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SERIES X: DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

Public data networks – Services and facilities

Packet assembly/disassembly facility (PAD) in a public data network

ITU-T Recommendation X.3

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION X.3

PACKET ASSEMBLY/DISASSEMBLY FACILITY (PAD) IN A PUBLIC DATA NETWORK

Summary

This Recommendation describes the functions performed by, and operational characteristics of, the PAD for the start-stop mode DTE. It provides the operation of the PAD depending on the possible values of PAD parameters. This revision includes a new parameter for the selection of the default packet size and additional PAD service and command signals for Chinese extended dialogue mode.

Source

ITU-T Recommendation X.3 was revised by ITU-T Study Group 7 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 31 March 2000.

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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As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

PACKET ASSEMBLY/DISASSEMBLY FACILITY (PAD) IN A PUBLIC DATA NETWORK

(revised in 2000)

Scope

The establishment in various countries of public data networks providing packet switched data transmission services creates a need to produce standards to facilitate access from the public telephone network, circuit switched public data networks and leased circuits.

The ITU-T,

considering

a) that Recommendations X.1 and X.2 define the user classes of service and user facilities in public data networks, Recommendation X.96 defines call progress signals, Recommendation X.29 defines the procedures between a packet assembly/disassembly facility (PAD) and a packet mode DTE or another PAD, Recommendation X.28 defines the DTE/DCE interface for a start-stop mode DTE accessing the PAD;

b) that the logical control links for packet switched data transmission services are defined in Recommendation X.92, and that in particular Recommendation X.92 allows for the incorporation of a PAD;

c) the urgent need to allow interworking between a start-stop mode DTE on a public switched telephone network, a public switched data network or leased circuit, and a packet mode DTE or another start-stop mode DTE using the virtual call facility of the packet switched data service;

d) that DTEs operating in the start-stop mode will send and receive network control information and user information in the form of characters or the break signals;

e) that DTEs operating in the packet mode will send and receive network control information and user information in the form of packets in accordance with Recommendation X.25;

f) that the packet mode DTE shall not be obliged to use the control procedures for PAD functions, but that some packet mode DTEs may wish to control specific functions of the PAD,

recommend

1) that the functions performed by, and operational characteristics of, the PAD for the start-stop mode DTE are described below in clause 1, *Description of the basic functions and user selectable functions of the PAD*;

2) that the operation of the PAD for the start-stop mode DTE should depend on the possible values of internal variables known as PAD parameters which are described below in clause 2, *Characteristics of PAD parameters*;

3) that the PAD parameters for the start-stop mode DTE and their possible values should be those which are listed below in clause 3, *List of PAD parameters and possible values*;

4) that the PAD features described in clauses 1, 2 and 3 could be expanded by future studies to allow interworking with non packet mode DTEs other than start-stop mode DTEs.

1 Description of the basic functions and user selectable functions of the PAD

1.1 The PAD performs a number of functions and exhibits operational characteristics. Some of the functions allow either or both the start-stop mode DTE and the packet mode DTE (or remote PAD) to configure the PAD so that its operation is adapted to the start-stop mode DTE characteristics, and possible to the application.

1.2 The operation of the PAD depends on the value of the set of internal variables called PAD parameters. This set of parameters exists for each start-stop mode DTE independently. The current value of each PAD parameter defines the operational characteristics of its related function.

1.3 Functions of the PAD

1.3.1 Basic functions include:

– assembly of characters into packets;

– disassembly of the *user data* field of packets;

– handling of virtual call set-up and clearing, resetting and interrupt procedures;

– generation of service signals;

– a mechanism for forwarding packets when the proper conditions exist, e.g., when a packet is full or an idle timer expires;

– a mechanism for transmitting data characters, including start, stop and parity elements as appropriate to the start-stop mode DTE;

– a mechanism for handling a *break* signal from the start-stop mode DTE;

– editing of *PAD command* signals;

– a mechanism for setting and reading the current value of PAD parameters.

1.3.2 Optional functions include:

– a mechanism for the selection of a standard profile;

– automatic detection of data rate, code, parity and operational characteristics;

– a mechanism for the remote DTE to request a virtual call between the start-stop mode DTE and another DTE.

1.4 User selectable functions which may be provided by the PAD

A number of packet-switched data network facilities may be available either on a subscription basis or on a per call basis, to start-stop mode DTEs as described in Recommendation X.2 for user classes of service 20 to 22. In addition, the following features may be available on a subscription basis:

– selection of an initial profile;

– modem type, speed, code and parity to be used by the PAD;

– other operational characteristics of the DTE.

As defined in this Recommendation, parameters provide for functions which concern:

– management of the procedure between the start-stop mode DTE and the PAD;

– management of the assembly and disassembly of packets;

– a number of additional functions related to the operational characteristics of the start-stop mode DTE;

– a number of additional functions related to videotex applications.

The method for the control of these functions is specified in Recommendation X.28 for the start-stop mode DTE and in Recommendation X.29 for the packet mode DTE or for another PAD.

