INTERNATIONAL TELECOMMUNICATION UNION

ITU-T U.203

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(03/93)

TELEGRAPH SWITCHING

INTERNATIONAL TELEX SERVICE

TECHNICAL REQUIREMENTS TO BE MET WHEN PROVIDING REAL-TIME BOTHWAY COMMUNICATIONS BETWEEN TERMINALS OF THE INTERNATIONAL TELEX SERVICE AND DATA TERMINAL EQUIPMENTS ON A PSPDN OR VIA THE PSTN

ITU-T Recommendation U.203

(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 U.203 was prepared by the ITU-T Study Group IX (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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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 U.203

TECHNICAL REQUIREMENTS TO BE MET WHEN PROVIDING REAL-TIME BOTHWAY COMMUNICATIONS BETWEEN TERMINALS OF THE INTERNATIONAL TELEX SERVICE AND DATA TERMINAL EQUIPMENTS ON A PSPDN OR VIA THE PSTN

(Helsinki, 1993)

The CCITT,

considering

(a) the increasing number of data terminal equipments (DTEs) connected to public data networks;

(b) the world-wide availability of the international telex service;

(c) the desirability of providing an appropriate mechanism whereby terminals of the international telex service can communicate with DTEs and vice-versa;

(d) that Recommendation F.60 gives the operational provisions for the international telex service and Recommendaiton F.69 gives the plan for telex destination codes;

(e) that Recommendation F.59 lists the essential characteristics of the international telex service;

(f) that Recommendation F.80 defines the basic requirements to be met for interworking relations between the international telex service and other services;

(g) that Recommendation F.83 defines the operational principles for communication between telex terminals and DTEs on a packet-switched public data network;

(h) that the U-Series Recommendations define the technical aspects of the telex service;

(i) that the classes of services, facilities and interfaces for data communication networks are defined in the relevant X-Series Recommendations, in particular, X.3, X.28, and X.29, defining the PAD function provided by a PSPDN, and X.25 defining the interface between a packet-mode DTE and PSPDN;

(j) that Recommedation X.121 defines the international numbering plan for public data networks,

unanimously declares the view

that the mechanisms to be provided to facilitate communication between telex terminals and data terminal equipments (DTEs) connected to a packet-switched public data network should be in accordance with this Recommendation.

Definitions

The following terms used in this Recommendation have the undermentioned definitions:

telex-packet interworking function (TPIWF): The Telex-Packet Interworking Function (TPIWF) is a functional unit which implements the requirement to allow bothway communication between telex terminals and packet-mode and character-mode data terminal equipments directly connected to a packet-switched public data network (PSPDN) or any identified DTE accessing the PSPDN in accordance with Recommendation X.28 or X.32. The method of implementation of any of the TPIWF functions in any physical unit is a national matter.

The functions of the TPIWF do not apply to interworking between telex and Telematic terminals, being the subject of other Recommendations.

TPIWF answerback: In the case of two-stage selection from the telex subscriber, the answerback which is returned in the first stage of selection and which uniquely identifies the destination TPIWF to the telex network.

registered DTE: In the case of one-stage selection, a DTE which has registered with the TPIWF for the initiation and reception of telex calls and which is assigned a telex number that is part of the telex national numbering plan for this purpose.

DTE answerback: In the case of one-stage selection, the answerback that is always returned to the telex network in response to a WRU signal and which uniquely identifies the registered DTE to the telex network.

DTE identification: In the case of two-stage selection, this is the DTE recall address.

real-time communication: The immediate transfer of information from a terminal connected to one network to a terminal connected to the other network subject only to the normal transmission delays and those imposed by the packetizing/depacketizing processes.

Abbreviations

DTE	Data Terminal Equipment
FAXIWF	Facsimile Interworking Function
PAD	Packet Assembler-Disassembler
PSPDN	Packet-Switched Public Data Network
PSTN	Public-Switched Telephone Network
SFU	Store-and-Forward Unit
TAED	Telex Automatic Emitting Device

1 Introduction

1.1 Scope

The procedures defined in this Recommendation enable telex subscribers to communicate with both packet-mode and character-mode data terminal equipments (DTEs) connected to a packet-switched public data network (PSPDN). Conversely, users of packet-mode and character-mode DTEs as well as character-mode DTEs accessing a PSPDN via the Public-Switched Telephone Network (PSTN), may communicate with telex subscribers.

1.2 Outline of operational principles

1.2.1 The operational procedures and full range of facilities available by this mode of interworking are described in Recommendation F.83.

1.2.2 Interworking shall be in real-time and support interactive communication, i.e. dialogue or conversational capability shall be possible.

1.2.3 Interworking capability shall be established by the provision of a Telex/Packet Interworking Function (TPIWF). The method of implementation of the TPIWF in any physical unit is a national matter.

1.2.4 At all stages of call set-up and subsequent connection, the TPIWF shall emulate a telex terminal to the telex network and a packet-mode DTE which supports X.29 procedures to the PSPDN.

1.2.5 In both the telex-to-PSPDN and PSPDN-to-telex directions, the point of interworking between the two networks shall be in the same country as the PSPDN, and therefore the international connection shall be via the telex network, as shown in Figure 1.

1.2.6 In the telex-to-PSPDN direction, both one-stage and two-stage selection procedures may be employed. The choice is a national matter and shall be at the discretion of the Administration operating the TPIWF.

1.2.7 This Recommendation does not apply to Telematic services that may be defined within other F-, T- and U-Series Recommendations. For example, interworking between telex terminals and DTEs connected to a PSPDN and which implement either Teletex or MHS protocols are defined in Recommendations U.201 and U.204 respectively.

1.2.8 This Recommendation does not make provision for a telex subscriber accessing a TPIWF to transit the associated PSPDN in order to access a DTE connected to another PSPDN situated in another country. This is left for further study.

1.2.9 Similarly, access to the TPIWF from a DTE connected to a foreign PSPDN in order to establish a connection to a telex subscriber in a third country is left for further study.

1.2.10 Access from a telex SFU to a two-stage TPIWF is left for further study.

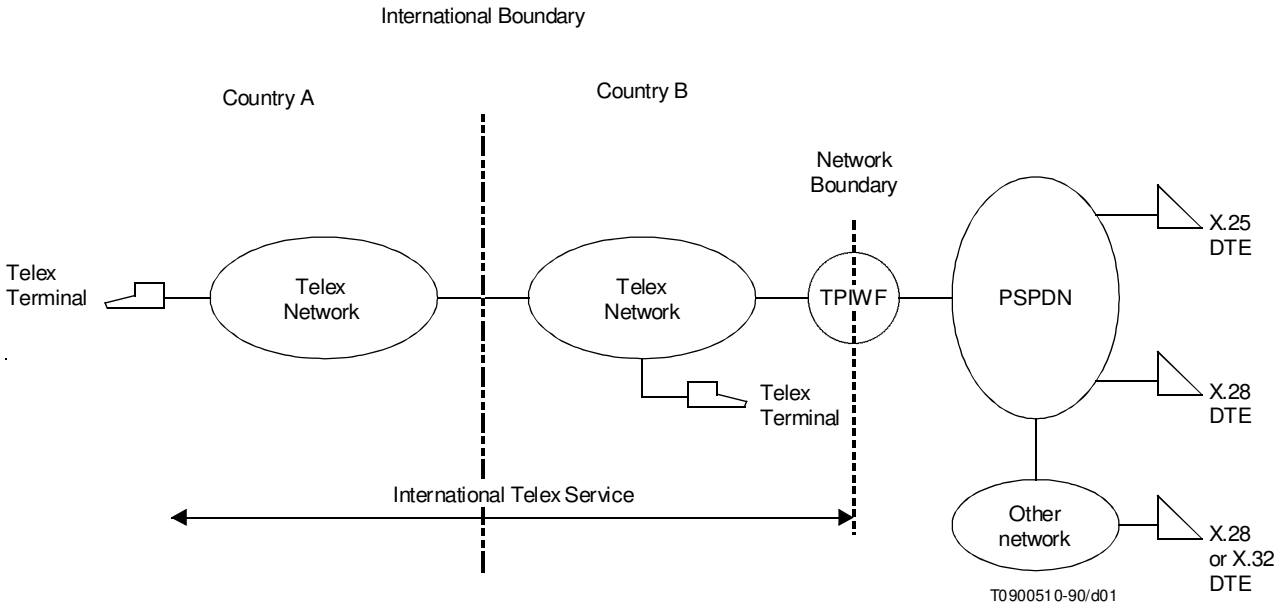


FIGURE 1/U.203

Basic model for interworking between telex terminals and DTEs connected to a PSPDN

