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SERIES V: DATA COMMUNICATION OVER THE
TELEPHONE NETWORK

Modems on digital circuits

**A 128 (144) kbit/s data circuit-terminating
equipment standardized for use on digital
point-to-point leased circuits**

ITU-T Recommendation V.300

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION V.300**A 128 (144) kbit/s DATA CIRCUIT-TERMINATING EQUIPMENT STANDARDIZED
FOR USE ON DIGITAL POINT-TO-POINT LEASED CIRCUITS****Summary**

This Recommendation specifies the necessary functions of a 64, 128 and 144 kbit/s DCE for the provision of digital leased circuits. Interworking with DCEs complying with Recommendation V.38 is covered. The recommended functions also allow this DCE to be deployed as a remote access to a flexible multiplexer as specified in Recommendation G.797.

The V.24 and X.24 DTE-DCE interfaces are specified in terms of functions and electrical characteristics. The use of additional interfaces is not precluded. Core functions include scrambling of data, testing facilities, optional aggregation function and optional multiplexing function. This type of DCE may be part of a managed network.

This Recommendation contains three appendices providing information on complementary functions or applications for this type of equipment.

Source

ITU-T Recommendation V.300 was prepared by ITU-T Study Group 15 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 2nd of July 1999.

FOREWORD

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation V.300**A 128 (144) kbit/s DATA CIRCUIT-TERMINATING EQUIPMENT STANDARDIZED
FOR USE ON DIGITAL POINT-TO-POINT LEASED CIRCUITS***(Geneva, 1999)***1 Scope**

This data circuit-terminating equipment (DCE) is intended for use on $n \times 64$ kbit/s based digital point-to-point leased circuits other than ISDN. Signalling rates supported by the equipment are 64 kbit/s and 128 kbit/s. This may be expanded to 144 kbit/s when a digital leased line network supports this type of connection, or for DCE interconnection on short haul leased circuits employing metallic pair(s). The DCE is specified herein in terms of the DTE-to-DCE interface(s) and features including rate adaptation, end-to-end signalling, testing and multiplexing facilities. The line signal and the line signalling rate that are used to connect this type of DCE locally to a number of 64 kbit/s or 128 kbit/s or 144 kbit/s, digital bearer circuit(s) are considered to be national matters, and are hence not specified herein. The transmission scheme chosen should, however, be capable of providing an octet timing recovery where a multiplexing function as specified in clause 9 is employed.

The principal characteristics of the DCE are as follows:

- a) duplex mode of operation on digital leased circuits;
- b) signalling rates of 64 and 128/144 kbit/s;
- c) inclusion of two (Note 3) different types of DTE-DCE functional interfaces;
- d) inclusion of testing facilities;
- e) optional provision of a means to differentiate between user and network data;
- f) optional inclusion of a multiplexer (for further study);
- g) optional inclusion of an equipment management function;
- h) inclusion of an optional aggregation function;
- i) backward compatibility with a DCE according to Recommendation V.38 [4].

NOTE 1 – Figure I.1 gives a schematic block diagram of the arrangement of functional blocks (without the multiplexer function) inside the DCE.

NOTE 2 – The term "line signalling rate" as used in the context of this Recommendation refers to the signalling rate at the input of the transmitter of the transmission unit (see Figure I.1).

NOTE 3 – The use of additional DTE-DCE interfaces, e.g. codirectional G.703 64 kbit/s [9], I.430 [11] or G.703/G.704 [9]/[10] is not precluded.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in the text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Recommendation V.10 (1993), *Electrical characteristics for unbalanced double-current interchange circuits operating at data signalling rates nominally up to 100 kbit/s.*
- [2] ITU-T Recommendation V.11 (1996), *Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s.*
- [3] ITU-T Recommendation V.24 (1996), *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE).*
- [4] ITU-T Recommendation V.38 (1996), *A 48/56/64 kbit/s data circuit-terminating equipment. standardized for use on digital point-to-point leased circuits.*
- [5] CCITT Recommendation V.54 (1988), *Loop test devices for modems.*
- [6] CCITT Recommendation X.21 (1992), *Interface between data terminal equipment and data circuit-terminating equipment for synchronous operation on public networks.*
- [7] CCITT Recommendation X.24 (1988), *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) on public data networks.*
- [8] CCITT Recommendation X.150 (1988), *Principles of maintenance testing for public data networks using data terminal equipment (DTE) and data circuit-terminating equipment (DCE) test loops.*
- [9] ITU-T Recommendation G.703, (1998), *Physical/electrical characteristics of hierarchical digital interfaces.*
- [10] ITU-T Recommendation G.704 (1998), *Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels.*
- [11] ITU-T Recommendation I.430 (1995), *Basic user-network interface – Layer 1 specification.*
- [12] CCITT Recommendation O.153 (1992), *Basic parameters for the measurement of error performance at bit rates below the primary rate.*
- [13] ISO 4902:1989, *Information technology – Data communication – 37-pole DTE/DCE interface connector and contact number assignments.*
- [14] ISO 4903:1989, *Information technology – Data communication – 15-pole DTE/DCE interface connector and contact number assignments.*
- [15] ISO/IEC 11569:1993, *Information technology – Telecommunications and information exchange between systems – 26-pole interface connector mateability dimensions and contact number assignments.*

3 Abbreviations

This Recommendation uses the following abbreviations:

AIS	Alarm Indication Signal
DCE	Data Circuit-terminating Equipment
DTE	Data Terminal Equipment

4 Signalling rates

4.1 Data signalling rates

The recommended data signalling rate (user rate) is synchronous at 128 kbit/s (144 kbit/s may also be supported).

4.2 Signalling rates on line

Data at either signalling rate may be supported by a digital bearer circuit being accessed with a line signalling rate that depends upon the leased line network implementation. This is not in the scope of this Recommendation. Appendix III depicts such an example with a 160 kbit/s line signalling rate.

5 Differentiation between user and network data signals

An optional scrambler/descrambler may be provided as a means of differentiating between user data and network data or network signalling towards the DCE [e.g. loss of synchronization or alarm indication signal (AIS)], and for fault detection. Where the scrambler/descrambler is provided, its use shall be subject to bilateral agreement between the Administrations concerned.

NOTE – The potential provision of an additional scrambler/descrambler inside the transmission unit of the DCE (see Figure I.1) is a national matter, and outside the scope of this Recommendation.

5.1 Scrambler

Where provided, the following self-synchronizing scrambler having the generating polynomial $1 + x^{-18} + x^{-23}$ shall be used for the transmitter of the DCE.

The message data sequence applied to the scrambler shall be effectively divided by the generating polynomial. The coefficients of the quotients of this division, taken in descending order, form the data sequence which shall appear at the output of the scrambler. The scrambler data output sequence thus shall be:

$$D_s = D_i \oplus D_s \cdot x^{-18} \oplus D_s \cdot x^{-23}$$

where:

D_s is the data sequence at the output of the scrambler

D_i is the data sequence applied to the scrambler

D_o is the data sequence at the output of the descrambler (see 5.2)

$\oplus$ denotes modulo 2 addition

$\cdot$ denotes binary multiplication