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REQUIREMENTS FOR NETWORK TERMINATION CONNECTED TO U-INTERFACE OF ISDN BASIC ACCESS

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U-rajapinnan käyttöönottoa tilaajaliittymässä selvittänyt työryhmä päätyi loppuraportissaan keväällä 1997 esittämään, että teleyrityksille annetaan mahdollisuus tarjota U-rajapintaa tilaajan liitäntäpisteenä S- ja T-rajapintojen ohella /viite1/. Samalla se ehdotti U-rajapintavaatimusten selvittämistä uudessa ryhmässä, jonka Telehallintokeskus asetti 28.5.1997 (liite 1).

Tässä raportissa esitetään asetetun uuden työryhmän laatimat vaatimukset ISDN:n perusliittymän U-rajapintaan liitettävälle verkkopäätteelle.

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1. Basic characteristics

This document specifies requirements for the ISDN basic access (2B+D) which employs a two-wire cable line. The primary rate access (30B+D) and other transmission media than cable wire lines are outside the scope of this document.

Instead of the common term “NT” (Network Termination) the term **“NT+”** is used to indicate that the equipment under consideration may comprise the features of terminal equipment normally belonging to the functional group of ISDN terminals (TE1).

NT+ equipment can be classified into three types on the basis of the features included in the equipment. The requirements are specified for each of the types in chapter 3 and minimum requirements are presented in chapter 4.

If NT+ is intended to be used for telephone service, it is additionally required that telephone traffic in the basic access shall be ensured with one terminal also during electricity break as specified in the Regulation on power supply in telecommunications networks /ref. 2/.

2. REFERENCES

1. ISDN-U-rajapinta tilaajan liitäntäpisteenä ; työryhmäraportti; Telehallintokeskuksen julkaisu 4/1997.
2. THK 30 A/1997 M; Regulation on power supply in telecommunications networks (1997).
3. ETS 300 012; ISDN; Basic user-network interface; Layer 1 specification and test principles; (1992)+A1(1994)+A2(1996).
4. EN 50098-1; Customer premises cabling for information technology; Part 1: ISDN basic access (1994).
5. Rec. I.430; Basic user-network interface - layer 1 specification (1988).
6. ETR 080; ISDN basic rate access; Digital transmission system on metallic local lines (November 1996).
7. Rec. G.961; Digital transmission system on metallic local lines for ISDN basic rate access (1993).
8. GFI 9403 ISDN Basic rate user access; Physical layer characteristics (1994).
9. Rec. V.110; Support by an ISDN of data terminal equipments with V-series type interfaces (1996).
10. GFI 97xx; Technical Recommendation for the analogue interface (R-interface) of the ISDN Terminal Adapter (under preparation).
11. CTR 3; ISDN; Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access (1995)+prA1(1997).
12. THK 24 B /1997 M; Regulation on electromagnetic compatibility of telecommunications terminal equipment, radio equipment and telecommunications networks (1997).
13. ETS 300 386-1; Telecommunication network equipment EMC compatibility requirements part 1: Product family overview, compliance criteria and test levels.
14. EN 55022; Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
15. Rec. K.21; Resistibility of subscriber’s terminal to overvoltages and overcurrents (1996).

16. ETS 300 047-5; ISDN; Basic access; Safety and protection part 3: Interface Ib - protection (1992).

17. Rec. K.22; Overvoltage resistibility of equipment connected to an ISDN T/S bus (1995).
18. EN 60950; Safety of information technology equipment including electrical business equipment.
19. ETS 300 019-1-1;Environmental conditions and environmental tests for telecommunications equipment, part 1: Classification of environmental conditions; Storage; class 1.2.
20. ETS 300 019-1-2;Environmental conditions and environmental tests for telecommunications equipment, part 1: Classification of environmental conditions; Transportation; class 2.3.
21. ETS 300 019-1-3;Environmental conditions and environmental tests for telecommunications equipment, part 1: Classification of environmental conditions; Stationary use: class 3.2.

