



Telecommunications
Standards Advisory
Committee (TSAC)

Technical Specification

Terminal Equipment
connected to
2 Mbit/s, 34 Mbit/s and
140 Mbit/s
Digital Leased Lines

**IDA TS DLCN
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Info-communications Media Development Authority
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IDA TS DLCN Issue 2, October 2013 re-issued as IMDA TS DLCN, 1 October 2016	Technical Specification for Terminal Equipment connected to 2 Mit/s, 34 Mbit/s and 140 Mbit/s Digital Line Lines
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Content

Section	Title	Page
1.	Scope	2
2.	References	3
3.	General Requirements	4
4.	Electrical Characteristics of 2,048 kbit/s Interface	6
5.	Basic frame structure at 2,048 kbit/s	6
6.	Frame Alignment and Cyclic Redundancy Check (CRC) Procedures	6
7.	2,048 kbit/s Synchronisation Interface	6
8.	Electrical Characteristics of 34,368 kbit/s Interface	7
9.	Electrical Characteristics of 139,264 kbit/s Interface	7
Annex	Corrigendum / Addendum	8
	<ul style="list-style-type: none"> ▪ Changes to IDA TS DLCN Issue 2, Oct 13 ▪ Changes to IDA TS DLCN Issue 1 Rev 1, May 11 ▪ Changes to IDA TS DLCN Issue 1, Jul 05 ▪ Changes to IDA TS DLCN 1 Issue 2 	

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Technical Specification for Terminal Equipment connected to 2 Mbit/s, 34 Mbit/s and 140 Mbit/s Digital Leased Lines

1 Scope

- 1.1 This Specification defines the network interface requirements for the following digital leased lines, based on relevant sections of the ITU-T Rec. G.703, and the ETSI EN 300 418 and EN 300 686:
- (a) 2 Mbit/s digital leased line which provides a bi-directional point-to-point digital transmission capability with a usable bit rate of 2,048 kbit/s
 - (b) 34 Mbit/s digital leased line which provides a bi-directional point-to-point digital transmission capability with a usable bit rate of 34,368 kbit/s
 - (c) 140 Mbit/s digital leased line which provides a bi-directional point-to-point digital transmission capability with a usable bit rate of 139,264 kbit/s
- 1.2 It defines the network interface provided by the digital leased line for which establishment and release of connection between Network Termination Points (NTPs), as shown in scenario 2 in Figure 1 (Figure 3 of ETSI EG 201 730-1), do not require any protocol exchange at the NTP. Scenarios for wireless connection (air interfaces) are outside the scope of this Specification.

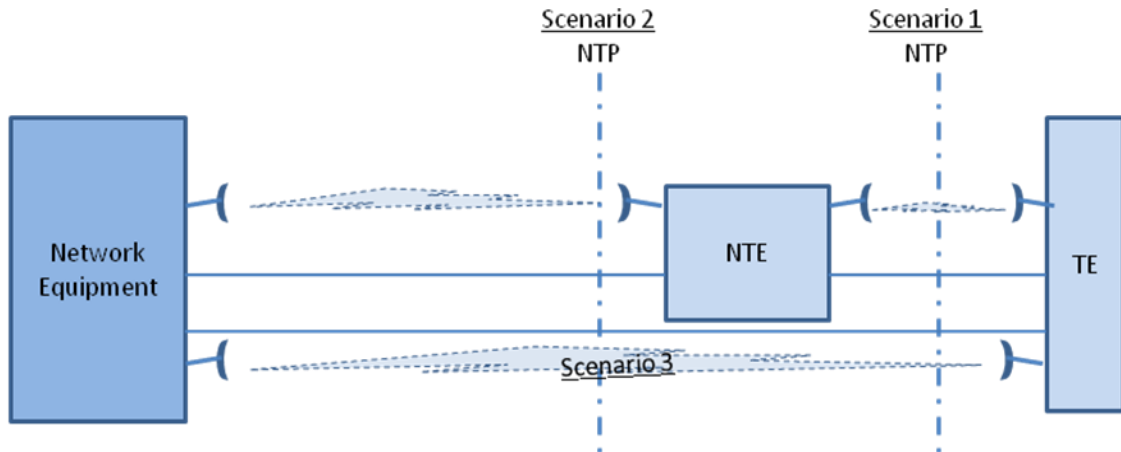


Figure 1 (Figure 3 of ETSI EG 201 730-1): Position of NTP

- 1.3 The provision of circuit timing and any structuring of data is the responsibility of the user.
- 1.4 For frame structures used in the hierarchical bit rate of 2,048 kbit/s, the basic frame structure and characteristics of frame structures carrying various bit rates in the 2,048 kbit/s interface, as defined in § 2.3 and § 5 of the ITU-T Rec. G.704, shall be applicable. The frame alignment and cyclic redundancy check relating to basic frame structure at 2,048 kbit/s, shall also be applicable.
- 1.5 For digital equipment which synchronises with an external 2,048 kHz synchronisation signal, requirements defined in § 13 of the ITU-T Rec. G.703, should be applicable.