1.3 Functions of the TPIWF

The TPIWF shall be responsible for the following functions:

- translation between telex signalling events and call progress signals within the PSPDN;
- receipt of characters from the telex network, and following conversion, packetizing them for forward transmission to the PSPDN;
- receipt of data packets from the PSPDN, depacketizing and converting the data for transmission as start-stop characters to the telex network;
- code conversion in accordance with Recommendation S.18, ensuring that the appropriate shift condition is maintained on the telex side:
- handling of WRU signals, answerbacks, ENQ and ACK characters;
- handling of received data packets with M-bit set;

– translation of received telex service signals into clearing cause codes and diagnostic codes for forwarding to the PSPDN;

– translation of received PSPDN clearing cause codes and diagnostic codes into telex service signals;

– handling of characters received on the backward path while forward transmission is in progress;

– processing of clearing signals from either network;

– packetizing in accordance with the prescribed conditions;

– relevant X.3, X.28 and X.29 procedures;

– predefined response to abnormal conditions.

1.4 Special provisions for the use of PAD service signals within the international telex service

To preserve the essential characteristics of the international telex service as detailed in Recommendation F.59, the use of service signals on the telex side of the TPIWF shall be in accordance with Recommendation F.60 and formatted in accordance with Recommendation U.1.

However, the use of PAD service signals in accordance with Recommendation X.28 is acceptable where they can be accomodated within the additional characters allowed in Recommendation U.1. Recommendation X.28 PAD service signals suitable for conversion are left for further study.

Exceptionally, the call connected PAD service signal and the incoming call PAD service signal is acceptable in the particular cases of a two-stage call from a telex subscriber and a call from the PSPDN to the international telex network respectively, (see Figure 3 and Figure 5).

2 Methods of interworking and addressable terminals

2.1 Considering

a) that Recommendation X.121 allows the use of up to 11 digits in the PSPDN Network Terminal Number/National Number;

b) that Data Network Identification Codes defined in Recommendation X.121 consist of four digits;

c) that signalling on telex trunks operating in accordance with Recommendations U.11 or U.12 allow a maximum of 12 digits to be forwarded,

then the following methods of accessing the TPIWF from the telex network may be employed, *viz*:

1) interworking with one-stage selection;

2) interworking with two-stage selection.

2.2 The method of accessing the TPIWF across the PSPDN from any DTE shall be in accordance with the relevant X-Series Recommendations.

2.3 The following DTE types may initiate calls via the TPIWF into the telex network:

– packet-mode DTEs connected to a PSPDN by dedicated circuit in accordance with Recommendations X.25 and X.29;

– packet-mode DTEs accessing the PSPDN in accordance with Recommendation X.32;

– character-mode DTEs connected to a PSPDN by dedicated circuit in accordance with Recommendation X.28;

– character-mode DTEs accessing a PSPDN across the PSTN in accordance with Recommendation X.28;

These possibilities are shown in Figure 1.

2.4 Because of addressing requirements within the PSPDN, only the following DTEs may receive telex calls:

- packet-mode DTEs connected to a PSPDN by dedicated circuit in accordance with Recommendations X.25 and X.29;
- packet-mode DTEs accessing the PSPDN in accordance with Recommendation X.32;
- character-mode DTEs connected to a PSPDN by dedicated circuit in accordance with Recommendation X.28;
- character-mode DTEs accessing a PSPDN across the PSTN in conformance with Recommendation X.28, this case being for further study.
- delivery of telex messages to an X.28 dial-up DTE using a store-and-retreive method (i.e. an X.28 DTE accessing the PSPDN across the PSTN) is defined in Recommendation U.205.

2.5 This Recommendation applies to user classes 8-13 and 20-23 as defined in Recommendation X.1.

2.6 Categories of access for DTEs accessing the PSPDN are defined in Recommendation X.10.

3 Access from the telex network to the PSPDN

Two basic access procedures for access from a telex terminal should be provided by the TPIWF:

a) *Interactive operation*

- input from manual calling terminals where the TPIWF may return prompt signals.

b) *Non-interactive operation*

- input from telex automatic emitting devices where prompt signals may not be required;
- interworking with other types of IWF (e.g. FAXIWF),

  (see Recommendation U.200)
- interworking with a telex SFU.

3.1 One-stage selection

In the one-stage selection procedure, the DTE is assigned a telex number that is part of the national telex numbering plan. Figure 2 shows the recommended access procedures.

3.1.1 Call establishment

3.1.1.1 The originating telex subscriber shall select the required DTE using normal telex procedures.

3.1.1.2 The telex number received by the TPIWF shall be verified as being proper to a registered DTE. The method of effecting this verification is a national matter. If the verification fails, the TPIWF may clear backwards with the service signal NP.

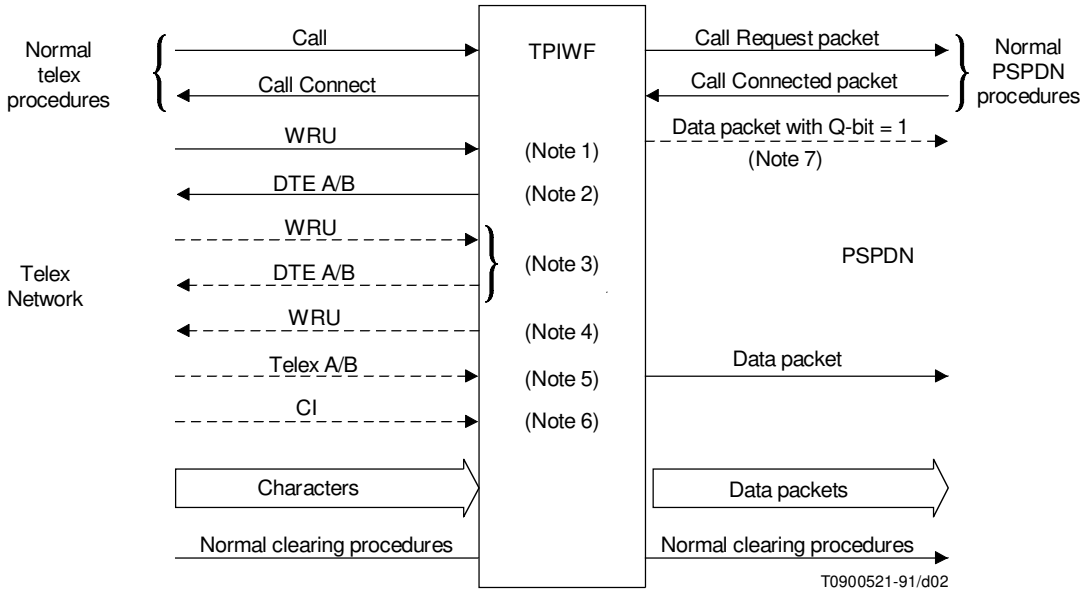
3.1.1.3 Having verified the received telex number, the TPIWF shall forward a call request packet to the PSPDN.

3.1.1.4 The procedures for call establishment within the PSPDN shall be in accordance with the relevant X-Series Recommendations.

3.1.1.5 If the call is accepted by the called DTE, the PSPDN shall return a call connected packet to the TPIWF which shall convert this on the telex side to a call connect signal for transmission across the telex network to the originating telex subscriber.

If the call is not accepted by the DTE or the PSPDN, as indicated in the clear indication packet received from the PSPDN, the TPIWF may return the appropriate service signal in accordance with Recommendation U.70 and formatted in accordance with 10.1/U.1 and Table 1b, to the originating telex subscriber followed by the clearing signal.

3.1.1.6 The DTE answerback shall be returned to the calling telex subscriber in accordance with Recommendation S.6. The format of the answerback shall be in accordance with Recommendation F.74.



