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DIGITAL SECTIONS AND DIGITAL LINE SYSTEMS

ACCESS DIGITAL SECTION FOR ISDN PRIMARY RATE AT 1544 kbit/s

ITU-T Recommendation G.963

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation G.963 was prepared by the ITU-T Study Group XVIII (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR, or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation G.963

ACCESS DIGITAL SECTION FOR ISDN PRIMARY RATE AT 1544 kbit/s

(Helsinki, 1993)

1 General

1.1 Scope

This Recommendation describes the characteristics of the primary rate access digital section at 1544 kbit/s between the user network interface (at the T reference point, defined in Recommendation I.411) and the local exchange (at the V3 reference point, defined in Recommendation Q.512) supporting the 1544 kbit/s primary rate interface structures defined in Recommendation I.412 and the required additional functions.

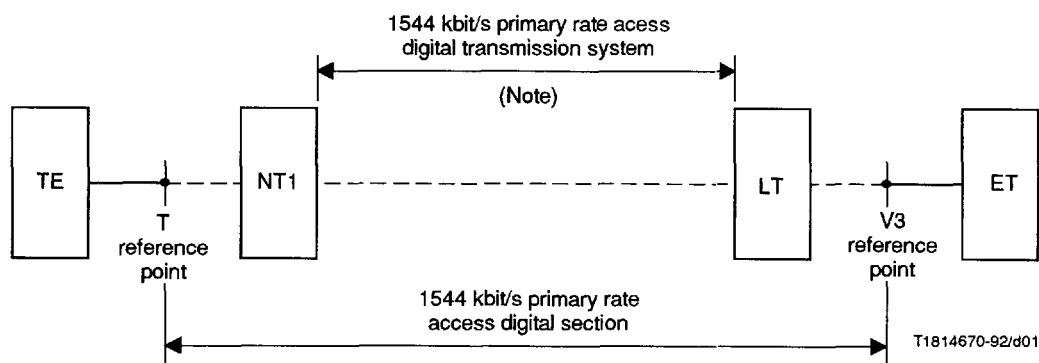
In this Recommendation and unless otherwise indicated, the term TE is used to indicate terminating layer 1 aspects of TE1, TA and NT2 functional groups.

When the term TE indicates terminating layer 1 aspects of TE1, then according to Figure 2/I.411, the S and T reference points coincide.

The terminology used in this Recommendation is contained in Recommendations I.112 and G.701.

1.2 Configuration

Figure 1 shows the boundaries of the access digital section in relation to the digital transmission system.



NOTE – The 1544 kbit/s primary rate access digital transmission system refers to either a line system using metallic media or optical fibres, or radio systems.

FIGURE 1/G.963

The 1544 kbit/s primary rate access digital section and digital transmission system boundaries

The concept of an access digital section is used in order to allow a functional and procedural description and a definition of network requirements.

NOTE – From a functional point of view, the information transferred across reference points T and V3 is different and therefore the 1544 kbit/s primary rate access digital section may not be symmetrical.