3. CLASSIFICATION AND CHARACTERISTICS OF NT+ EQUIPMENT

3.1 Case 1: NT+ type 1 not comprising TE functions (Fig. 1)

This type of NT+ represents the ISDN functional group of NT1 with a standard S/T-interface for type approved ISDN terminal equipment (TE1). NT+ comprises only layer 1 characteristics.

Requirements for NT+ type 1

- The characteristics of S/T- interface of NT+ shall be as specified in standard ETS 300 012 /ref. 3/. Customer premises cabling shall be as specified in standard EN 50098-1 /ref. 4/. The requirements for NT+ are given as requirements for the b-side of the interface. The standards are based on Recommendation I.430 /ref. 5/.

- The characteristics of the network side of NT+ equipment (U- interface) shall be as specified in report ETR 080 /ref. 6/ which is based on Recommendation G.961 /ref. 7/.

- Transmission code used in Finland is 2B1Q as specified in the document GFI 9403 /ref. 8/. The GFI presents national option selections and other clarifications for the above mentioned standards to be applied in Finland.

S/T- layer 2 and 3 S/T layer 1 (b-side) U-interface (transmission system)
S/T- layer 1 (a-side)

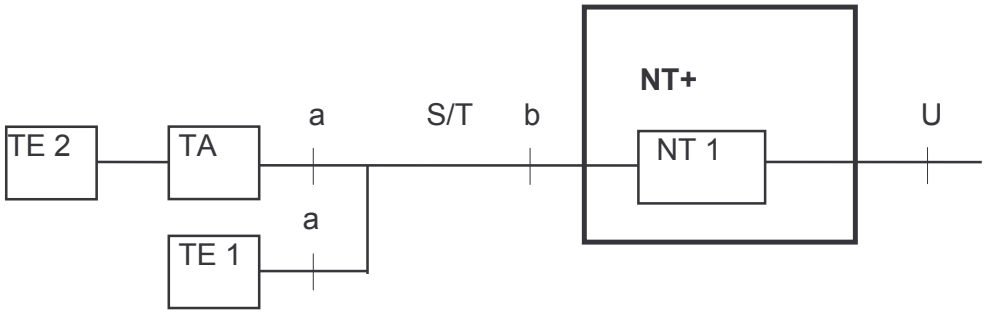


Figure 1 NT+ type 1 not comprising TE functions

3.2 Case 2: NT+ type 2 comprising TE functions (Fig. 2)

NT+ contains features belonging to the ISDN functional group of TE 1. S/T- interface is internal interface of NT+ equipment. Terminal features of NT+ may comprise the whole set of ISDN TE1 functions or functions to adapt non-ISDN terminals e.g. data terminals (Recommendation V.110 /ref.9/) or analogue telephone sets (a/b- adapter /ref.10/) to the ISDN basic access.

The interface at the user side of NT+ may also be a non-standardized interface (e.g. S') provided that the NT+ in conjunction with the intended terminal complies with the standardized ISDN access requirements.

NT+ may also provide a standardized S/T-interface as specified in 3.1.

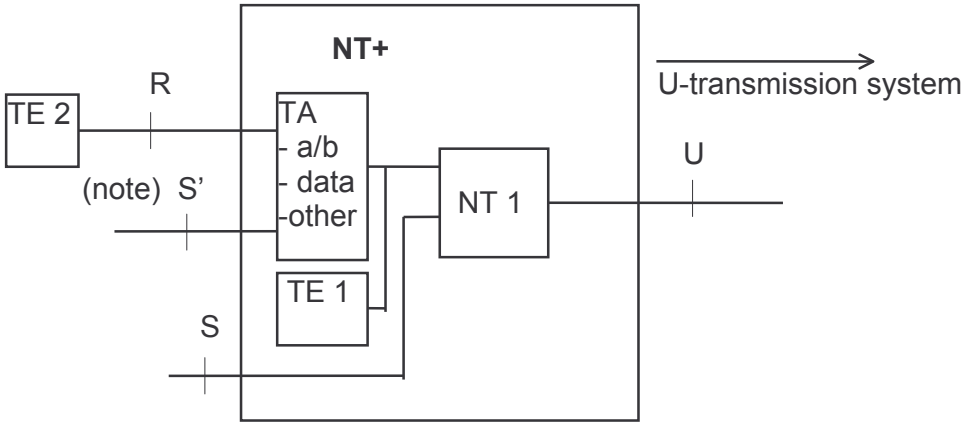
Requirements for NT+ type 2

- NT+ shall in conjunction with the intended terminal comply with the standards for layer 2 and 3 requirements of the ISDN basic access. The minimum requirements are specified in the type approval requirements CTR 3 /ref. 11/.