Table 1 shows details of the valid values and combination of values of PAD parameters standardized by ITU-T. Other values and combinations of values are for further study.

1.4.1 PAD recall using a character

This function allows the start-stop mode DTE to initiate an escape from the *data transfer* state or the *connection in progress* state in order to send *PAD command signals*.

1.4.2 Echo

This function provides for characters received from the start-stop mode DTE to be transmitted back to the start-stop mode DTE as well as being interpreted by the PAD.

1.4.3 Selection of the data forwarding characters

This function allows the selection of defined sets of character(s) received from the start-stop mode DTE to be recognized by the PAD as an indication to complete the assembly and forward a complete packet sequence as defined in Recommendation X.25.

1.4.4 Selection of idle timer delay

This function allows the selection of the duration of an interval between successive characters received from the start-stop mode DTE which, when exceeded, will cause the PAD to terminate the assembly of a packet and to forward it as defined in Recommendation X.25.

1.4.5 Ancillary device control

This function allows for flow control between the PAD and the start-stop mode DTE. The PAD indicates whether it is ready or not to accept characters from the start-stop mode DTE by transmitting special characters. These characters are those which in International Alphabet No. 5 (IA5) are used to switch an ancillary transmitting device on and off.

1.4.6 Control of PAD service signals

This function provides the start-stop mode DTE with the ability to decide whether or not and in what format *PAD service* signals are transmitted.

1.4.7 Selection of operation of the PAD on receipt of the break signal

This function allows the selection of the operation of the PAD after the receipt of a *break* signal from the start-stop mode DTE.

1.4.8 Discard output

This function provides for a PAD to discard the content of user sequences in packets upon request rather than disassembling and transmitting these to the start-stop mode DTE.

1.4.9 Padding after carriage return

This function provides for the automatic insertion by the PAD of padding characters in the character stream transmitted to the start-stop mode DTE after the occurrence of a carriage return character. This allows for the printing mechanism for the start-stop mode DTE to perform the carriage return function correctly.

1.4.10 Line folding

This function provides for the automatic insertion by the PAD of appropriate format effectors in the character stream transmitted to the start-stop mode DTE. The predetermined maximum number of graphic characters per line may be set.

1.4.11 Flow control of the PAD by the start-stop mode DTE

This function allows for flow control between the start-stop mode DTE and the PAD. The start-stop mode DTE indicates whether it is ready or not to accept characters from the PAD by transmitting special characters. These characters are those which in IA5 are used to switch an ancillary transmitting device on and off.

1.4.12 Linefeed insertion after carriage return

This function provides for the automatic insertion by the PAD of a linefeed character in the character stream to or from the start-stop mode DTE or after each of each carriage return character. This function applies only in the *data transfer* state.

1.4.13 Padding after linefeed

This function provides for the automatic insertion by the PAD of padding characters in the character stream transmitted to the start-stop DTE after the occurrence of a linefeed character. This allows for the printing mechanism of the start-stop mode DTE to perform the linefeed operation correctly. This function applies only in the *data transfer* state.

1.4.14 Editing

This function provides for character delete, line delete and line display editing capabilities in the *PAD command* state and the *data transfer* state for the start-stop mode DTE. During the *PAD command* state the editing function is always available.

1.4.15 Editing PAD service signals

This function provides the start-stop mode DTE with the ability to decide whether or not editing *PAD service* signals are transmitted and which format should be used.

1.4.16 Echo mask

When echo is enabled (see 1.4.2), this function allows selected defined sets of character(s) received from the start-stop mode DTE not to be transmitted back to the start-stop mode DTE.

1.4.17 Parity treatment

This function allows the PAD to check parity in the data stream from the start-stop mode DTE and/or generate parity in the data stream to the start-stop mode DTE.

1.4.18 Page wait

This function allows the PAD to suspend transmission of additional characters to the start-stop mode DTE after a specified number of linefeed characters have been transmitted by the PAD.

1.4.19 Videotex selectable functions

The following functions have been defined to meet the requirements of Videotex applications.

1.4.19.1 Size of input field

This function allows the definition of the maximum length of an input field which may be smaller or greater than the data packet size. When this input field has been filled up by characters received from the start-stop mode DTE, the PAD should complete the assembly and forward a complete packet sequence as defined in Recommendation X.25.

If this function is not supported or if the parameter reference 23 value is set to 0, only the data forwarding signals defined by parameter references 3 and 4 (and 25 when supported) have to be used.

When this function is supported and when the parameter reference 23 value is not 0, the data forwarding signals defined by parameter references 3 and 4 (and 25 when supported) have to be used.

The size of the input field is defined in graphic characters (see Note in 3.23).

NOTE – This function will be handled by using the editing buffer with the specific rules described in 3.6.1.3/X.28.