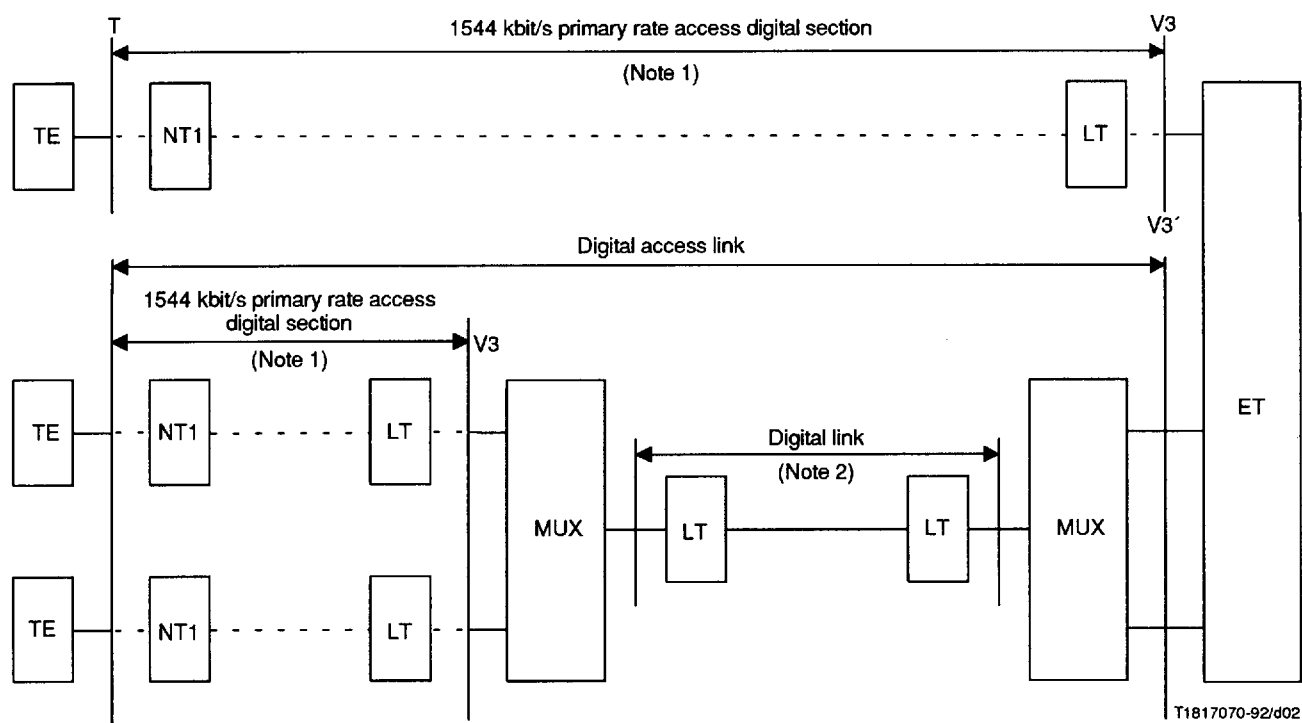
The concept of a digital transmission system is used in order to describe the characteristics of an implementation using a specific medium in support of the access digital section.

NOTE – The T and V3 reference points are defined in Recommendations I.411 and Q.512, respectively.

1.3 Application

The 1544 kbit/s primary rate access digital section may be applied as given in Figure 2 for:

- direct access to the local exchange (V3 reference point);
- access via higher order multiplex equipment to the local exchange.



NOTES

- 1 1544 kbit/s primary rate access digital sections may include one or more regenerators.
- 2 Multiple applications of digital links and multiplexors are possible.

FIGURE 2/G.963

Examples of equipment configurations in the ISDN subscriber primary rate access at 1544 kbit/s

1.4 Abbreviations

A number of abbreviations are used in this Recommendation, some of which are commonly used in the ISDN reference configuration while others have been created only for this Recommendation, as follows:

DS	(1544 kbit/s Primary Rate) access Digital Section
FE	Function Element used between ET and LT
SIG	SIGnal between LT and NT1
DL	4 kbit/s Data Link (m-bits)
PRM	Performance Report Message
HDLC	High level Data Link Control procedures

2 Modelling and relationship between the digital section and the ET

The general model shown in Figure 3 depicts the whole ISDN customer access layer 1 and adjacent entities and provides the basis to describe the functions performed by the DS and those performed by TE, ET and system management and how various functions are grouped. In particular, according to this model the maintenance functions specified in this Recommendation are not confined to functions performed by the DS but include functions associated with ET layer 1.

