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PUBLIC DATA NETWORKS INTERFACES

INTERFACE BETWEEN DATA TERMINAL EQUIPMENT (DTE) AND DATA CIRCUIT - TERMINATING EQUIPMENT (DCE) FOR START - STOP TRANSMISSION SERVICES ON PUBLIC DATA NETWORKS

ITU-T Recommendation X.20

(Extract from the *Blue Book*)

NOTES

- 1 ITU-T Recommendation X.20 was published in Fascicle VIII.2 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).
- 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 X.20

INTERFACE BETWEEN DATA TERMINAL EQUIPMENT (DTE) AND DATA CIRCUIT-TERMINATING EQUIPMENT (DCE) FOR START-STOP TRANSMISSION SERVICES ON PUBLIC DATA NETWORKS

(Geneva, 1972; amended at Geneva, 1976 and 1980,
Malaga-Torremolinos, 1984 and Melbourne, 1988)

The CCITT,

considering

- (a) that Recommendations X.1 and X.2 define the services and facilities to be provided by a public data network;
- (b) that Recommendation X.92 defines the hypothetical reference connections for public synchronous data networks;
- (c) that Recommendation X.96 defines *call progress* signals;
- (d) that the necessary elements for an interface Recommendation should be defined in architectural levels;
- (e) that it is desirable for characteristics of the interface between the DTE and DCE of a public data network to be standardized,

unanimously recommends

that the interface between the DTE and DCE in public data networks for user classes of service employing start-stop transmission should be as defined in this Recommendation.

1 Scope

1.1 This Recommendation defines the physical characteristics and call control procedures for a general purpose interface between DTE and DCE for user classes of service, as defined in Recommendation X.1, employing start-stop transmission.

1.2 The formats and procedures for *selection*, *call progress* and *DCE provided information* are included in this Recommendation.

1.3 The provision for duplex operation is covered.

2 DTE/DCE physical interface elements

2.1 Interchange circuits

A list of the interchange circuits concerned is presented in Table 1/X.20. Definitions of these interchange circuits are given in Recommendation X.24.

TABLE 1/X.20

Interchange circuit	Interchange circuit name	Direction	
		to DCE	from DCE
G (see Note)	Signal ground or common return		
Ga	DTE common return	X	
Gb	DCE common return		X
T	Transmit	X	
R	Receive		X

Note - This conductor may be used to reduce environmental signal interference at the interface. In case of shielded interconnecting cable, the additional connection considerations are part of Recommendations X.24 and ISO 4903.

2.2 Electrical characteristics

The electrical characteristics of the interchange circuits at the DCE side of the interface will comply with Recommendation X.26.

The electrical characteristics at the DTE side of the interface may be applied according to Recommendations X.26, X.27 (without cable termination in the load), or Recommendation V.28.

For interworking between a V.28-DTE and a X.26-DCE refer to Recommendation X.26 and ISO 4903.

2.3 Mechanical characteristics

Refer to ISO 4903 (15-pole DTE/DCE interface connector and contact number assignments) for mechanical arrangements.

2.4 Fault conditions of interchange circuits

For the association of the receiver circuit-failure detection to particular interchange circuits in accordance with the type of failure detection, see Recommendation X.26, § 11 and Recommendation X.27, § 9.

2.4.1 Circuit R in failure state

The DTE should interpret a fault condition on circuit R as $r = 0$, using failure detection type 2. When the electrical characteristics are applied according to Recommendation V.28, the DTE should interpret generator in power-off condition or open-circuited interconnecting cable as a binary 0.

2.4.2 Circuit T in failure state

The DCE will interpret a fault condition on circuit T as $t = 0$, using failure detection type 2.

3 Call control characters and error checking

All characters for call control purposes are selected from International Alphabet No. 5 according to Recommendation T.50.

Even parity according to Recommendation X.4 applies for IA5 characters interchanged for call control purposes.

4 Elements of the call control phase for circuit switched service

The state diagram provided in Figure A-1/X.20 shows the relationship between the various *call control* phase states as defined below, together with the recognized transactions between these states under normal operating conditions. Illustrated examples of the time sequence relationships between these states and associated time-out operation are provided in Figure B-1/X.20.

The *call control* phase can be terminated by either the DTE or the DCE by *clearing* as defined in § 6 below.

4.1 Events of the call control procedures

(See Figure A-1/X.20.)

4.1.1 Ready (state 1)

Circuits T and R show binary 0.

4.1.2 Call request (state 2)

The calling DTE shall indicate a request for a call by signalling steady binary condition $t = 1$ provided that it was previously signalling *DTE ready* ($t = 0$).

4.1.3 Proceed-to-select (state 3)

When the network is prepared to receive selection information, the DCE will signal steady binary condition $r = 1$.