1.4.19.2 End-of-frame signals

This function indicates to the PAD when it can start the echoplex procedure. Upon receipt of the end-of-frame signal, the PAD echoes characters received from the start-stop mode DTE (see 4.19.3/X.28).

When this function is not supported or when the parameter reference 24 value is set to 0, the echoplex procedures should be in accordance with the interleaving rules in 4.19/X.28, 4.19.1/X.28 and 4.19.2/X.28.

1.4.19.3 Selection of extended data forwarding signals

This function allows the selection of defined sets of character(s) or sequences of characters received from the start-stop mode DTE to be recognized by the PAD as an indication to complete the assembly and forward a complete packet sequence as defined in Recommendation X.25.

When this function is not supported or when the parameter reference 25 value is set to 0, data forwarding signals have to be in accordance with 4.4/X.28.

1.4.19.4 Display interrupt

This function allows the selection of a character received from the start-stop mode DTE indicating to the PAD to discard the contents of the user sequences received from the X.25 DTE rather than disassembling and transmitting these to the start-stop mode DTE. In addition, characters previously received from the start-stop mode DTE which have not already been sent to the X.25 DTE are also discarded.

1.4.19.5 Confirmation of display interrupt

This function allows the selection of the character to be sent by the PAD to the start-stop mode DTE after having performed the display interrupt as described by parameter reference 26.

1.4.19.6 Diacritic character editing

This function allows the X.25 DTE to indicate to the PAD the way in which diacritic characters are handled, especially when Character delete, Line delete or Size of input field functions are to be performed. This function allows the PAD to know the type of coding used for diacritic characters in order to correctly perform editing functions.

When this function is not supported or if the parameter reference 28 value is set to 0, the basic character set is assumed.

When this function is supported and when the parameter reference 28 value is not 0, the parameter value indicates the diacritic character coding in use.

1.4.19.7 Extended echo mask

When echo is enabled (i.e. parameter 2 is not equal to 0), this function allows a selected defined set of character(s) received from the start-stop mode DTE either not to be transmitted back to the start-stop DTE or to be transmitted back to the start-stop mode DTE.

2 Characteristics of PAD parameters

2.1 In this Recommendation parameters are identified by decimal reference numbers.

2.2 In this Recommendation the possible values of the parameters are represented by decimal numbers.

2.3 Specific procedures, described in Recommendations X.28 and X.29 are available for initializing, reading and changing values of PAD parameters.

2.4 Determination of the values of PAD parameters

2.4.1 Initial values of PAD parameters

On initialization, the initial value of each PAD parameter is set according to a predetermined set of values called an initial standard *profile*. Table 1/X.28 gives details of the initial values of parameters for transparent and simple standard profiles which have been agreed by ITU-T.

Networks may offer other standard profiles that provide different, predetermined sets of PAD parameter values.

2.4.2 Current values of PAD parameters

The current values of PAD parameters are the values resulting from possible modifications by the PAD, the start-stop mode DTE and/or the packet mode DTE (or remote PAD).

3 List of PAD parameters and possible values

Restrictions on the permissible relationships between the values of the various parameters is a subject for further study.

3.1 PAD recall using a character

Reference 1

The parameter will have the following selectable values:

not possible – represented by decimal 0;

possible by character 1/0 (DLE) – represented by decimal 1;

possible by graphic character defined by the user – represented by decimal 32 to 126.

A graphic character, defined by the user to escape from the *data transfer* state and to recall the PAD, is the binary representation of the decimal value in accordance with Recommendation T.50.

3.2 Echo

Reference 2

The parameter will have the following selectable values:

no echo – represented by decimal 0;

echo (see Note 1) – represented by decimal 1;

echo all characters except the data forwarding sequence defined by parameter 25 (see Note 3) – represented by decimal 2;

scrambled echo character (see Note 2) – represented by decimal 32 to 126.

NOTE 1 – If parameter 20 is implemented, the selection of the characters to be echoed is dependent on the value of parameter 20.

NOTE 2 – The decimal value represents the character to be transmitted back to the start-stop mode DTE.

NOTE 3 – If parameter 29 is implemented, the selection of the characters to be echoed is dependent on the value of parameter 29.

3.3 Selection of data forwarding character(s)

Reference 3

This parameter is represented by the following encoding of basic functions, each having a decimal value as shown below:

no data forwarding character – represented by decimal 0;

alphanumeric characters (A to Z, a to z, 0 to 9) – represented by decimal 1;

character CR – represented by decimal 2;

characters ESC, BEL, ENQ, ACK – represented by decimal 4;

characters DEL, CAN, DC2 – represented by decimal 8;

characters EXT, EOT – represented by decimal 16;

characters HT, LF, VT, FF – represented by decimal 32;

all other characters in columns 0 and 1 of IA5 not included in above – represented by decimal 64.

NOTE – The decimal representation of individual values of this parameter allows coding to represent a single function or combination of functions, see Table 1.

3.4 Selection of idle timer delay

Reference 4

The parameter will have the following selectable value:

any number from 0 to 255 – represented by the respective decimal number.