2 References

- 2.1 For the technical requirements captured in this Specification, reference has been made to the following standards. Where versions are not indicated, implementation of this Specification shall be based on valid versions of these standards published by the respective Standards Development Organisations.

ITU-T Rec. G.703 (11/2001)	Physical / electrical characteristics of hierarchical digital interfaces
ITU-T Rec. G.704 (10/1998)	Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704
ITU-T Rec. G.706 (04/1991)	Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels
ETSI EG 201 730-1 V2.1.4 (2006-03)	Terminals' access to Public Telecommunications Networks; Application of the Directive 1999/5/EC (R&TTE), article 4.2; Guidelines for the publication of interface specifications; Part 1: General and common aspects
ETSI EN 300 418 V1.2.1 (2001-07)	Access and Terminals (AT); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation
ETSI EN 300 686 V1.2.1 (2001-07)	Access and Terminals (AT); 34 Mbit/s and 140 Mbit/s digital leased lines (D34U, D34S, D140U, D140S); Network interface presentation
IEC 60950-1	Information Technology Equipment – Safety
IEC 62368-1	Audio/video, information and communication technology equipment – Part 1: Safety requirements
IEC CISPR 32	Electromagnetic compatibility of multimedia equipment – Emission requirements Note: Validity of the IEC CISPR 22, EMC standard for information technology equipment, will lapse by 31 March 2017, in sync with IEC's timeline for withdrawing this CISPR standard, and replacing it with the CISPR 32 standard.
IEC CISPR 24	Information technology equipment – Immunity characteristics – Limits and methods of measurement

ETSI European Telecommunications Standards Institute
 IEC International Electro-technical Commission
 ITU-T International Telecommunication Union – Telecommunication Sector

3 General Requirements

3.1 Power Supply

- 3.1.1 The TE may be AC powered or DC powered. For AC powered equipment, the Specification shall be complied with when operating from an AC mains supply of voltage, $230V \pm 10\%$ and frequency, $50 \text{ Hz} \pm 2\%$. Where external power supply is used, e.g. AC adaptor, it shall not affect the capability of the equipment to meet the Specification.

3.2 Electromagnetic Compatibility (EMC) & Electrical Safety Requirements

3.2.1 Electromagnetic Compatibility (EMC) Assessment

3.2.1.1 Electromagnetic Interference (EMI) or Emission Measurements

The following emissions measurements shall be performed on the NTE/TE, where applicable:

- (a) Radiated emissions from the NTE/TE shall be measured to Class B requirements defined in §4 and Tables A.4 and A.5 of CISPR 32;
- (b) Conducted emission at the DC power port of the NTE/TE shall be measured to Class B requirements defined in §4 and Table A10 of CISPR 32;
- (c) Conducted emission at the AC mains port shall be measured for NTE/TE with dedicated AC/DC power converter to Class B requirements defined in §4 and Table A.10 of CISPR 32 (equipment with DC power port which is powered by a dedicated AC/DC power converter or adapter is defined as AC mains powered equipment [§3.1.1 of CISPR 32]); and
- (d) Conducted emission at the wired network port¹ of the NTE/TE shall be measured to Class B requirements defined in Table A.12 of CISPR 32.

3.2.1.2 Electromagnetic Susceptibility (EMS) or Immunity Testing

The following immunity tests may be performed on the NTE/TE to requirements defined in CISPR 24, where applicable:

- (a) RF electromagnetic field (80 MHz to 1 GHz) at the enclosure of equipment;
- (b) Electrostatic discharge at the enclosure of equipment;
- (c) Fast transients (common mode) at DC power and AC main power ports that have cables longer than 3 m;
- (d) RF common mode 0.15 MHz to 80 MHz at DC power and AC mains power ports that have cables longer than 3 m;
- (e) Voltage dips and interruptions at AC mains power port of equipment with dedicated AC/DC power converter; and
- (f) Surges, common and differential mode at AC mains power port of equipment with dedicated AC/DC power converter.