The *proceed-to-select* signal will start within 6 seconds of the *call request* being sent.

4.1.4 Selection signal sequence (state 4)

The *selection* signal sequence shall be transmitted by the DTE on circuit T.

The format of *selection* signal sequence is defined in § 4.6.1 below.

The information content and coding of the *selection* signal sequence is contained in Annex G and Recommendation X.121.

The *selection* signal sequence shall start within 6 seconds of the *proceed-to-select* being received and shall be completed within 36 seconds.

The maximum permissible interval between individual selection characters is 6 seconds.

4.1.5 DTE waiting (state 5)

During *DTE waiting*, the DTE signals steady binary condition $t = 1$.

4.1.6 Incoming call (state 8)

The DCE will indicate an incoming call by signalling steady binary condition $r = 1$.

4.1.7 Call accepted (state 9)

The DTE shall accept the incoming call not later than 600 ms by signalling the steady state binary condition $t = 1$.

10-100 ms thereafter, the DTE transmits the call control character 0/6 (ACK).

4.1.8 *Call not accepted (state 18)*

If the DTE does not wish to accept the incoming call it shall signal this not later than 600 ms by changing circuit T to steady binary condition 1.

10-100 ms thereafter, the DTE shall transmit the call control character 1/5 (NAK) followed by *DTE clear request* (state 13).

4.1.9 *Call progress signal sequence (state 6)*

The *call progress* signal sequence will be transmitted by the DCE to the calling DTE on the R circuit when an appropriate condition is encountered by the network.

A *call progress* signal sequence will consist of one or more *call progress* signal blocks. A *call progress* signal block will consist of one or more *call progress* signals.

The format of the *call progress* signal sequence is defined in § 4.6.2 below.

The coding of *call progress* signals is provided in Annex E.

The description of *call progress* signals is provided in Recommendation X.96.

A *call progress* signal sequence will be transmitted by the DCE within 60 seconds of: 1) the *end-of-selection* signal or 2) in case of *direct call*, the *proceed-to-select* signal being sent by the DTE. The *call progress* signal sequence, however, will not be sent by the DCE before the reception of the *end-of-selection* signal except in the case of expiration of time-outs described in § 4.1.4 where there may be a *call progress* signal sequence followed by the *clear indication*.

Note - When an error is detected in a received *call progress* signal sequence, the DTE may choose to either ignore the signal or attempt a new call after clearing.

4.1.10 *DCE provided information sequence (states 7A and 7B)*

The *DCE provided information* sequences will be transmitted by a DCE to the calling DTE (state 7A) or a called DTE (state 7B) on circuit R.

A *DCE provided information* sequence will consist of 1 or more *DCE provided information* blocks. Each *DCE provided information* block will be limited to a maximum length of 128 characters.

The format of the *DCE provided information* sequences is defined in § 4.6.3 below.

The information content of *DCE provided information* is given in Annex G.

A *DCE provided information* sequence (state 7B) will be sent to the called DTE within 60 seconds of the *call accepted* signal being sent.

4.1.10.1 *Line identification*

Calling and *called line identification* is an optional additional facility.

The information content of *calling* and *called line identification* is provided in Annex G.

Calling and *called line identification* will be transmitted by the DCE on the R circuit during states 7B or 7A respectively.

When provided, *called line identification* (state 7A) will be transmitted by the DCE to the calling DTE after all *call progress* signals, if any.

When provided, *calling line identification* (state 7B) will be transmitted by the DCE to the called DTE after *call accepted* has been sent by the DTE.

In the case where the *calling line identification* facility is not provided by the originating network, or the *called line identification* facility is not provided by the destination network, a *dummy line identification* shall be provided by the DCE to the DTE.

4.1.10.2 *Charging information*

Charging information is an optional additional facility provided during state 7B.

Upon completion of clearing the call for which *charging information* has been requested, the DCE will, within 200 ms after entering *ready* (state 1), establish an incoming call to the DTE for the purpose of giving *charging information*.

Charging information will be transmitted by the DCE on circuit R.

The DCE will send *clear indication* (state 16) upon sending the last *charging information* block. The DTE should send *clear request* (state 13) when it has correctly received the *charging information* signal, if the DCE has not previously signalled the *clear indication*.

The format of *charging information* is defined in § 4.6.3 below.

4.1.11 *Connected (state 10)*

The DCE signals that the connection is being established by the transmission of the call control character 0/6 (ACK) on circuit R. Because of possible switching delays in the network, the DTE must keep circuit T in steady binary condition 1 during this state.

4.1.12 *Ready for data (state 11)*

20 ms after the reception of the call control character 0/6 (ACK) in state 10, the connection is available for data transfer between both DTEs.