The value 0 will indicate that no data forwarding on time-out is required; a value between 1 and 255 will indicate the value of the delay in twentieths of a second.

NOTE 1 – Some PAD implementations may not offer all possible values of idle timer delay within the selectable range. In such cases where the value selected is not available, the PAD will assume the next higher available value in the range.

NOTE 2 – The effect of the idle timer delay on data forwarding may be subject to flow control constraints.

3.5 Ancillary device control

Reference 5

The parameter will have the following selectable values:

no use of X-ON (DC1) and X-OFF (DC3) – represented by decimal 0;

use of X-ON and X-OFF (data transfer) – represented by decimal 1;

use of X-ON and X-OFF (data transfer and command) – represented by decimal 2.

3.6 Control of PAD service signals and PAD command signals

Reference 6

The parameter is represented by the following encoding of basic functions, each having a decimal value as shown below:

no service signals are transmitted to the start-stop mode DTE – represented by decimal 0;

service signals other than the prompt *PAD service* signal are transmitted in the standard format – represented by decimal 1;

editing *PAD service* signals only are transmitted in the format specified by parameter 19 – represented by decimal 2;

prompt *PAD service* signal is transmitted in the standard format – represented by decimal 4;

PAD *service* signals are transmitted in a network-dependent format – represented by decimal 8 to 15.

PAD service signals and PAD command signals in the extended dialogue mode format:

extended dialogue mode handling, with *PAD service* signals in English – represented by decimal 16;

extended dialogue mode handling, with *PAD service* signals in French – represented by decimal 32;

extended dialogue mode handling, with *PAD service* signals in Spanish – represented by decimal 48;

extended dialogue mode handling, with PAD service signals in Chinese – represented by decimal 64.

NOTE 1 – The decimal representation of individual values of this parameter allows coding to represent a single function or combination of functions, see Table 1. The transmission of service signals is controlled by the values 0, 1, 2, 4 and 5. In addition, the actual text of the service signal is controlled by the values 16 and above.

NOTE 2 – Values of 64 to 240 in multiples of 16 represent additional languages provided on a network dependent basis.

NOTE 3 – Values of 16 to 240 in multiples of 16 may be combined with values 8 to 15 to provide a network-dependent extended dialogue mode (e.g. a value of 41 is equivalent to 32 + 9, network-dependent French).

NOTE 4 – To enable or disable service signals in the extended dialogue mode, the values 16 to 240 in multiples of 16 can be combined with: 0 for no service signals, 1 for service signals other than the prompt, 2 for editing service signals alone and 5 (4 + 1) for service signals and the prompt.

3.7 Selection of operation of PAD on receipt of break signal from the start-stop mode DTE

Reference 7

This parameter is represented by the following encoding of basic functions, each having a decimal value as shown below:

nothing	–	represented by decimal 0;
send to packet mode DTE or other PAD an *interrupt* packet	–	represented by decimal 1;
reset	–	represented by decimal 2;
send to packet mode DTE or other PAD an *indication of break PAD* message	–	represented by decimal 4;
escape from *data transfer* state	–	represented by decimal 8;
discard output to start-stop mode DTE	–	represented by decimal 16.

NOTE – The decimal representation of individual values of this parameter allows coding to represent a single function or combination of functions, see Table 1.

3.8 Discard output

Reference 8

The parameter will have the following selectable values:

normal data delivery to the start-stop mode DTE	–	represented by decimal 0;
discard output to start-stop mode DTE	–	represented by decimal 1.

3.9 Padding after carriage return

Reference 9

The parameter will have the following selectable value:

any number from 0 to 255	–	represented by the respective decimal number.

A value between 0 and 255 will indicate the number of padding characters to be generated by the PAD after a carriage return character is transmitted to the start-stop mode DTE.

When parameter 9 is 0, there will be no padding except that *PAD service* signals will contain a number of padding characters according to the data rate of the start-stop mode DTE.

3.10 Line folding

Reference 10

The parameter will have the following selectable values:

no line folding	–	represented by decimal 0;
any value between 1 and 255	–	represented by the respective decimal number.

A value between 1 and 255 will indicate the number of graphic characters per line that will be transmitted by the PAD without inserting appropriate format effectors.

3.11 Binary speed

This parameter is a read-only parameter and cannot be changed by either of the DTEs. It enables the packet-mode DTE to access a characteristic of the start-stop mode DTE which is known by the PAD.