NOTES

1 This is the normal WRU signal transmitted to a telex terminal following receipt of the call connect signal by the network.

2 The DTE answerback shall be transmitted in accordance with Recommendation S.6 and 5.1.1.

3 The TPIWF shall be prepared to accept a WRU signal from the calling telex subscriber at any stage following call connect and shall always reply with the DTE answerback.

4 In accordance with Recommendation S.23, a WRU signal may be transmitted 800 ms after the transmission of the DTE answerback if the forward path from the telex network remains idle. An additional WRU should be transmitted if there was no response to the first.

5 The first 20 characters received should be regarded as the calling telex answerback and should immediately be sent to the PSPDN as an individual data packet as an early indication that the call is from a telex subscriber, irrespective of the prescribed packet-forwarding conditions. Therefore, within the telex network, it is especially important that the provisions of 7.9/U.1, be applied. The question of attaching a "calling herald" to this first telex answerback is a national matter. [Such a calling herald, with the telex answerback attached, could take the form:

Incoming telex call via TPIWF ..... (Herald)
32266 TDS EI» ..... (Calling telex answerback)
The language to be used is a national matter.]

6 Indicates that the call is from a telex automatic emitting device and requires no action by the TPIWF.

7 Data packet with Q-bit set to 1, optionally transmitted to set the remote PAD parameters (see 4.4).

FIGURE 2/U.203

Call set-up in the telex-to-PSPDN direction (case of one-stage selection)

3.1.1.7 If the call originates from a telex automatic emitting device, the calling telex subscriber should indicate this by commencing the procedure with the non-interactive service request (CI).

3.1.1.8 If continuous text is received by the TPIWF after the return of the DTE answerback or following receipt of the CI sequence, the TPIWF shall enter the text transfer phase and forward all received telex characters in data packets to the PSPDN in accordance with the packet forwarding conditions in use by the TPIWF (see 3.3).

3.1.1.9 It should be noted that, in the one-stage selection procedure, it is not possible for the calling telex subscriber to indicate his telex address in the call request packet sent to the PSPDN (see 3.2.4). Consequently, the calling DTE address, transmitted to the PSPDN in the call request packet will generally be the PSPDN address of the TPIWF. This will depend on the national implementation of the TPIWF.

3.2 Two-stage selection

3.2.1 General

3.2.1.1 In the two-stage selection procedure, the called DTE address is given in a second stage of selection after a telex connection has been established between the originating telex subscriber and the TPIWF.

3.2.1.2 The originating telex subscriber shall use normal telex procedures to access the TPIWF which shall be allocated a telex number that is part of the telex national numbering plan of the country in which the TPIWF is located.

3.2.1.3 The procedures to be followed shall be in accordance with Figure 3.

3.2.1.4 The procedures to be followed when a WRU signal is received shall be in accordance with 5.1.2.

3.2.2 Determination of the calling telex address

This requirement is optional at the discretion of the Administration operating the TPIWF but is nevertheless considered to be desirable. If these procedures are not implemented, the TPIWF will indicate to the called DTE that the call is originated by a telex terminal/TPIWF, by forwarding the answerbacks of the calling telex terminal and of the TPIWF in accordance with the relevant X-Series Recommendations.

3.2.2.1 If provided as a capability the TPIWF shall determine the calling telex address from the received telex answerback in accordance with the rules laid down in Recommendation U.74.

3.2.2.2 If the calling telex address cannot be determined, the TPIWF shall forward the answerback of the calling telex subscriber as received, and of the TPIWF in the call user data in the call request packet sent to PSPDN.

3.2.2.3 If the calling telex address can be determined from the received telex answerback, it shall be placed by the TPIWF in the calling DTE address field of the call request packet in accordance with Recommendation X.25.

The format to be used shall be in accordance with the relevant X-Series Recommendations.

3.2.3 Input of the DTE address by the telex subscriber

3.2.3.1 In the second stage of selection, it will be necessary for the calling telex subscriber to input the address of the required DTE.

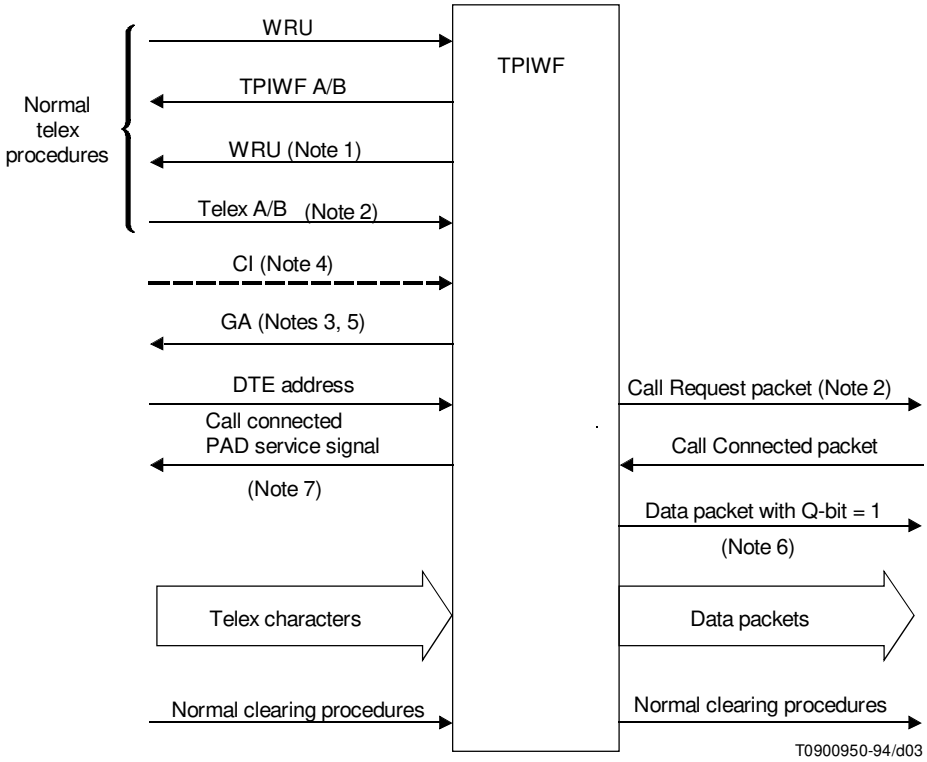
3.2.3.2 The TPIWF shall be capable of receiving and correctly interpreting selection information of the general form shown in Figure 4.

3.2.4 Possible use of call user data

3.2.4.1 The originating telex subscriber may, depending on the requirements of the called DTE, input call user data. The TPIWF shall be capable of receiving and processing this call user data by implementing PAD functions in accordance with Recommendations X.3, X.28 and X.29. Call user data shall consist of a maximum of 12 alphanumeric characters and shall be placed by the TPIWF in octets 5-16 of the call user data field of the call request packet sent to the PSPDN.

3.2.4.2 The originating telex subscriber may optionally, as call user data, include his calling telex address, up to a maximum of 12 characters.

This will be delivered to the called DTE in octets 5-16 of the call user data field of the incoming call packet.



NOTES

1 In accordance with Recommendation S.23, this WRU signal may be transmitted 800 ms after transmission of the TPIWF answerback if the backward path remains idle.

2 When the calling telex subscriber's answerback is not processable in accordance with Recommendation U.74, the received telex answerback shall be forwarded to PSPDN as call user data in the Call Request Packet.

3 The prompt GA shall be transmitted three seconds after detection of the processable answerback if the backward path remains idle.

4 Indicates that the call is from a telex automatic emitting device and requires no action by the TPIWF.

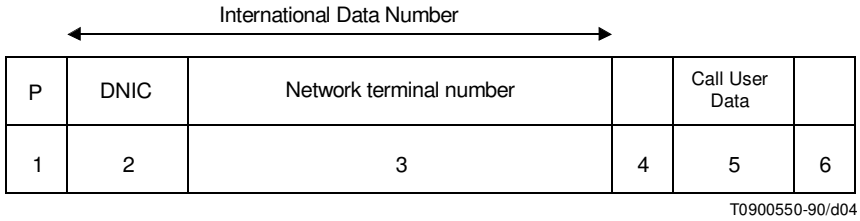
5 The prompt GA is not sent if CI has been received.