4.1.13 *Events of the call control procedures for multipoint circuit-switched service*

4.1.13.1 *Ready (state 1)*

See § 4.1.1.

4.1.13.2 *Call request (state 2)*

See § 4.1.2.

4.1.13.3 *Proceed to select (state 3)*

See § 4.1.3.

4.1.13.4 *Selection signal sequence (state 4)*

See § 4.1.4.

A *facility request* signal is used to indicate the category of the point to multipoint service which is required. The coding is defined in Annex F.

4.1.13.5 *DTE waiting (state 5)*

See § 4.1.5.

4.1.13.6 *Incoming call (state 8)*

See § 4.1.6.

4.1.13.7 *Call accepted (state 9)*

See § 4.1.7.

4.1.13.8 *Call not accepted (state 18)*

See § 4.1.8.

4.1.13.9 *Call progress signal sequence (state 6)*

See § 4.1.9.

The *call progress* signals related to each of the called DTEs are transmitted and then, in the same order, the *called line identification* signals of the different called DTEs.

When no specific *call progress* signals are necessary for a given called DTE, then the call progress signal "00" is used for this DTE so that the order could be kept.

4.1.13.10 *DCE provided information sequence (states 7A and 7B)*

The DCE provided information sequences will be transmitted by a DCE to the calling DTE (state 7A) or a called DTE (state 7B) on circuit R.

A DCE provided information sequence will consist of one or more *DCE provided information* blocks. Each *DCE provided information* block will be limited to a maximum length of 128 characters, except for *called line identification* in case of multipoint calls where the maximum length is 512 characters.

The format of the *DCE provided information* sequences is defined in § 4.6.3 below.

The information content of DCE provided information is given in Annex G.

A *DCE provided information* sequence will be sent to the called DTE within 60 seconds of the call accepted signal being sent.

4.1.13.10.1 *Line identification*

See § 4.1.10.1.

The *called line identification* related to the different called DTEs are provided in sequence.

4.1.13.10.2 *Charging information*

See § 4.1.10.2.

4.1.13.11 *Connected (state 10)*

See § 4.1.11.

4.1.13.12 *Ready for data (state 11)*

See § 4.1.12.

4.2 *Unsuccessful call*

If the required connection cannot be established, the DCE will indicate this and the reason to the calling DTE by means of a *call progress* signal. Afterwards the DCE will signal *DCE clear indication* (state 16).

4.3 *Call collision (state 19)*

A *call collision* is detected by the DCE when it receives *call request* in response to an *incoming call*. The DCE may either accept the *call request* or may perform *DCE clearing*.

4.4 *Direct call*

For the *direct call* facility, *selection* signals (state 4) are always bypassed.

Note - The *direct call* facility can only be provided on a subscription basis and not on a per-call basis.

4.5 *Facility registration/cancellation procedure*

Registration/cancellation of optional user facilities shall be carried out by a DTE in accordance with normal call establishment procedures using the *selection* sequence, which is defined in § 4.6.1 below.

The format of the *facility registration/cancellation* signal is defined in § 4.6.1.3 below.

The *facility registration/cancellation* procedure shall not be combined with establishment of a normally addressed call, but shall be taken as an independent procedure.

In response to acceptance or rejection of the *facility registration/cancellation* procedure, the network will provide the appropriate *call progress* signal followed by *clear indication*.

4.6 *Selection, call progress and DCE provided information formats*

(See also Annex D for a syntactic description of the formats.)

4.6.1 *Format of selection sequence*

A selection sequence shall consist of a *facility request* block, or an *address* block, or a *facility request* block followed by an *address* block, or a *facility registration/cancellation* block.

4.6.1.1 *Facility request block*

A *facility request* block shall consist of one or more *facility request* signals.

Multiple *facility request* signals shall be separated by character 2/12 (" , ").

A *facility request* signal shall consist of a *facility request* code and may contain one or more *facility* parameters. The *facility request* code, *facility* parameter and subsequent *facility* parameters shall be separated by character 2/15 (" / "). For an interim period the 2/15 (" / ") separator will not be used in some networks.

The end of a *facility request* block shall be indicated by character 2/13 (" - ").

The coding of *facility request*, indicator and parameter is provided in Annex F.

4.6.1.2 *Address block*

An *address* block shall consist of one or more *address* signals.

An *address* signal shall consist of either a *full address* signal or an *abbreviated address* signal.

Start of an *abbreviated address* signal shall be indicated by a prefix character 2/14 (" . ").

Multiple *address* signals shall be separated by character 2/12 (" , ").

4.6.1.3 *Facility registration/cancellation block*

A *facility registration/cancellation* block shall consist of one or more *facility registration/cancellation* signals.

A *facility registration/cancellation* signal shall consist of up to four elements in order: *facility request* code, *indicator*, *registration* parameter, *address* signal.