Reference 11

The parameter will have the following values:

50 bit/s	–	represented by decimal 10;
75 bit/s	–	represented by decimal 5;
100 bit/s	–	represented by decimal 9;
110 bit/s	–	represented by decimal 0;
134.5 bit/s	–	represented by decimal 1;
150 bit/s	–	represented by decimal 6;
200 bit/s	–	represented by decimal 8;
300 bit/s	–	represented by decimal 2;
600 bit/s	–	represented by decimal 4;
1200 bit/s	–	represented by decimal 3;
1800 bit/s	–	represented by decimal 7;
75/1200 bit/s	–	represented by decimal 11;
2400 bit/s	–	represented by decimal 12;
4800 bit/s	–	represented by decimal 13;
9600 bit/s	–	represented by decimal 14;
19 200 bit/s	–	represented by decimal 15;
48 000 bit/s	–	represented by decimal 16;
56 000 bit/s	–	represented by decimal 17;
64 000 bit/s	–	represented by decimal 18;
14 400 bit/s	–	represented by decimal 19.

NOTE – The values implemented in individual PADs depend on the range of DTE data transmission rates which are supported. The allocation of decimal values to all known rates is to avoid revision of the Recommendation in the future.

3.12 Flow control of the PAD by the start-stop mode DTE

Reference 12

The parameter will have the following selectable values:

no use of X-ON (DC1) and X-OFF (DC3) for flow control	–	represented by decimal 0;
use of X-ON and XOFF for flow control	–	represented by decimal 1.

3.13 Linefeed insertion after carriage return

Reference 13

This parameter is represented by the following encoding of basic functions, each having a decimal value as shown below:

no linefeed insertion	–	represented by decimal 0;
insert linefeed after each carriage return in the data stream *to* the start-stop DTE	–	represented by decimal 1;
insert linefeed after each carriage return in the data stream *from* the start-stop mode DTE	–	represented by decimal 2;
insert linefeed after each carriage return in the echo stream to the start-stop mode DTE	–	represented by decimal 4.

NOTE 1 – The decimal representation of individual values of this parameter allows coding to represent a single function or combination of functions, see Table 1.

NOTE 2 – This function applies only in the *data transfer* state.

3.14 Linefeed padding

Reference 14

The parameter will have the following selectable value:

any number from 0 to 255 – represented by the respective decimal number.

A value between 0 and 255 will indicate the number of padding characters to be generated by the PAD after a linefeed character is transmitted to the start-stop mode DTE during the data transfer state.

3.15 Editing

Reference 15

The parameter will have the following selectable values:

no use of editing in the *data transfer* state – represented by decimal 0;

use of editing in the *data transfer* state – represented by decimal 1.

The use of value 1 suspends the following operations of the PAD:

a) data forwarding on full packet until the editing buffer is full;

b) data forwarding on idle timer period expiry.

NOTE – The value of parameter 4 remains unchanged.

3.16 Character delete

Reference 16

The parameter will have the following selectable value:

one character from IA5 – represented by decimal 0 to 127.

The character defined by the user for character delete is the binary representation of the decimal value in accordance with Recommendation T.50.

the sequence of characters 1/3 4/7 – represented by decimal 128;

the sequence of characters 1/3 1/3 – represented by decimal 129;

the sequence of characters 2/10 2/10 – represented by decimal 130.

3.17 Line delete

Reference 17

The parameter will have the following selectable value:

one character from IA5 – represented by decimal 0 to 127.

The character defined by the user for line delete is the binary representation of the decimal value in accordance with Recommendation T.50.

3.18 Line display

Reference 18

The parameter will have the following selectable value:

one character from IA5 – represented by decimal 0 to 127.

The character defined by the user for line display is the binary representation of the decimal value in accordance with Recommendation T.50.

3.19 Editing PAD service signals

Reference 19

The parameter will have the following selectable values:

no editing *PAD service* signals	–	represented by decimal 0;
editing *PAD service* signals for printing terminals	–	represented by decimal 1;
editing *PAD service* signals for display terminals	–	represented by decimal 2;
editing *PAD service* signals using one character from the range of IA5	–	represented by decimal 8 and 32 to 126.

NOTE – This parameter does not apply if the value of parameter 6 is set to 0.

3.20 Echo mask

Reference 20

This parameter is represented by the following encoding of basic functions, each having a decimal value as shown below:

no echo mask (all characters echoed)	–	represented by decimal 0;
no echo of character CR	–	represented by decimal 1;
no echo of character LF	–	represented by decimal 2;
no echo of characters VT, HT, FF	–	represented by decimal 4;
no echo of characters BEL, BS	–	represented by decimal 8;
no echo of characters ESC, ENQ	–	represented by decimal 16;
no echo of characters ACK, NAK, STX, SOH, EOT, ETB, ETX	–	represented by decimal 32;
no echo of editing characters as designated by parameters 16, 17 and 18	–	represented by decimal 64;
no echo of all other characters in columns 0 and 1 of IA5 not mentioned above, and the character DEL	–	represented by decimal 128.

NOTE 1 – The decimal representation of individual values of this parameter allows coding to represent a single function or combination of functions, see Table 1.

NOTE 2 – If parameter 5, 12 or 22 is set to a non-zero value, then X-ON and X-OFF are not echoed.

NOTE 3 – The PAD recall character specified by the value of parameter 1 is not echoed.

NOTE 4 – A character need only be specified by a single value of parameter 20 in order for it not to be echoed.