6 Control information data packet optionally transmitted to set the remote PAD parameters (see 4.4).

7 This is the call connected PAD service signal, possibly including the DTE identification.

FIGURE 3/U.203

Telex access procedures to TPIWF with two-stage selection (applicable to either manual terminal or TAED)



Field 1	Optional prefix, the use of which is a national matter determined by the Administration which operates the TPIWF.
Field 2	Data network identification code in accordance with Recommendation X.121.
Field 3	Network terminal number consisting of up to ten digits in accordance with Recommendation X.121. This may also contain any required sub-addressing digits.
Field 4	Delimiter in accordance with Recommendation X.28. This field is mandatory only if Field 5 is used.
Field 5	Call user data in accordance with Recommendation X.28. This field is optional depending on the requirements of the destination DTE which may demand the use of the appropriate call user data before an incoming call packet will be accepted. This field may consist of up to 12 alphanumeric characters, as required by the destination DTE (see 3.2.4).
Field 6	End-of-selection signal (+).

FIGURE 4/U.203

General format of selection information input by the telex subscriber (second stage)

3.2.4.3 It is at all times the responsibility of the originating telex subscriber to be aware of the requirements of the destination DTE in respect of sub-addressing and the use of call user data.

3.2.5 Having received the addressing information from the telex subscriber, the TPIWF shall forward a call request packet to the PSPDN. The procedures for call establishment within the PSPDN shall be in accordance with the relevant X-Series Recommendations.

3.2.6 If the call can be successfully established through the PSPDN, the TPIWF shall return to the telex terminal a connected PAD service signal, as defined in Recommendation X.28. This connected PAD service signal may contain the called DTE address as specified in 3.5.2.1/X.28.

If the call cannot be successfully established through the PSPDN, the TPIWF will act as described in 7.3.

3.2.7 Where it can be determined by the TPIWF that the addressed DTE is a character-mode terminal operating in accordance with Recommendation X.28 (e.g. by numbering plan), in order to allow for the possibility of an error-free conversational capability, the TPIWF shall preferably at this stage forward a data packet with Q-bit set to 1 to the PAD controlling the X.28 character-mode terminal to set an adequate profile to ensure compatibility with the international telex service (see 4.4).

3.2.8 The TPIWF shall then enter the data transfer phase.

3.2.9 During the PSPDN call establishment phase, the TPIWF may clear the telex call if the connection through the PSPDN is impossible to establish. Alternatively, the TPIWF may choose not to clear the telex call but to allow the telex user to set up another PSPDN call, possibly to another DTE. The choice between the two alternatives is a network option.

3.2.10 The reaction to abnormal conditions encountered during call establishment shall be handled in accordance with clause 9.

3.3 Data transfer phase – Packet forwarding conditions

3.3.1 In the text transfer phase, ITA2 characters received by the TPIWF from the telex network shall be converted, assembled into packets and transmitted to the PSPDN in accordance with the packet forwarding conditions employed by the TPIWF.

3.3.2 Code conversion between ITA2 and IA5 shall be in accordance with Recommendation S.18.

3.3.3 The packet forwarding conditions employed by the TPIWF are those described in Recommendations X.3, X.28 and X.29. They depend on the setting of various PAD parameters. The initial profile for these parameters is given in Table 1.

Moreover, the following other conditions are specific to the TPIWF:

- reception of an ENQ character in a data packet (see 5.2.1);
- answerback received from the telex terminal in response to an ENQ character (see 5.2.1).

3.3.4 Reception of a WRU signal from the telex network at any stage during the text transfer phase shall cause the return of the appropriate answerback sequence in accordance with clause 5.

3.3.5 The amount of storage to be provided in the TPIWF should be consistent with the requirement to maintain the quality of the international telex service (see clause 9.1.5.1).

3.3.6 The procedures to be followed when abnormal conditions are encountered in the text transfer phase of the call are described in clause 9.

4 Access from the PSPDN to the telex network

4.1 Call establishment

4.1.1 The types of DTE listed in 2.4 may initiate calls towards the TPIWF for the purpose of establishing a connection with a telex subscriber.

4.1.2 It should be noted that some PSPDN providers may implement schemes which, among other things, limit the duration an X.28 dial-in DTE may be connected to the network awaiting the return of the connected PAD service signal. If exceeded, the call attempt will be cleared. Consequently, if such a DTE initiates a call attempt to a telex destination which does not return the call connect signal within the timeout period, then all call attempts to this destination will fail. For example, the T11 timeout of 180 seconds defined in Table D.1/X.25 should be sufficient.

Administrations should therefore make the appropriate national procedures available to dial-up DTEs which will enable such DTEs to make telex calls to those destinations which do not return the call connect signal within the defined timeout period for the return of the connected PAD service signal.

4.1.3 Because of the special procedures applied to the handling of WRU signals and answerback sequences, it is therefore necessary that calling DTEs which are themselves accessed from the telex side using one-stage selection should be registered with the TPIWF for the purpose of initiating telex calls. If a non-registered DTE attempts to establish a telex call, the TPIWF shall reject the call attempt. The procedures to be applied shall be in accordance with the relevant X-Series Recommendations.

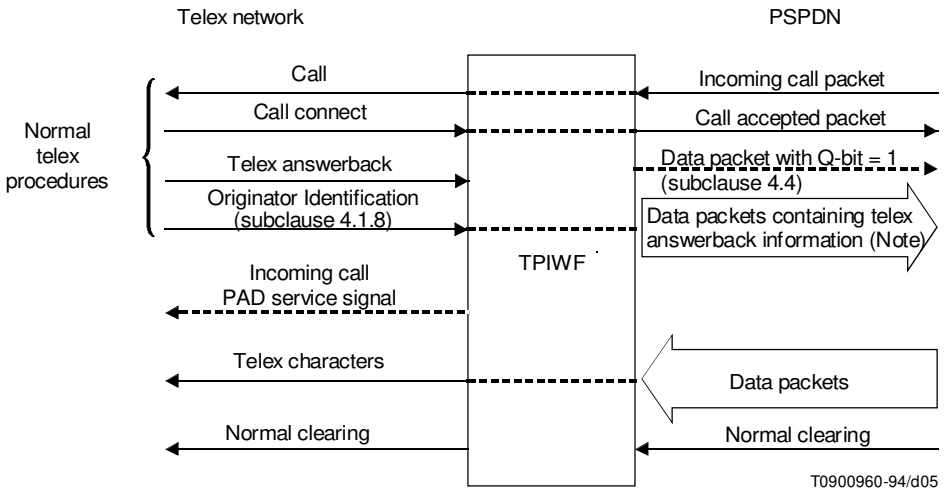
Conversely, when the TPIWF operates in accordance with two-stage selection on the telex side, any of the DTEs listed in 2.3 may initiate a telex call.

4.1.4 Call establishment from the calling DTE across the PSPDN to the TPIWF shall be in accordance with the relevant X-Series Recommendations.

4.1.5 The TPIWF shall use the telex selection information contained in the incoming call packet received from the PSPDN to establish the telex call using normal telex procedures and in accordance with Figure 5.

4.1.6 Receipt of the call connect signal from the telex network shall cause the TPIWF to forward a call accepted packet through the PSPDN.

4.1.7 The handling of the received telex answerback shall be in accordance with the relevant U- and X-Series Recommendations. However, it is recommended that the following procedures be adopted in respect of handling of the received telex answerback.



NOTE – In some networks, these are generated in response to an ENQ character during the data transfer phase.

FIGURE 5/U.203

PSPDN-to-telex access procedures

Normally, the TPIWF should receive the answerback of the called telex subscriber within two seconds of receipt of the call connect signal. However, some telex networks may associate date and time information, and other information, with this answerback. The TPIWF shall therefore handle the received answerback in the following way:

a) The TPIWF shall monitor for the receipt of 20 characters at automatic speed. If additional characters are not received within a period of 800 ms, then the received 20 characters shall be regarded as the answerback of the called telex subscriber and shall be sent in a data packet to the PSPDN in accordance with the packet forwarding conditions employed by the TPIWF.

b) If more than 20 characters are received, then these should be accepted up to a maximum of 128 characters and forwarded in accordance with the packet forwarding conditions employed by the TPIWF.

c) If more than 128 characters are received, this will be regarded as an abnormal condition and handled in accordance with 9.3.