- The internal layer 1 S/T- interface shall be implemented (e.g. activation) in such a way that the layer 2 and 3 characteristics comply with the set requirements.

- The U-transmission characteristics are equivalent to those of NT+ type 1. They are described in 3.1.

Layers 1, 2 and 3;
NT+ in conjunction with an intended terminal



note: S' indicates a simplified S-interface

Figure 2 NT+ type 2 comprising TE1 functions

3.3 Case 3: NT+ type 3 comprises NT2 functions

NT+ comprises NT2 functions typically provided by PABXs and other terminal controllers. Requirements for NT+ type 3 equipment are already incorporated in the requirements for NT+ type 1 and 2 equipment.

3.4 Environmental requirements

- Requirements for electromagnetic compatibilty of telecommunications terminal equipment are specified in Regulation THK 24 B/1997 M /ref.12/. Detailed test requirements are specified in standards ETS 300 386-1 /ref.13/ and EN 55022 /ref.14/.
- Requirements for resistability to overvoltages and overcurrents are specified for U-interface in Recommendation K.21 /ref.15/ and for S/T- interface in standard ETS 300 047-5 /ref. 16/ and in Recommendation K.22 /ref.17/.
- NT+ equipment shall comply with safety protection requirements as specified in standard EN 60950 /ref.18/. Environmental conditions are given in standards ETS 300 019-1-1/ ref.19 /, ETS 300 019-1-2 /ref. 20/ and ETS300 019-1-3 /ref. 21/.

4. MINIMUM REQUIREMENTS FOR NT+

4.1 Minimum requirements for layer 1: U-Interface (NT-side)

Layer 1 requirements for U-interface are applicable to all the three types of NT+ equipment.

4.1.1 System performance

Performance test 1

The test shall be performed according to ETR 080, subclause 6.2.4.1.

The test configuration shall be “Test p” as described in ETR 080.

The test loop shall be as described for “Test p” in ETR 080 with exeption that instead of “Loop 2” 0,5 mm PE-cable shall be used. The modified test loop is described in Figure 3. The characteristics of the 0,5 mm PE-cable are described in subclause C.1.2 of ETR 080.

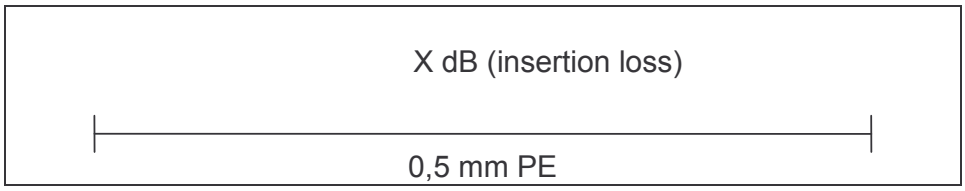


Figure 3 Test loop for performance tests

The noise model shall be as described for “Test p” in ETR 080.

The BER requirement shall be as described for “Test p” in ETR 080.

It is required that
- the BER requirement is met for all loop lengths
- for the maximum loop length the value of X (insertion loss) shall be equal to or more than 36 dB at 40 kHz
- the system shall activate within 15 seconds for all loop lengths (cold-start) as specified in ETR 080, subclause A.10.6.

Performance test 2

The test shall be performed according to subclause 6.2.4.2 of ETR 080 with the exception that instead “Loop 2” 0,5 mm PE-cable shall be used. The test loop is equivalent to the test loop of Performance test 1 described above. The value of X shall be 36 dB.
It is required that
- the BER requirement is met
- the system shall activate within 15 seconds (cold-start) as described in ETR 080, subclause A.10.6.