NOTE 5 – This parameter applies only when parameter 2 is set to 1.

NOTE 6 – Parameter 20 value 64 (in combination) does not apply if editing is not enabled.

3.21 Parity treatment

Reference 21

This parameter will have the following selectable values:

no parity checking or generation	–	represented by decimal 0;
parity checking	–	represented by decimal 1;
parity generation	–	represented by decimal 2;
no parity – transparent bit 8	–	represented by decimal 4.

NOTE 1 – The decimal representation of individual values of this parameter allows coding to represent a single function or a combination of functions, see Table 1.

NOTE 2 – Characters generated by the PAD itself (e.g. *PAD service signals*) have even parity when parameter 21 is set to zero unless the parity is determined by alternate means.

3.22 Page wait

Reference 22

This parameter will have the following selectable values:

page wait disabled	– represented by decimal 0;
page wait condition after *n* linefeed characters are sent by the PAD to the start-stop mode DTE	– represented by decimal 1 to 255.

3.23 Size of input field

Reference 23

The parameter will have the following selectable values:

no input field length	– represented by decimal 0;
size of input field (in graphic characters)	– represented by decimal 1 to 255.

NOTE – Implementors should take into account that a graphic character may be coded with several bytes. The definition of a graphic character is given in Annexes A/T.101, B/T.101 and C/T.101.

3.24 End-of-frame

Reference 24

The parameter will have the following selectable values:

no end-of-frame signals	– represented by decimal 0;
the end-of-frame condition is fulfilled upon receipt of this character	– represented by decimal 1 to 31;
the end-of-frame condition is fulfilled upon receipt of a complete packet sequence	– represented by decimal 32;
the end-of-frame condition is fulfilled upon detection of the end of a timer	– represented by decimal 64.

The value of the timer is service dependent and shall be in the range of 1 to 5 seconds with a typical value of 3 seconds. The value of this timer cannot be changed by the X.25 DTE nor the start-stop mode DTE.

NOTE – The decimal representation of each individual value allows the coding to represent a single function or combination of functions (see Table 1).

The PAD shall consider receipt of an X.25 Reset packet, X.25 Clear indication packet or any X.29 PAD message as an "End-of-frame" signal.

3.25 Selection of extended data forwarding signals

Reference 25

This parameter is represented by the following encoding of basic functions, each having a decimal value as shown below:

no extended data forwarding condition	– represented by decimal 0;
sequence of two characters starting with 1/3	– represented by decimal 1;
character 1/10	– represented by decimal 2;
character 1/12	– represented by decimal 4;
character 2/3	– represented by decimal 8;
character 5/15	– represented by decimal 16;

sequence of the two characters 1/11 4/10 or sequence of the two characters 1/11 4/11 – represented by decimal 32;

sequence of three characters starting with characters 2/10 3/0 – represented by decimal 64;

either character 1/3 or character 2/10 – represented by decimal 128.

NOTE – The decimal representation of individual value of this parameter allows coding to represent a single function or combination of functions (see Table 1).

3.26 Display interrupt

Reference 26

The parameter will have the following selectable values:

display interrupt disabled – represented by decimal 0;

display interrupt condition occurs upon receipt of this character – represented by decimal 1 to 127;

display interrupt condition occurs upon receipt of any character – represented by decimal 128;

display interrupt condition occurs upon receipt of any one of 2/10, 5/15, 3/0 to 3/9 inclusive – represented by decimal 129;

display interrupt condition occurs upon receipt of any one of 1/3, 1/12 or 3/0 to 3/9 inclusive – represented by decimal 130.

3.27 Confirmation of display interrupt

Reference 27

The parameter will have the following selectable values:

confirmation prompt of display interrupt disabled – represented by decimal 0;

the confirmation prompt of display interrupt is character from IA5 – represented by decimal 1 to 127.

3.28 Diacritic character editing

Reference 28

The parameter will have the following selectable values:

basic character set primary code table only, normally ASCII – represented by decimal 0;

composite coded diacritic character set – rule 1 (SS2) – represented by decimal 1;

Diacritic and supplementary characters consisting of several bytes created using SS2 code extensions are deleted as a single character.

composite coded diacritic character set – rule 2 (G1) – represented by decimal 2;

Diacritic characters consisting of several bytes created using the primary table in G0 in G-Left and supplementary in G-Right are deleted as a single character.

direct coded diacritic character rule – represented by decimal 3;

Diacritic and supplementary characters consisting of several bytes created using SS2 code extension are deleted as a single character.

coding of SS2 – represented by decimal 4;

The coding of SS2 is by default the C0 code 1/9; this parameter reference value indicates that coding of SS2 uses the alternate code 8/14.

NOTE – This value may be combined with one of the three previous ones.

multi-byte character sets – this is for further study.

The support of multi-byte character sets is for further study.