Other procedures may also be employed on a national basis.

4.1.8 Following receipt of the answerback of the called telex subscriber, the TPIWF shall forward either:

– the DTE answerback, where the TPIWF in the reverse direction uses one-stage selection; or

– the TPIWF answerback, where the TPIWF in the reverse direction uses two-stage selection and the PSPDN does not provide the calling DTE address in the incoming call packet; or

– the DTE identification, where the TPIWF in the reverse direction uses two-stage selection and the PSPDN has provided the calling DTE address in the incoming call packet.

Alternatively, as a network option, the TPIWF may respond with its own answerback.

In the latter two cases, the TPIWF may furthermore send a herald before entering the text transfer phase, such a herald to contain any necessary additional information to assist the called telex subscriber in recalling the originator.

4.1.9 The TPIWF shall then enter the text transfer phase.

4.1.10 Abnormal conditions encountered during call establishment shall be handled in accordance with clause 9.

4.2 Text transfer phase

4.2.1 Data packets received by the TPIWF from the PSPDN shall be disassembled and forwarded as telex characters to the telex network.

4.2.2 Code conversion from IA5 to ITA2 shall be in accordance with Recommendation S.18.

4.2.3 The PAD parameters of the TPIWF shall be set in order to ensure compatibility with the characteristics of the international telex service and are described in Table 2.

4.2.4 The procedures to be followed when abnormal conditions are encountered during the text transfer phase shall be in accordance with clause 9.

4.3 Reaction of TPIWF to data packets with M-bit set

It is recommended that the TPIWF ignore the M-bit setting as it has no relevance to telex, depacketize the data and forward the characters to the telex network in the normal way. Recommendation X.29 gives further details.

4.4 Setting of PSPDN PAD parameters by TPIWF

There is benefit to be gained if the TPIWF indicates to the remote PAD an adequate profile for successful intercommunication between the DTE and the telex terminal. The method to achieve this in conformance with Recommendations X.28 and X.29 is left for further study. It is recommended that, as a minimum, the following packet-forwarding conditions be set in the remote PAD:

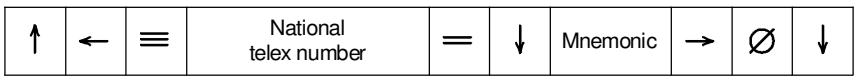
- idle timer < 1 second (X.3 parameter No. 4)
- ENQ]
- BEL] (X.3 parameter No. 3).

The parameters will be optionally set through the use of a data packet with Q-bit set to 1 in accordance with Figures 2, 3 and 5. The method of implementation shall be in accordance with the relevant X-Series Recommendations.

5 WRU and answerback processing

5.1 Call established from the telex network to the PSPDN

5.1.1 In the case of one-stage selection, the answerback sequence to be returned to the calling telex subscriber at any stage of the call shall be the DTE answerback formatted in accordance with Recommendation F.74 and Figure 6.



T0900570-90/d06

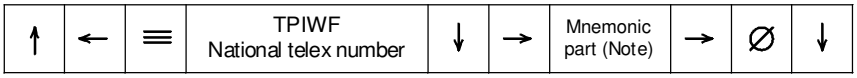
where Φ is the telex network identification code in accordance with Recommendation F.69,
e.g. 33620 = TDS EI.

FIGURE 6/U.203

Format of DTE answerback (case of one-stage selection)

5.1.2 In the case of two-stage selection, two different answerback formats are relevant depending on the phase of the call.

5.1.2.1 During the first stage of selection only, the TPIWF shall respond to a received WRU from the telex network by returning the TPIWF answerback. The format of this answerback sequence shall be in accordance with Recommendation F.60 and Figure 7.



T0900580-90/d07

where Φ is the telex network identification code in accordance with Recommendation F.69, e.g. 180 TPIWF EI.

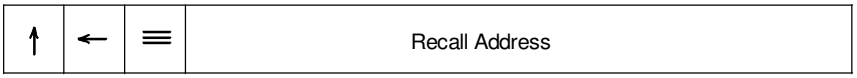
NOTE – The mnemonic part is normally TPIWF. However, where the national number plus the telex network identification code consists of more than seven digits, the mnemonic part must be reduced.

FIGURE 7/U.203

Format of TPIWF answerback

5.1.2.2 Following the receipt of the call connected packet from the PSPDN and throughout the data transfer phase of the call, the answerback sequence returned to the calling telex subscriber in response to a received WRU signal should be either the DTE identification (see Figure 8) or the TPIWF answerback (see Figure 7). The choice between both possibilities depends on the TPIWF implementation.

When the called DTE address is contained in the call connected packet, it shall be translated by the TPIWF into the DTE identification which shall be formatted in accordance with Figure 8.



T0900590-90/d08

FIGURE 8/U.203

Format of DTE identification

5.1.3 Any WRU signal received in the data transfer phase should not be converted (to ENQ) or forwarded to the PSPDN.

5.1.4 The answerback sequence should only be returned to the telex network when all outstanding data have been transmitted to the PSPDN in accordance with the appropriate packet forwarding conditions.

5.2 Call established from PSPDN to the telex network

5.2.1 The DTE may verify connection to the correct telex terminal by forwarding the IA5 character ENQ as part of a data packet. This shall be converted by the TPIWF into the WRU signal (ITA2 combination 30 + combination 4) and forwarded to the telex network to trigger the answerback of the called telex subscriber.

The TPIWF shall forward all outstanding characters to the telex network before transmission of the WRU. The first 20 characters received shall be regarded as the requested telex answerback and forwarded by the TPIWF in a single data packet containing only this answerback.

5.2.2 It is the responsibility of the calling DTE to take whatever action is deemed necessary if no answerback is returned in response to the ENQ character.

5.2.3 The DTE may request the TPIWF to forward the appropriate answerback to the telex network by the use of the ACK character. This shall be interpreted by the TPIWF as being equivalent to the telex "Here Is" feature and shall forward one of the following answerback sequences:

- where the TPIWF in the reverse direction uses one-stage selection, it shall return the DTE answerback;
- where the TPIWF in the reverse direction uses two-stage selection, the DTE identification, or the TPIWF answerback, as appropriate, shall be returned.

Neither of these answerback sequences should be returned until all outstanding characters have been transmitted to the telex network.

6 Clearing procedures

Clearing of an established connection may be initiated from within either the international telex network or the PSPDN.

6.1 Clearing initiated within the PSPDN

6.1.1 For the purpose of this Recommendation, clearing procedures within the PSPDN shall be in accordance with the relevant X-Series Recommendations.

6.1.2 However, irrespective of the method of clearing employed within the PSPDN, it is recommended that the TPIWF be organized so that all outstanding characters are forwarded to the telex network in advance of the clear signal.

NOTE – It should be recognized that administrations may have no control over the clearing methods used by any DTE connected to the PSPDN and there is, therefore, a consequential risk of loss of data with some clearing methods.

6.1.3 Where the call has been initiated by the telex subscriber but is cleared within the PSPDN, the TPIWF shall transmit the clear signal to the telex network, unless a follow-on call is allowed by the TPIWF and requested by the telex terminal.

NOTE – Some further study of procedures to achieve this facility is necessary.

6.1.4 It is at the discretion of the DTE to invoke a follow-on call within the PSPDN in accordance with Recommendation X.28.

6.2 Clearing initiated within the telex network

6.2.1 Whenever the TPIWF receives the clear signal from the telex network, it shall at all times packetize all outstanding characters and send these in data packets to the PSPDN followed by the clearing procedure in accordance with national requirements. The clear confirmation signal shall be returned to the telex network in accordance with the relevant U-Series Recommendations.

6.2.2 The TPIWF should operate in such a manner as to ensure that all outstanding telex characters are forwarded within data packets to the PSPDN without loss of information.

6.2.3 If the TPIWF receives the clear signal from the telex network during character transmission to the telex network, the call shall be cleared towards the PSPDN in accordance with national requirements. The TPIWF shall also return the clear confirmation signal to the telex network in accordance with the relevant U-Series Recommendations.