This model includes primitive procedures between ET layer 1 and ET layer 2 and between ET layer 1 and system management:

- I.431 to Q.920/Q.921 interactions between ET layer 1 and ET layer 2 and between ET layer 1 and system management based on PH and MPH primitives, respectively, as defined in Recommendation I.431. These interactions are for the support of functions specified in Recommendations Q.920 and Q.921;
- interactions between ET layer 1 and system management for the support of functions associated with the DS, based on MPH primitives.

The primitive procedures within TE comply with the specification according to Recommendation I.431.

This model does not constrain layer 1 arrangements between LT and NT1, or the primary rate access digital transmission system technology.

3 Functions

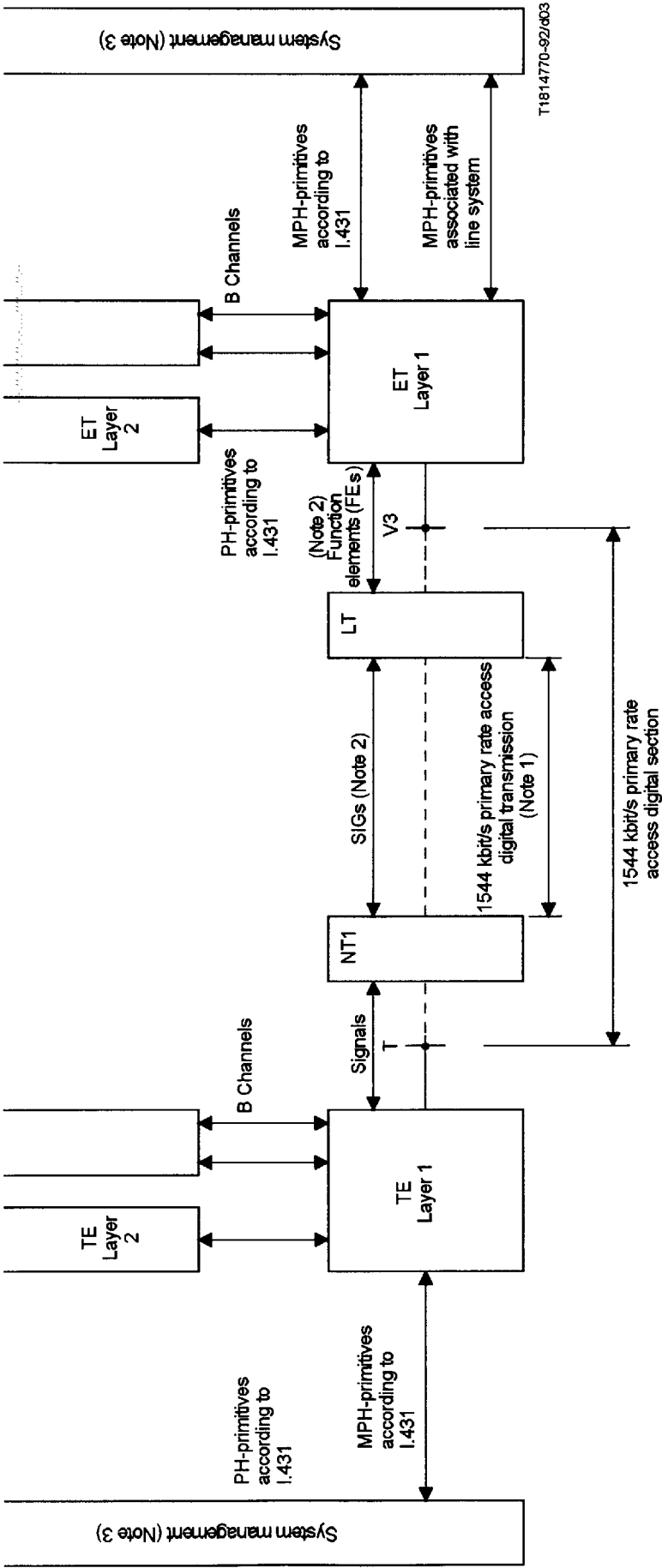
For each direction of transmission of the DS the following shall be provided:

- 24 time-slots at 64 kbit/s for the transport of any appropriate allocation of the following: B-, H0-, and H11-channels;
- 1 time-slot at 64 kbit/s within 24 time-slots for the transport of a D-channel when this channel is present;
- 8 kbit/s for frame alignment, and to follow the procedure for multiframe alignment, CRC, and the utilization of the m-bits, as described in Recommendations G.704 and G.706.

