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SERIES Q: SWITCHING AND SIGNALLING

Digital exchanges – Transmission characteristics

Transmission characteristics at digital interfaces of digital exchanges

ITU-T Recommendation Q.554

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.554

TRANSMISSION CHARACTERISTICS AT DIGITAL INTERFACES OF DIGITAL EXCHANGES

Summary

This Recommendation contains detailed transmission characteristics of the digital interface ports of digital exchanges. It covers the requirements for transmission characteristics of the half connections between the digital interfaces and the exchange test points. The overall characteristics of a connection through the digital exchange involving two interfaces could be obtained by suitably combining the values for the characteristics of the two half connections.

Source

ITU-T Recommendation Q.554 was revised by ITU-T Study Group 15 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 8th of November 1996.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. 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, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

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

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 Q.554

TRANSMISSION CHARACTERISTICS AT DIGITAL INTERFACES OF DIGITAL EXCHANGES

(revised in 1996)

1 General

The field of application of this Recommendation is found in Recommendation Q.500.

The signals taken into consideration are passed through the following interfaces as described in Recommendations Q.511 and Q.512 and Figure 1/Q.551.

– Interface A is for primary rate digital signals at 2048 kbit/s or 1544 kbit/s.

– Interface B is for secondary rate digital signals at 8448 kbit/s or 6312 kbit/s.

– Interface types V are for digital subscriber line access.

Interface types V may appear remote from the exchange through the use of digital transmission facilities. When this occurs, there should be no impact on transmission parameters other than delay.

Detailed transmission characteristics of the digital interface ports are given in clause 2.

Clause 3 covers the requirements for transmission characteristics of the half connections between the digital interfaces and the exchange test points. The half connection comprises an input connection (the one-way 64 kbit/s path from the interface to the test point) and an output connection (the one-way 64 kbit/s path from the test point to the interface) as defined in Recommendation Q.551. Requirements are given for the input connection and the output connection characteristics and the two are not necessarily identical.

The overall characteristics of a connection through the digital exchange involving two interfaces can be obtained by suitably combining the values for the characteristics of the two half connections. For example, the overall characteristics of the connection between a Z interface and the A interface are obtained by combining the Z interface half-connection characteristics given in 3.3/Q.552 with the A interface half-connection requirements given in 3.1.

Where bit integrity is maintained on the digital half connection and the error performance requirements are met, the digital half connection will add no impairment to the voice-band performance of a complete connection through the switch (with the exception of delay). For this reason, the digital half-connection requirements do not include the conventional voice band parameters.

The cases where bit integrity is not maintained are not subject of this Recommendation.

The values given are to be considered as either "design" or "performance objectives" according to the explanation of the terms given in Recommendation G.102 (Transmission performance objectives and Recommendations) and the particular context. These objectives should be met under the most adverse specified timing and synchronization conditions as given in clause 3/Q.541.

2 Characteristics of interfaces

This clause covers requirements for interfaces A, B, and V.

These interfaces must meet the requirements for timing and synchronization given in clause 3/Q.541.

2.1 Interface characteristics common to digital interfaces

The general characteristics of the interfaces A, B, V_2, V_3, V_4 and V_5 are given in Recommendations G.703, G.704, G.706, Q.511 and Q.512.

2.2 Interface characteristics at interface A

The physical and electrical characteristics of interface A are given in clauses 2/G.703 and 6/G.703.

2.2.1 Jitter and wander tolerance at the exchange input

Jitter and wander tolerance is the ability of the exchange to accept phase deviations on incoming signals without introducing slips or errors.

The jitter/wander tolerance at input A should comply:

– with 3.1.1/G.824, for the A interface at 1544 kbit/s;

– with 3.1.1/G.823, for the A interface at 2048 kbit/s.

This specification may not be applicable to inputs used solely for synchronization purposes (i.e. for deriving the internal timing of the exchange).

2.2.2 Maximum time interval error (MTIE) at the exchange output

MTIE is defined in Recommendation G.811. Limits on MTIE are given in Recommendations G.823 and G.824. Additional information regarding interface A is given in Recommendation Q.541.

2.3 Interface characteristics at interface B

The physical and electrical characteristics of interface B are given in clauses 3/G.703 and 7/G.703. Additional information regarding interface B is given in Recommendation Q.541.

2.3.1 Jitter and wander tolerance at the exchange input

Jitter and wander tolerance is the ability of the exchange to accept phase deviations on incoming signals without introducing slips or errors.

The jitter/wander tolerance at input B should comply:

– with 4.2.2/G.824 for the B interface at 6312 kbit/s;

– with 3.1.1/G.823, for the B interface at 8448 kbit/s.

This specification may not be applicable to inputs used solely for synchronization purposes (i.e. for deriving the internal timing of the exchange).

2.3.2 Maximum Time Interval Error (MTIE) at the exchange output

MTIE is defined in Recommendation G.811. Limits on MTIE are given in Recommendations G.823 and G.824.

2.4 Interface characteristics at interface V_1

The functional characteristics of the basic access digital section between the V_1 and T reference point are defined in Recommendations Q.512 and I.430. The characteristics and parameters of a digital

transmission system which may form part of the digital section for the ISDN basic rate access are given in Recommendation I.431.

2.5 Interface characteristics at other V-type interfaces

The other V-type interfaces will have transmission characteristics of the A and B interfaces as given in 2.2 and 2.3 above.

3 Characteristics of 64 kbit/s half connections

This clause covers the essential digital characteristics of 64 kbit/s half connections. Where these requirements are met, the digital half connection will add no impairment to the voice-band performance of a complete connection through the exchange (with the exception of delay). The voice-band performance of digital half connections may therefore be interpreted by assuming that ideal send and receive sides (see Recommendation G.712) are connected to the digital inputs and outputs respectively. The digital half-connection requirements also ensure that any connection through the exchange using a pair of digital half connections will provide acceptable performance for non-voice 64 kbit/s digital services.

3.1 Half connection characteristics common to all digital interfaces

3.1.1 Error performance

The design objective long-term mean Bit Error Ratio (BER) for a single pass of a 64 kbit/s connection through an exchange between the digital transmission/switching interfaces should be 1 in 10^{-9} or better. This corresponds to 99.5% error-free minutes assuming that the occurrence of errors has a Poisson distribution.

3.1.2 Bit integrity

Bit integrity will be maintained if called for to support 64 kbit/s non-telephony services.

NOTE – It is understood that to meet this requirement, digital processing devices such as μ-/A-law converters, echo suppressors and digital pads must be disabled for non-telephony calls requiring bit integrity. The means of disabling these devices has yet to be determined. (See 1.2.6.1/Q.551.)

3.1.3 Bit sequence independence

No limitation should be imposed by the exchange on the number of consecutive binary ones or zeros or any other binary pattern within the 64 kbit/s paths through the exchange.

3.1.4 Absolute group delay

The requirements for absolute group delay are given in 3.3.1/Q.551.

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