6.3 To illustrate a particular implementation of the above procedures, an example of a possible scheme for the handling of clearing conditions by the TPIWF is shown in Appendix I.

7 Ineffective call attempts

7.1 General

7.1.1 For call attempts initiated in the direction PSPDN-to-telex, the TPIWF shall be capable of receiving telex service signals constructed in accordance with Recommendation U.1 and translating these into the appropriate clearing cause codes for transmission to the PSPDN.

7.1.2 For call attempts initiated in the direction telex-to-PSPDN, the TPIWF shall be capable of recognizing any received clearing cause codes, and translating these into the appropriate telex service signal for return to the originating telex subscriber in accordance with the relevant U-Series Recommendations.

7.2 Ineffective calls within the telex network

7.2.1 From the viewpoint of the PSPDN, it is always the TPIWF which initiates clearing when a call attempt from the PSPDN-to-telex fails within the telex network.

Consequently, the clearing cause code generated by the TPIWF will depend on the way the TPIWF is connected to the PSPDN.

7.2.2 The particular telex service signal received may be translated into an appropriate diagnostic code and forwarded to the PSPDN along with the clearing cause code. The translation between telex service signals and diagnostic codes is for further study.

7.3 Ineffective calls within the PSPDN

7.3.1 Receipt of a clear request packet by the TPIWF from the PSPDN in response to a transmitted call request packet is an indication of failure of the call attempt within the PSPDN or refusal of the DTE to accept the call.

7.3.2 The received clear request packet shall contain the relevant clearing cause code and diagnostic code. These shall be translated by the TPIWF into telex service signals and returned to the originating telex subscriber in accordance with the relevant U-Series signalling Recommendations.

7.3.3 The translation between clearing cause code and telex service signals shall generally follow Recommendation U.70 and is given in Table 1. The received diagnostic code may be ignored.

Translation between the diagnostic code and the expanded form of the service signal in accordance with Recommendation U.45 is for further study.

7.3.4 If, during call establishment any abnormal condition is encountered on the interface between the TPIWF and PSPDN the incoming call attempt from the telex network shall be cleared with the service signal NC.

7.4 Appendix II contains an example of a possible scheme for the reaction of the TPIWF to ineffective calls within the telex network.

8 TPIWF PAD parameters

8.1 The TPIWF shall implement PAD functions in accordance with Recommendation X.3, see Table 2.

8.2 The desirability of allowing any DTE the ability to alter the value of any TPIWF PAD parameter is for further study.

8.3 Depending on the implementation of the TPIWF, it may be possible to alter the PAD parameters of the TPIWF from the telex side, but this is not advisable.

9 Abnormal conditions

9.1 Telex-to-PSPDN direction

9.1.1 Inter-character timeout during input of DTE address

If there is a delay in excess of 15 seconds at the start or during DTE address input in the case of two-stage selection, the TPIWF shall clear the call with the service signal NP.

TABLE 1/U.203

Translation between X.25 clearing cause codes and telex service signals

Clearing cause code (as per Recommendation X.25) (Note)		Telex service signal
DTE original	00) (80-FF)	DER
Number Busy	(01)	OCC
Out-of-Order	(09)	DER
Network Congestion	(05)	NC
Access Barred	(0B)	NA
Not Obtainable	(0D)	NP
Remote Procedure Error	(11)	DER
Local Procedure Error	(13)	NC
ROA Out-of-Order	(15)	NC
Invalid Facility Request	(03)	NP
Reverse Charging not Subscribed	(19)	NP
Fast Select Acceptance not Subscribed	(29)	NP
Incompatible Destination	(21)	NP
NOTE – Hexadecimal representation of Recommendation X.25 binary values.		

9.1.2 Receipt of national variants of telex characters

F, G, H in figure-case.

If ITA2 combinations 6, 7 or 8 are received by the TPIWF in figure case, the provisions of Recommendation S.18 shall apply. This is regarded as a national matter.

9.1.3 Receipt of "Bell" character

Receipt of ITA2 combination 10 in figure case shall be handled in accordance with Recommendation S.22.

9.1.4 TPIWF receives an "indication-of-break" PAD message

If the TPIWF receives an indication-of-break PAD message from the PSPDN, it shall attempt to flow control the calling telex terminal in accordance with Recommendation U.46. If the attempt is unsuccessful, the connection to the PSPDN shall be cleared by means of a clear request packet.

Any data packets which has been received from the PSPDN will be buffered until the result of the U.46 procedure is known. If unsuccessful, the data shall be discarded. If successful, the characters shall be transmitted to the telex network in the normal way, followed by the code expression BK and the clear signal.

9.1.5 Lack of storage capacity during telex input

9.1.5.1 If, for any reason, the TPIWF is not able to deliver data packets to the PSPDN in the normal way, these should be queued until the interface to the PSPDN again indicates that transmission of data packets may resume. However, because the TPIWF is designed to provide real-time communication, a limit should be placed on the amount of data that may be stored per call. The value of this limit is for further study.

TABLE 2/U.203

Proposed "Telex" profile for the PAD parameters of the TPIWF

X.3 Parameter	Value	Description
1	0	PAD recall is not possible
2	0	Echo mode set to "no echo"
3	126	Packet forwarding on CR, WRU, ENQ, BEL and LF
4	(Note 1)	Packet forwarding after idle time
5	0	No use of ancillary device control
6	1	Some PAD service signals sent to Telex Network (Note 2)
7	0	No reaction to "Break"
8	0	Normal data delivery
9	0	No padding after carriage return
10	69	Telex line length
11	10	Telex speed of 50 bit/s
12	0	No flow control by telex terminal (Note 3)
13	1	Line feed inserted after carriage return (Note 4)
14	1	150 ms delay after line feed

NOTES

1 Value to be determined as a national matter in the range 1-40. It should be further noted that the use of lower values in this range can affect the charging in the PSPDN.

2 Only clear indication PAD service signals with a direct telex equivalent should be transmitted (see Table 1), and formatted as per Recommendation U.1.

3 Flow control on the telex side between the telex terminal and the TPIWF shall be in accordance with Recommendation U.46 (see 9.3).

4 Some implementations may have the facility to detect a contiguous line feed, in which case the value of this parameter should be ignored.

9.1.5.2 If the queue size is exceeded, the TPIWF shall attempt to flow control the calling telex terminal in accordance with Recommendation U.46.

If unsuccessful, the connection to the telex network shall be cleared.

If successful, the TPIWF shall send the following text to the calling telex terminal:

"Delivered up to nn--nn"

where "nn--nn" are the last 20 characters which were successfully transmitted.

The connection to the telex network shall then be cleared following transmission of the code expression BK.

9.1.5.3 The procedure to be followed within the PSPDN as a result of these events shall be in accordance with the relevant X-Series Recommendations.

9.2 PSPDN-to-telex direction

9.2.1 The procedures to be applied to abnormal conditions encountered between the PSPDN and the TPIWF shall be in accordance with the relevant X-Series Recommendations.

9.2.2 If either a reset or restart packet is received from the PSPDN, the connection to the telex network shall be cleared. It should be recognized that a restart packet will clear down all logical channels on that particular interface.

9.2.3 The handling of received data packets with the D-bit set is for further study.

9.2.4 A telex terminal may attempt to stop the transfer of characters from the TPIWF in accordance with Recommendations F.60 and S.4 by transmitting a single or repetitive ITA2 combination 20, (letter T). The TPIWF should then cease transfer of characters to the telex terminal.

9.3 Flow control of the teleprinter

9.3.1 Some abnormal conditions will arise when it will be necessary for the TPIWF to attempt to flow control in accordance with Recommendation U.46, the transmission of characters from the telex terminal if data is not to be lost.

9.4 Detection of signals on the backward path during forward transmission – Counterwriting

9.4.1 For the purpose of this Recommendation, counterwriting is defined as the simultaneous reception and transmission of characters over the same telex line or the reception of data packets from the PSPDN while the TPIWF is receiving telex characters for forward transmission as data packets to the PSPDN.

9.4.2 Counterwriting from the telex network will be recognized in the following way.

9.4.2.1 A data packet has been received from the PSPDN and the TPIWF is in the process of forwarding telex characters to the telex network.