Figure 4 shows the functions which must be supported by the DS.

3.1 B-channel

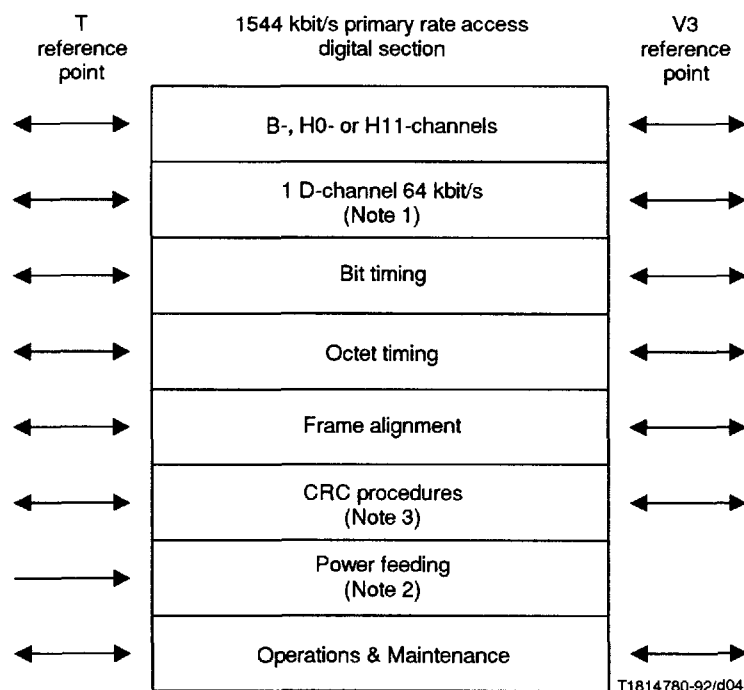
This function provides for the bidirectional transmission of independent B-channel signals each having a bit rate of 64 kbit/s as defined in Recommendation I.412.



NOTES

- 1 The digital transmission system refers to either a digital line transmission system using metallic media or optical fibres, or radio systems.
- 2 SIGs, FEs and primitives refer to an exchange of information. They do not imply any specific implementation. Some of these functions may be terminated in the LT and then would not pass the digital transmission system.
- 3 The term "system management" corresponds to both system and layer management as defined in Recommendation Q.940.

FIGURE 3/G.963
General model of ISDN customer access layer 1 and adjacent entities



NOTES

- 1 Provided when this channel is present.
- 2 This power feeding function is optional. Only NT1 may be powered from the interface at the T reference point (see Recommendation I.431).
- 3 The generation, monitoring, or termination of the CRC bits is optional.

FIGURE 4/G.963

Functions**3.2 H0-channel**

This function provides for the bidirectional transmission of independent H0-channel signals each having a bit rate of 384 kbit/s as defined in Recommendation I.412.

3.3 H11-channel

This function provides for the bidirectional transmission of an H11-channel signal having a bit rate of 1536 kbit/s as defined in Recommendation I.412.

3.4 D-channel

This function provides for the bidirectional transmission of a D-channel signal having a bit rate of 64 kbit/s as defined in Recommendation I.412.

3.5 Bit timing

This function provides bit (signal element) timing to enable the TE or NT and LT or ET to recover information from the aggregate bit stream.

3.6 Octet timing

This function provides 8 kHz timing for TE or NT and LT or ET to enable an octet structure for voice coders and for other timing purposes as required.