4.1.2 Operation and maintenance

The implementation and operation of the mandatory EOC functions specified in subclause A.8.3.3.4 of ETR 080, is required.

4.1.3 Power feeding

Feeding voltage

The NT+ shall operate over a range of feeding voltages between
- the minimum feeding voltage of +28V, as described in ETR 080, subclause 10.6.3, and
- the maximum feeding voltage of +115V, as described in ETR 080, subclause 10.5.1

Power requirements

The power requirements of NT+ shall be according to ETR 080, subclause 10.6.1.

4.1.4 Transmitter output characteristics

Pulse shape

The transmitted pulse shape shall be as specified in ETR 080, subclause A.12.2.

Signal power

The average signal power shall be as specified in ETR 080, subclause A.12.3.

Power spectral density

The maximum power spectral density shall be as specified in ETR 080, subclause A.12.4.

4.1.5 Transmitter/receiver termination

Return loss

The return loss shall be as specified in ETR 080, subclause A.13.2.

Longitudinal conversion loss

The longitudinal conversion loss shall be as specified in ETR 080, subclause A.13.3.

4.2 Minimum requirements for layer 1: S/T- interface (NT-side)

Layer 1 requirements for S-interface are applicable to NT+ type 1 terminals and to those type 2 terminals which provide the standard S/T-interface.

4.2.1 Power Feeding

Normal power conditions

The maximum power from power source 1 in normal power conditions shall be as specified in ETS 300 012, subclause A:9.2.2.1.

Testing shall be done according to ETS 300 012, subclause E.5.1.1.

Restricted power conditions (Optional)

The maximum power from power source 1 under restricted power conditions shall be as specified in ETS 300 012, subclause A:9.2.2.2.

Testing shall be done according to ETS 300 012, subclause E.5.1.2.

Switch over between normal and restricted power conditions

(NOTE: This requirement applies only when restricted power mode is implemented.)

An established connection shall remain connected during switch over from normal to restricted power condition and vice versa.

4.2.2 Impedance

NT transmitter output impedance

The NT transmitter output impedance shall be as specified in ETS 300 012, subclause A:8.5.1.1.

Testing shall be done according to ETS 300 012, subclause E.4.3.1 Test A.

NT receiver input impedance

The NT receiver input impedance shall be as specified in ETS 300 012, subclause A:8.6.1.2.

Testing shall be done according to ETS 300 012, subclause E.4.7.1.1 Test A.

4.2.3 Longitudinal conversion loss

Longitudinal conversion loss of transmitter output

The Longitudinal conversion loss of transmitter output shall be as specified in ETS 300 012, subclause A:8.5.6.1.

Testing shall be done according to ETS 300 012, subclause E .4.6.

Unbalance about earth of the receiver input

Unbalance about earth of the receiver input shall be as specified in ETS 300 012, subclause A:8.6.4.

Testing shall be done according to ETS 300 012, subclause E.4.7.4.

4.2.4 Wiring configurations

Wiring configurations are specified in ITU-T Recommendation I.430, Appendix 2.

Testing shall be done with a high impedance 0,5 mm PE cable (Z_c= 150 Ω).

The system shall operate within the limits of the following wiring configurations:

1. Short passive bus (0 - 200 m)
2. Short passive bus, Y-configuration (2x 0 - 100 m) as specified in EN 50098-1
3. Extended passive bus (0 - 500 m) with a differential distance between TE connection points as specified in Recommendation I.430.
4. Point-to-point (0 - 1000 m)

For all of the wiring configurations, the following requirements apply:

- BER shall be $< 10^{-7}$ (measurement period is 2 min).
- Switch over between normal and restricted power conditions.

(Note: This requirement applies only when restricted power mode is implemented.)
An established connection shall remain connected during switch over from normal to restricted power condition and vice versa.

4.3 Minimum requirements for layer 2 and layer 3 characteristics

Layer 2 and layer 3 requirements are applicable to NT+ type 2 and type 3 equipment. The minimum requirements for layer 2 and layer 3 are described in CTR 3.