9.4.2.2 Characters are received from the telex network. The number of characters to be received before counterwriting is deemed to exist is a national matter.

9.4.2.3 If characters are received from telex during transmission to telex, but a state of counterwriting has not been reached, the received characters shall be stored and transmitted to the PSPDN when an idle condition is reached.

9.4.3 While recognizing that communication across the PSPDN is full duplex, interworking with the telex network (a half duplex network) means that the DTE may not freely transmit data if garbling within the telex network is not to occur. Accordingly, counterwriting within the PSPDN is recognized in the following way.

9.4.3.1 The TPIWF is in the process of receiving characters from the telex network for packetizing and forwarding to the PSPDN.

9.4.3.2 One or more data packets are received from the PSPDN.

9.4.4 The action to be taken by the TPIWF shall be similar to receipt of an indication-of-break packet and is described in 9.1.4.

Appendix I

Handling of clearing procedures by TPIWF

(This appendix does not form an integral part of this Recommendation)

I.1 General

While recognizing that the procedures to be applied at the interface between the TPIWF and the PSPDN shall be as described in the relevant X-Series Recommendations, this appendix contains an example of one possible method of operation for the TPIWF in relation to the handling of clearing signals. Other methods of implementation may also be available.

I.1.1 Clearing initiated by the DTE may take two forms:

a) generation of an invitation to clear PAD message in accordance with Recommendation X.29;

b) generation of a clear request packet in accordance with Recommendation X.25.

I.1.2 In the case of an invitation-to-clear PAD message from the DTE, the Q-bit will be set and the packets will be sequenced in an acceptable manner (from the telex viewpoint).

I.1.3 In the case of a clear request packet, this particular packet type has the property of by-passing all other packets in the sequence and there is a consequential risk of loss of data, i.e. the complete text may not be received by the telex subscriber.

I.1.4 It should be noted that some DTEs may not be able to respond to an invitation-to-clear PAD message with the correct clear request packet. In this situation, there is a risk of loss of data.

I.1.5 While the clearing procedures within the PSPDN shall be in accordance with the relevant X-Series Recommendations, in order to maintain the quality of the telex service, the use of the following procedures, or equivalent, is recommended.

I.2 Clearing initiated by PSPDN

I.2.1 The preferred method of clearing by the DTE is by the use of an invitation to clear PAD message in accordance with Recommendation X.29. In this particular case, the TPIWF shall reply with a clear request packet to the PSPDN after all outstanding characters have been transmitted to the telex network.

I.2.2 If, however, the DTE clears with a clear request packet and the PSPDN subsequently transmits a clear indication packet to the TPIWF, then the TPIWF shall discard all outstanding data and initiate clearing into the telex network.

These procedures are shown in Figure I.1.

NOTE – It is recognized that Administrations may have no control over the clearing method used by any DTE connected to the PSPDN and the above procedures may not be universally applicable.

I.2.3 If, during reception of characters from the telex network, the TPIWF receives either an invitation to clear PAD message or a clear indication packet from the PSPDN, it shall immediately transmit a clearing signal into the telex network and respectively return either a clear request packet or a clear confirmation packet to the PSPDN.

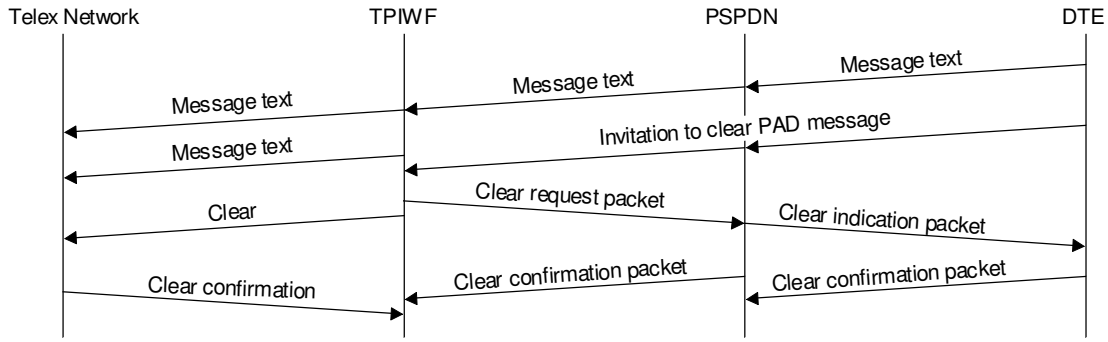
I.3 Clearing initiated from the telex network

I.3.1 Whenever the TPIWF receives a clear signal from the telex network, it shall at all times initiate clearing towards the PSPDN by forwarding an invitation to clear PAD message after all outstanding data packets have been transmitted to the PSPDN.

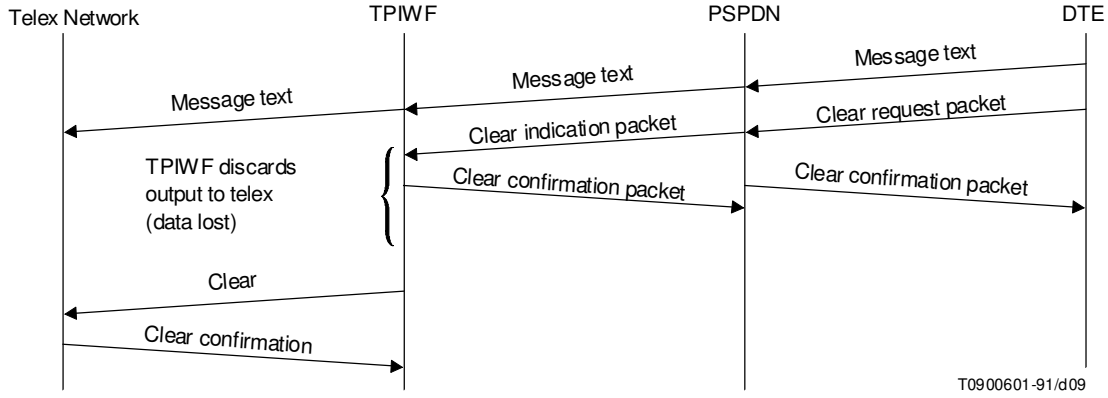
I.3.2 On the telex side, the TPIWF shall respond to a received clearing signal in accordance with the relevant U-Series signalling Recommendations.

I.3.3 If the TPIWF receives a clearing signal on the backward path during text transmission towards the telex network, the TPIWF shall clear the call towards the PSPDN with the appropriate clearing cause code and diagnostic code contained in the invitation to clear PAD message in accordance with the national requirements of the PSPDN.

I.3.4 Clearing procedures from the telex side are shown in Figure I.2.



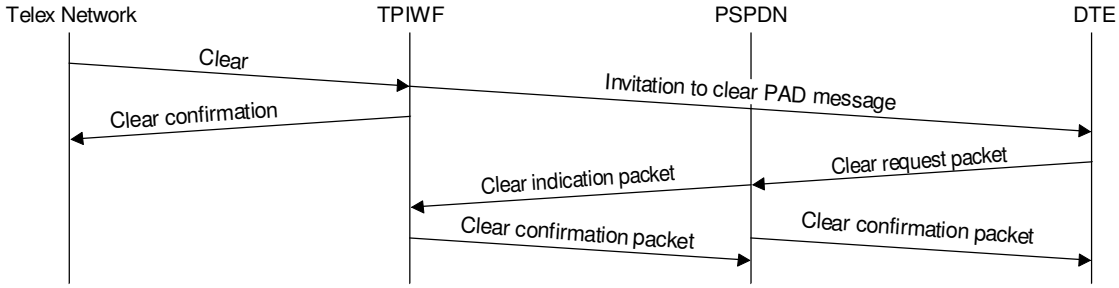
a) Invitation to clear PAD message from DTE