3.2.2 Equipment Safety Testing

3.2.2.1 Equipment safety testing or assessment shall be performed to requirements defined in IEC 60950-1 or IEC 62368-1, based on the following assumptions:

- (a) NTE/TE is powered by a dedicated external power supply (AC/DC converter or power adapter/charger); and

¹ Wired network port is used for voice, data and signaling transfers intended for connection to a communication network, e.g. CATV, PSTN, ISDN, ADSL and LAN (§3.1.32 [12]).

- (b) NTE/TE operates with SELV in environments where overvoltage from telecommunication networks is not possible. SELV refers to voltages not exceeding 42.4 V peak or 60 V DC.

3.2.2.2 For NTE/TE safety assessment performed with the hazard-based approach, the processes defined in IEC 62368-1 shall be used:

- (a) Identify energy sources in the NTE/TE;
- (b) Classify energy sources (effect on the body or combustible material, e.g. possibility of injury or ignition);
- (c) Identify safeguards for protection against energy sources; and
- (d) Consider the effectiveness of safeguards with respect to compliance criteria or requirements defined in the IEC 62368-1 standard.

4 Electrical Characteristics of 2,048 kbit/s Interface

4.1 General Characteristics (§ 9.1, ITU-T Rec. G.703)

- 4.1.1 The nominal bit rate shall be 2,048 kbit/s, and accuracy shall be ± 50 ppm (± 102.4 bit/s).
- 4.1.2 The signal transmitted at the output port shall comply with the High Density Bipolar code of order 3 (HDB3) encoding rules as defined in Annex A of ITU-T Rec. G.703 and Annex B of ETSI EN 300 418. The input port shall correctly decode HDB3 encoded signals without error in accordance with HDB3 encoding rules as defined in Annex A of ITU-T Rec. G.703 and Annex B of ETSI EN 300 418.

4.2 Specifications at the Output Ports (§ 9.2, ITU-T Rec. G.703)

- 4.2.1 The pulse at the output port shall comply with the requirements given in Table 7/G.703 and Figure 15/G.703 for 2,048 kbit/s digital leased lines using 120 Ω interfaces (Table 1, ETSI EN 300 418).

4.3 Specifications at the Input Ports (§ 9.3, ITU-T Rec. G.703)

- 4.3.1 The input return loss with respect to 120 Ω at the interface should be greater than or equal to the values given in § 9.3, ITU-T Rec. G.703 (Table 2, ETSI EN 300 418).

4.4 Grounding of outer conductor or screen (§ 9.4, ITU-T Rec. G.703)

- 4.4.1 The outer conductor of the coaxial pair shall be connected to the bonding network both at the input port and the output port.

5 Basic frame structure at 2,048 kbit/s

- 5.1 For frame structure at 2,048 kbit/s hierarchical level, the requirements specified in § 2.3 and § 5 of ITU-T Rec. G.704 shall be applicable.

6 Frame Alignment and Cyclic Redundancy Check (CRC) Procedures

- 6.1 For frame structure at 2,048 kbit/s hierarchical level, the requirements specified in § 4 of ITU-T Rec. G.706 for frame alignment and CRC procedures, relating to frame structure at 2,048 kbit/s, shall be applicable.

7 2,048 kbit/s Synchronisation Interface

- 7.1 The use of this interface, according to § 13 of ITU-T Rec. G.703, is recommended for all applications where it is required to synchronise a digital equipment by an external 2048 kHz synchronisation signal.

8 Electrical Characteristics of 34,368 kbit/s Interface

8.1 General Characteristics (§ 11.1, ITU-T Rec. G.703)

- 8.1.1 The nominal bit rate shall be 34,368 kbit/s, and accuracy shall be ± 20 ppm (± 688 bit/s).
- 8.1.2 The signal transmitted at the output port shall comply with the High Density Bipolar code of order 3 (HDB3) encoding rules as defined in Annex A of ITU-T Rec. G.703 and Annex B of ETSI EN 300 686. The input port shall correctly decode HDB3 encoded signals without error in accordance with HDB3 encoding rules as defined in Annex A of ITU-T Rec. G.703 and Annex B of ETSI EN 300 686.