3.7 Frame alignment

This function provides information to enable the TE or NT and LT or ET to recover the time-division multiplexed channels.

3.8 CRC procedure

This function protects against false framing and may provide for error performance monitoring of the access digital section. This includes the multiframe procedure defined in Recommendation G.704.

3.9 Power feeding

This optional function feeds power to NT1 via the user network interface in accordance with Recommendation I.431.

3.10 Operations and maintenance

This optional function supports required actions and information for operating and maintaining the DS controlled by the ET as defined in Recommendation I.604. The function is conveyed by a bidirectional 4 kbit/s data link transported in the m-bits.

Four categories of functions have been identified:

- commands regarding LT, regenerator, or NT1;
- information from LT, regenerator, or NT1;
- indications of defect conditions;
- indications of access digital section power feeding status.

4 Network performance

4.1 Availability

The definition of availability is given in Annex A/G.821. The availability objective of the DS should be consistent with the availability requirement for the hypothetical reference digital section as given in Recommendations G.801 and I.350.

4.2 Signal transfer delay

Signal transfer delay is specified for B-channels and is defined as absolute signal delay between T and V3 reference points for each direction of transmission. The value shall be less than 2 ms when systems are implemented using metallic media, optical fibres, or a radio relay system. The application of a satellite system in the DS is also possible; however, for speech services, Recommendation G.114 may limit such an application until appropriate methods to control double satellite hops and switching of echo control devices are available. These methods are outside the scope of this Recommendation.

In case of remote application of the DS (see Figure 2 with a digital link between the DS and the ET) the signal transfer delay is defined for the DS between the T and V3 reference points.

4.3 Error performance

Error performance must be consistent with the requirements given in Recommendation G.821, local grade.

4.4 Jitter

4.4.1 Output/input jitter at the T reference point

The requirements are defined in 4.5/I.431.

4.4.2 Jitter at the V3 reference point

The input jitter limits are described in Recommendation G.824.

NOTE – If models described in Figure 2 are used to connect a customer to the ET, jitter reduction is not required at V3.

5 Operations and maintenance

5.1 General

This subclause describes the operations and maintenance functions for the DS.

Further assumptions regarding system management are given in Annex A. The maintenance functions defined in Recommendation I.604 provide the capability to maintain the DS to the level of network performance given in 4.

It must be possible to test and maintain the DS in accordance with Recommendation I.604 regardless of the subscriber installation.

The main features are:

- a) control of maintenance and test support facilities;
- b) monitoring of the function elements to provide operating and performance information and fault condition indications;
- c) maintenance communication facility.

5.2 Control facilities

5.2.1 Loopbacks

Loopbacks are maintenance tools used to assist in locating faults in the network. This specification covers loopback 1, 1A and 2 (see Recommendation I.604), all of which are complete loopbacks. Loopbacks are controlled by the codewords specified in Table 2.

5.2.1.1 Loopback implementation

The various loopbacks are summarized below, and illustrated in Figure 5.

- 1) Loopback 1 is located within the LT. It loops the 1544 kbit/s signal back to the ET.
- 2) Loopback 1A is located within the regenerator. It loops the 1544 kbit/s signal back to the ET.
- 3) Loopback 2 is located within the NT1 and loops the 1544 kbit/s signal (line loopback) or 1536 kbit/s signal (payload loopback) back to the ET. Loopback 2 may be implemented as a line loopback or as a payload loopback depending on whether the NT1 terminates framing.

NOTE – Line loopback shall result in a full 1544 kbit/s loopback back to the interface of the received bit stream. Bit sequence integrity shall be maintained.

A payload loopback is implemented only in equipment that terminates framing of the primary rate access line. The signal looped back to the received signal is 1536 kbit/s. The framing bits are originated at the loopback point. The payload loopback shall maintain bit sequence integrity for the information bits; however, the payload loopback need not maintain the integrity of eight-bit time slots, frames, or multi-frames.