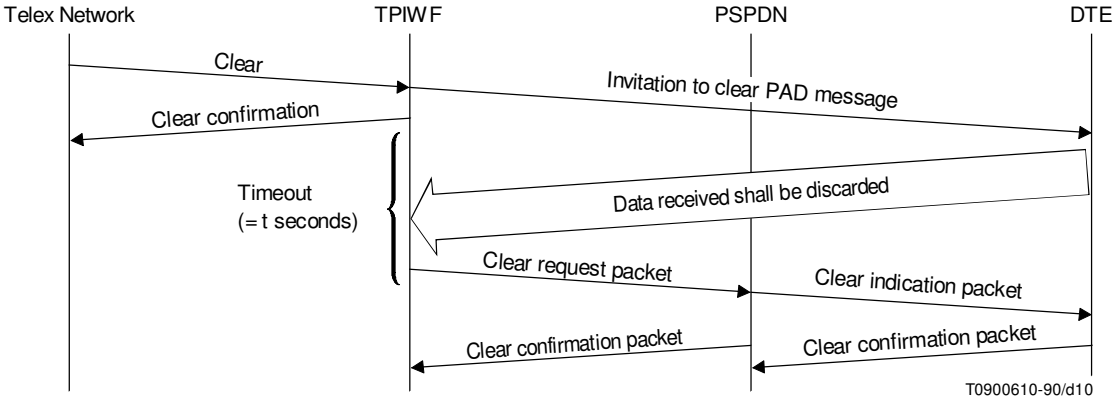
b) Clear request packet from DTE

FIGURE I.1/U.203

Clearing procedures initiated by the DTE



a) Normal clear from the telex network (DTE able to respond to invitation to clear PAD message)



b) Normal clear from telex network (DTE unable to respond to invitation to clear PAD message)

FIGURE I.2/U.203

Clearing procedures initiated from the telex network

Appendix II

Reaction by the TPIWF to ineffective call attempts within the telex network

(This appendix does not form an integral part of this Recommendation)

II.1 General

When interworking between the telex network and the PSPDN, in either direction, it will be necessary to make suitable provision for the handling of call attempts which fail in either network. This means that it will be necessary to be able to receive telex service signals and, in general, translate them into PSPDN clearing cause codes and diagnostic codes in accordance with national requirements. On the other hand, for calls which fail within the PSPDN, it will be necessary to translate the received cause code/diagnostic code and translate these into relevant telex service signals. As these service signals will be crossing national boundaries, it is necessary to standardize the translation as in Table 1 and 7.3.

II.2 Ineffective calls within the telex network

II.2.1 For call attempts which originate within the PSPDN and which subsequently fail within the telex network, the TPIWF will receive the appropriate telex service signal. However, from the viewpoint of the PSPDN, it is the TPIWF which clears the call and accordingly the clearing cause code will be set at 00.

II.2.2 Clearing herald for X.28 DTE

II.2.2.1 Because X.28 DTEs cannot interpret diagnostic codes and in order to maintain an acceptable Quality of Service, it is desirable to provide additional information to indicate why the call attempt has failed within the telex network. This may take the form of a "clearing herald" generated by the TPIWF and returned to the PSPDN when the source of the call is an X.28 DTE. Other methods may also be possible.

II.2.2.2 Where such a herald is provided, it is recommended that it follow one of the following formats:

a) it may include the text of the received service signal, as received; or

b) it may include the following text:

"Call failed in telex network, diagnostic code = XXX"

where XXX is the diagnostic code into which the service signal would have been translated if the calling source had been an X.25 DTE. The definition of the translation between service signals and diagnostic codes shall be in accordance with the relevant X-Series Recommendations.

The latter format is preferred as the same diagnostic codes will then be used for all DTEs.

II.2.2.3 In order to implement this scheme, it will be necessary for the PSPDN to provide a "calling source indicator" to the TPIWF in the call request packet. The method of implementing this shall be in accordance with the relevant X-Series Recommendations.

It will also be necessary for the TPIWF to buffer the received service signal, send a call accepted packet to the PSPDN, followed by the text of the clearing herald (as data) and terminate with an invitation to clear PAD message. These procedures are shown in Figure II.1.

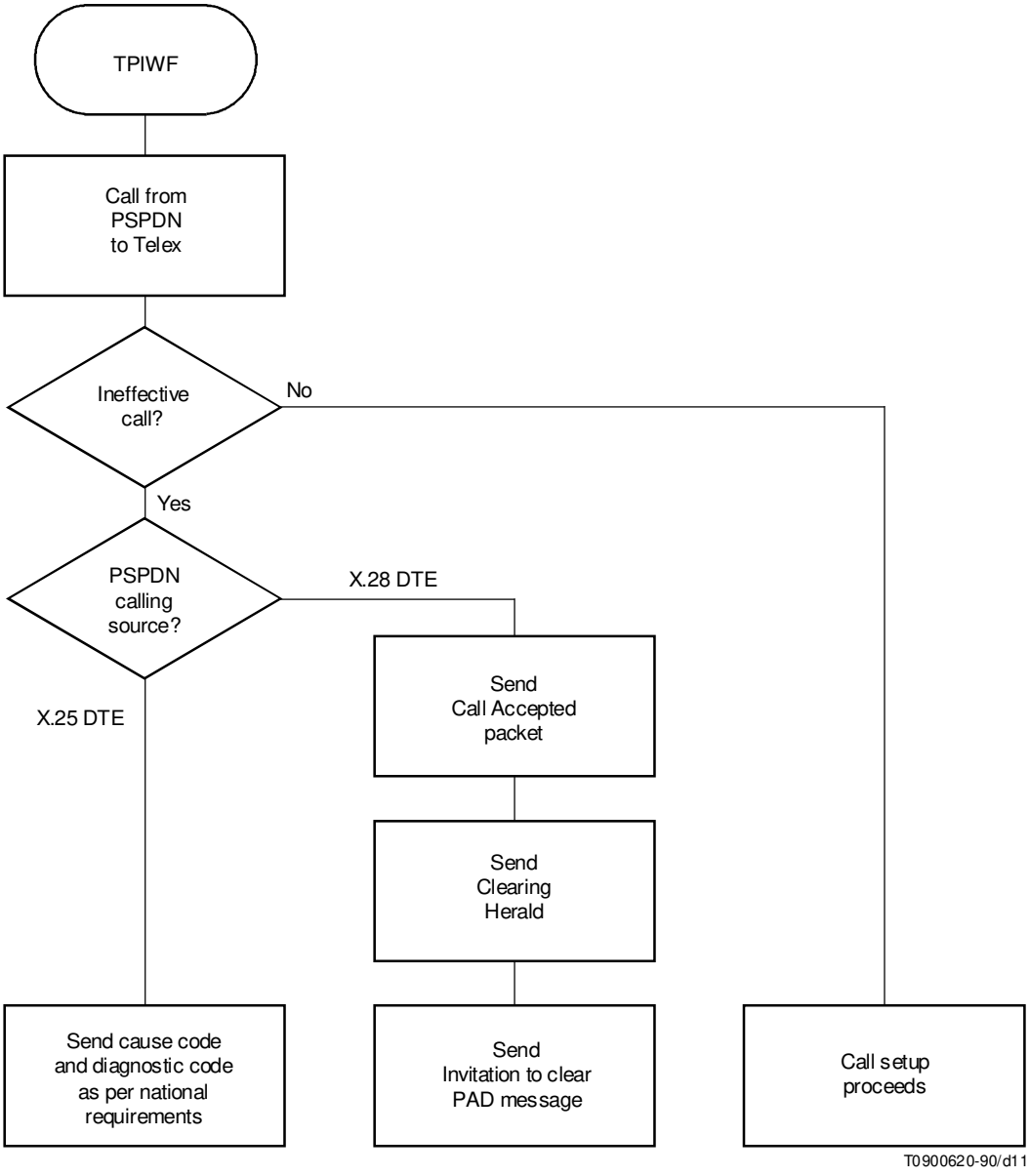


FIGURE II.1/U.203

Handling of received telex service signals by the TPIWF

Access from the PSPDN to the telex network, 10

Access from the telex network to the PSPDN, 5

Call established from PSPDN to the telex network, 13

Call established from the telex network to the PSPDN, 12

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Determination of the calling telex address, 7

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Inter-character timeout during input of DTE address, 15

Lack of storage capacity during telex input, 16

Methods of interworking and addressable terminals, 4

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Receipt of national variants of telex characters, 16

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