8.2 Specifications at the Output Ports (§ 11.2, ITU-T Rec. G.703)

- 8.2.1 The pulse at the output port shall comply with the requirements given in Table 9/G.703 and Figure 17/G.703 for 34,368 kbit/s digital leased lines (Table 1, ETSI EN 300 686).

8.3 Specifications at the Input Ports (§ 11.3, ITU-T Rec. G.703)

- 8.3.1 The input return loss at the network interface, with respect to 75Ω , should be greater than or equal to values given in § 11.3, ITU-T Rec. G.703 (Table 3, ETSI EN 300 686).

8.4 Grounding of outer conductor or screen (§ 11.4, ITU-T Rec. G.703)

- 8.4.1 The outer conductor of the screen of the symmetrical pair shall be connected to the bonding network both at the input port and the output port.

9 Electrical Characteristics of 139,264 kbit/s Interface

9.1 General Characteristics (§ 12.1, ITU-T Rec. G.703)

- 9.1.1 The nominal bit rate shall be 139,264 kbit/s, and accuracy shall be ± 15 ppm (± 2089 bit/s).
- 9.1.2 The signal transmitted at the output port shall comply with the Coded Mark Inversion (CMI) encoding rules as defined in Annex A of ITU-T Rec. G.703 and Annex C of ETSI EN 300 686. The input port shall correctly decode CMI encoded signals without error in accordance with CMI encoding rules as defined in Annex A of ITU-T Rec. G.703 and Annex C of ETSI EN 300 686.

9.2 Specifications at the Output Ports (§ 12.2, ITU-T Rec. G.703)

- 9.2.1 The pulse at the output port shall comply with the requirements given in Table 10/G.703, Figures 18 and 19/G.703 for 139,264 kbit/s digital leased lines (Table 4, ETSI EN 300 686).

9.3 Specifications at the Input Ports (§ 12.3, ITU-T Rec. G.703)

- 9.3.1 The input return loss at the network interface, with respect to 75Ω , should be greater than or equal to values given in § 12.3, ITU-T Rec. G.703 (Table 6, ETSI EN 300 686).

9.4 Grounding of outer conductor or screen (§ 11.4, ITU-T Rec. G.703)

- 9.4.1 The outer conductor of the screen of the symmetrical pair shall be connected to the bonding network both at the input port and the output port.

Annex A Corrigendum / Addendum

Revised TS		Items Changed	Date of Issue
Page	Section		
Changes to IDA TS DLCN Issue 2, October 2013			
4	§3.2	<p>The IMDA TS DLCN Issue 1 (October 2016) has replaced the IDA TS DLCN Issue 2 (October 2013).</p> <p>Changes are largely editorial to provide updates and clarity in the application of EMC and safety requirements, in line with standards development that has taken place in the Standards Development Organisation concerned.</p>	1 Oct 16

Changes to IDA TS DLCN Issue 1 Rev 1, May 11			
Page	TS Ref.	Items Changed	Date of Issue
—	—	<p>This Specification has streamlined and harmonised the network interface requirements for 2Mbit/s, 34 Mbit/s and 140 Mbit/s digital leased lines, based on relevant sections of the ITU-T Rec. G.703, and the ETSI EN 300 418 and EN 300 686. As digital leased line connections do not require any protocol to be exchanged at the network for call establishment and release, users may determine their use of circuit timing and data structure.</p> <p>The Specification has been re-issued as the IDA Technical Specification for Terminal Equipment connected to 2Mbit/s, 34 Mbit/s and 140 Mbit/s Digital Leased Lines (“IDA TS DLCN Issue 2”).</p>	29 Oct 13

Changes to IDA TS DLCN Issue 1, Jul 05			
Page	TS Ref.	Items Changed	Date of Issue
—	—	Change of IDA’s address at cover page to Mapletree Business City.	1 May 11

Changes to IDA TS DLCN 1 Issue 2			
Page	TS Ref.	Items Changed	Date of Issue
—	—	<p>The IDA Technical Specification (IDA TS DLCN Issue 1) has superseded the IDA Type Approval Specification for Digital Interfaces based on hierarchical bit rates of 2048 kbit/s, 34,368 kbit/s and 139,264 kbit/s (IDA TS DLCN 1 Issue 2).</p> <p>The Technical Specification has also incorporated the EMC requirements, previously published under the IDA TS EMC Issue 1 Rev 1.</p> <p>Changes are mainly editorial in nature, in which the essential technical requirements for compliance remain unchanged.</p>	21 Jul 05