3.29 Extended echo mask

Reference 29

The parameter will have the following selectable values:

no extended echo mask (the parameter reference 20 may be active) – represented by decimal 0;

1/10 is echoed as 2/3 – represented by decimal 1;

1/3 is echoed as 2/10 – represented by decimal 2;

no echo of 1/15 – represented by decimal 4;

no echo of all characters in columns 8 and 9 (Note 4) – represented by decimal 8;

no echo of all characters in columns 8 and 9 except 9/11 (Note 4) – represented by decimal 16;

no echo of the sequence of two characters 1/3 x/y (x between 2 and 7, y between 0 and 7) – represented by decimal 32.

NOTE 1 – The decimal representation of individual values of this parameter allows coding to represent a single function or a combination of functions.

NOTE 2 – This parameter does not apply if parameter 2 is set to 0.

NOTE 3 – If parameter 20 is set to 128, 1/3, 1/10 and 1/15 are not echoed.

NOTE 4 – This value is applicable only in an 8-bit environment.

3.30 Selection of the default packet size

Reference 30

This parameter will have the following selectable values:

The default packet size is network dependent – represented by decimal 0;

The default packet size is 16 – represented by decimal 4;

The default packet size is 32 – represented by decimal 5;

The default packet size is 64 – represented by decimal 6;

The default packet size is 128 – represented by decimal 7;

The default packet size is 256 – represented by decimal 8;

The default packet size is 512 – represented by decimal 9;

The default packet size is 1024 – represented by decimal 10;

The default packet size is 2048 – represented by decimal 11;

The default packet size is 4096 – represented by decimal 12.

Table 1/X.3 – Possible values and combination of values of PAD parameters (Note 1)

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
1	PAD recall using a character (E)	0		Not possible	
		1		Character DLE	
			32 to 126	Possible; using one graphic character defined by user	
2	Echo (E)	0		No echo	
		1		Echo	
			2	Echo all characters except the data forwarding sequence defined by parameter 25	
			32 to 126	Scrambled echo character	
3	Selection of *data forwarding* character(s) (E)	0		No *data forwarding* character(s)	
			1	Alphanumeric characters (A to Z, a to z, 0 to 9)	
		2		Character CR	
			4	Characters ESC, BEL, ENQ, ACK	
			6	Characters CR, ESC, BEL, ENQ, ACK	Value formed by combination (2 + 4)
			8	Characters DEL, CAN, DC2	
			16	Characters ETX, EOT	
			18	Characters CR, EOT, ETX	Value formed by combination (2 + 16)
			32	Characters HT, LF, VT, FF	
			64	All characters in columns 0 and 1 of IA5 except those shown above for values 2, 4, 8, 16, 32	
				Values 3, 5 to 7, 9 to 15, 17 to 31, 33 to 63, 65 to 125, 127 may be formed by combinations of values 1, 2, 4, 8, 16, 32, 64	
		126		All characters in columns 0 and 1 and character DEL	Value formed by combination (2 + 4 + 8 + 16 + 32 + 64)
4	Selection of idle timer delay (E)	0 20 255	1 to 19 21 to 254	Value of idle timer in twentieths of a second	(Note 3)
5	Ancillary device control (E)	0		No use of X-ON (DC1) and X-OFF (DC3)	
		1		Use of X-ON and X-OFF (data transfer)	
			2	Use of X-ON and X-OFF (data transfer and command)	

Table 1/X.3 – Possible values and combination of values of PAD parameters
(Note 1) *(continued)*

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
6	Control of *PAD service* signals and *PAD command* signals (E)	0		No *PAD service* signals are transmitted to the start-stop mode DTE	
		1		*PAD service* signals are transmitted in the standard format	
			2	*PAD service* signals are transmitted in the format specified by parameter 19	Value formed by combination (1 + 4)
			5	*PAD service* signals and the *prompt PAD service* signal are transmitted in the standard format	
			8 to 15	*PAD service* signals are transmitted in a network dependent format	
			16	Extended dialog mode, *PAD service* signals are in English	
			32	Extended dialog mode, *PAD service* signals are in French	
			48	Extended dialog mode, *PAD service* signals are in Spanish	
			64	Extended dialog mode, *PAD service* signals are in Chinese	
7	Section of operation of the PAD on receipt of break signal from the start-stop mode DTE (E)	0		Nothing	
			1	Interrupt	
		2		Reset	
			4	Send to DTE an indication of *break PAD message*	
			5	Interrupt and indication of break	Value formed by combination (1 + 4)
		8		Escape from *data transfer* state	
			16	Discard output, to start-stop mode DTE	
		21		Discard output, interrupt and indication of break	Value formed by combination (1 + 4 + 16)
				Values 3, 4, 6, 7, 9 to 20, 22 to 31 may be formed by combination of values 1, 2, 4, 8, 16	

Table 1/X.3 – Possible values and combination of values of PAD parameters
(Note 1) *(continued)*

