SERVICE CON	TNSS-SERVICE confirm
TESDS-STATUS REQ	TNSDS-STATUS request
TESDS-STATUS IND	TNSDS-STATUS indication
TESDS-REPORT IND	TNSDS-REPORT indication
TESDS-UNITDATA REQ	TNSDS-UNITDATA request
TESDS-UNITDATA IND	TNSDS-UNITDATA indication
TEMM-ATTACH DETACH GROUP IDENTITY REQ	TNMM-ATTACH DETACH GROUP IDENTITY request
TEMM-ATTACH DETACH GROUP IDENTITY IND	TNMM-ATTACH DETACH GROUP IDENTITY indication
TEMM-ATTACH DETACH GROUP IDENTITY CON	TNMM-ATTACH DETACH GROUP IDENTITY confirm
TEMM-DISABLING IND	TNMM-DISABLING indication
TEMM-ENABLING IND	TNMM-ENABLING indication
TEMM-ENERGY SAVING REQ	TNMM-ENERGY SAVING request
TEMM-ENERGY SAVING CON	TNMM-ENERGY SAVING confirm
TEMM-REPORT IND	TNMM-REPORT indication
TEMM-REGISTRATION IND	TNMM-REGISTRATION indication

(continued)

Table 210 (concluded): Mapping between TNP1 PDUs and MT2 service primitives

TNP1 PDU	Service Primitive
TEMM-REGISTRATION CON	TNMM-REGISTRATION confirm
TEMM-SERVICE IND	TNMM-SERVICE indication
TEMTA-CAPABILITY QUERY	TNP1-CAPABILITY request
TEMTA-CAPABILITY INFO	TNP1-CAPABILITY response
TEMTA-IDENTIFICATION QUERY	TNP1-IDENTIFICATION request
TEMTA-IDENTIFICATION INFO	TNP1-IDENTIFICATION response
TEMTA-OPERATION	TNP1-OPERATION request/indication
TEMTA-SERVICE PROFILE	TNP1-SERVICE PROFILE request
TEMTA-SERVICE PROFILE INFO	TNP1-SERVICE PROFILE response
TEMTA-STATE QUERY	TNP1-STATE request
TEMTA-STATE INFO	TNP1-STATE response

Annex A (normative): Formatting transparent circuit mode data to MAC PDU

The MAC-TRAFFIC PDU is used for sending U-plane traffic data on the uplink and downlink using TCH/S, TCH/7.2, TCH/4.8 or TCH/2.4, as defined in ETS 300 392-2 [2], subclause 21.4.6. This PDU has no header and all capacity is devoted to traffic information passed to and from the U-plane. When the MAC is in traffic mode, this PDU type is assumed unless the slot flag indicates the presence of the STCH.

This annex defines the formatting of transparent circuit mode data in the MAC-TRAFFIC PDU. This formatting shall be used for all transparent circuit mode data originating from/targeted to TE2 over R_T and applications internal to MT2. Figure A.1 defines the general formatting to be applied to all TCHs. The Most Significant Bit (MSB) of any octet is placed in the MAC TRAFFIC PDU bit with the smallest ordinal number. Values for total number of octets (N) and total number of bits (B) per a MAC TRAFFIC PDU are defined in table A.1 for different TCHs.

Octet	1	2	...	N
MAC block bit	1 ... 8	9 ... 16	...	(B - 8) ... B

Figure A.1: Octet and bit alignment in MAC TRAFFIC PDU

Table A.1: Capacity of a single MAC TRAFFIC PDU at different logical channels

Logical channel	Number of data bits (B)	Octets/timeslot (N)
TCH/7,2	432	54
TCH/4,8	288	36
TCH/2,4	144	18

The 8-bit (octet) formatting defined in this annex shall be used as basic formatting to transfer transparent mode data of any character length. For other character lengths than 8-bit, a mapping to this basic formatting shall be defined at application level.

NOTE: This mechanism removes all redundant information from the serail line lower layer character format and no information about possible parity bit or number of stop bits will be transferred over the AI. As a result e.g. 4 800 bit/s second low protected data rate is equivalent to 6 600 bit/s, when the serial line interface applies start bit, eight information bits, parity bit and one stop bit.

For half MAC blocks, the same octet and bit ordering and alignment shall apply.

History

Document history			
May 1998	Public Enquiry	PE 9841:	1998-05-20 to 1998-10-16