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
8	Discard output (E)	0 1		Normal data delivery Discard output	
9	Padding after carriage return (CR) (E)	0 1 to 7	 8 to 255	No padding after CR (Note 4) Number of padding characters inserted after CR	
10	Line folding (E)	0 1 to 255		No line folding Number of graphic characters per line	
11 (read only)	Binary speed of start-stop mode DTE (E)	0 2	 1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	110 bit/s 134.5 bit/s 300 bit/s 1200 bit/s 600 bit/s 75 bit/s 50 bit/s 800 bit/s 200 bit/s 100 bit/s 50 bit/s 75/1200 bit/s 2400 bit/s 4800 bit/s 9600 bit/s 19 200 bit/s 48 000 bit/s 56 000 bit/s 64 000 bit/s 14 400 bit/s	The values implemented in individual PADs depend on the range of DTE data transmission rates which are supported. The allocation of decimal values of all known rates is to avoid revision of the Recommendation in the future
12	Flow control of the PAD (E)	0 1		No use of X-ON (DC1) and X-OFF (DC3) for flow control Use of X-ON (DC1) and X-OFF (DC3) for flow control	
13	Linefeed insertion after carriage return (A)	0 1 4	 2 	No linefeed insertion Insert linefeed after transmission of CR to the start-stop mode DTE Insert linefeed after each carriage return in the data stream from the start-stop mode DTE Insert linefeed after echo of CR to start-stop mode DTE	

Table 1/X.3 – Possible values and combination of values of PAD parameters
(Note 1) *(continued)*

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
13 *(cont.)*	Linefeed insertion after carriage return (A) *(cont.)*	5		Insert linefeed after transmission to the start-stop mode DTE and after echo of CR	Combination (1 + 4)
		6		Insert linefeed in data stream after CR from the start-stop mode DTE and after echo of a CR to the start-stop mode DTE	Combination (2 + 4)
		7		Insert linefeed in the data stream to and from the start-stop mode DTE and after echo of a CR to the start-stop mode DTE	Combination (1 + 2 + 4) NOTE – Applies only to *data transfer* state
14	Padding after linefeed (A)	0		No padding after linefeed	NOTE – Applies only to *data transfer* state
		1 to 7	8 to 255	Number of padding characters inserted after linefeed	
15 (Note 5)	Editing (A)	0		No use of editing in the *data transfer* state	
		1		Use of editing in the *data transfer* state	
16 (Note 5)	Character Delete (A)		0 to 126	One character from IA5	
		127		Character 7/15 (DEL)	
			128	Sequence of characters 1/3 4/7	
			129	Sequence of characters 1/3 1/3	
			130	Sequence of characters 2/10 2/10	
17 (Note 5)	Line delete (A)		0 to 23	One character from range of IA5	
		24		Character 1/8 (CAN)	
			25 to 127	One character from range of IA5	
18 (Note 5)	Line delete (A)		0 to 17	One character from range of IA5	
		18		Character 1/2 (DC2)	
			19 to 127	One character from range of IA5	
19 (Note 5)	Editing PAD service signals (A)		0	No editing *PAD service* signals	
		1		Editing *PAD service* signals for printing terminals	
			2	Editing *PAD service* signals for display terminals	
			8 32 to 126	Editing *PAD service* signals using one character from the range of IA5	

Table 1/X.3 – Possible values and combination of values of PAD parameters
(Note 1) *(continued)*

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
20 (Notes 6 and 7)	Echo mask (A)	0		No echo mask (all characters echoed)	Values may be formed by combination of basic values
			1	No echo of CR	
			2	No echo of LF	
			4	No echo of VT, HT, FF	
			8	No echo of BEL, BS	
			16	No echo of ESC, ENQ	
			32	No echo of ACK, NAK, STX, SOH, EOT, ETB, ETX	
			64	No echo of editing characters as designated by parameters 16, 17, 18 (Note 8)	
			128	No echo of all other characters in columns 0 and 1 not mentioned above and DEL	
21 (Note 9)	Parity treatment (A)	0		No parity checking or generation	Value formed by combination (1 + 2)
			1	Parity checking	
			2	Parity generation	
			3	Parity checking and parity generation	
			4	No parity – transparent bit 8	
22	Page wait (A)	0		Page wait disabled	
			1 to 22	Number of line feed characters considered by the PAD for the page wait function	
		23	24 to 255		
23	Size of input field (A)	0		Undefined size	
			1 to 255	Length of input field (number of graphic characters)	
24	End-of-frame signals (A)	0		No end-of-frame signal	Values may be formed by combination of basic values
			1 to 31	Character representing the end of a frame	
		32		A frame is represented by a complete packet sequence	
			64	At the end of a timer, an end of frame condition may be assumed	

Table 1/X.3 – Possible values and combination of values of PAD parameters
(Note 1) *(continued)*

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
25	Extended data forwarding signals (A)	0		No extended data forwarding signal	Values may be formed by combination of basic values
			1	Sequence of two characters 1/3 x/y	
			2	Character 1/10	
			4	Character 1/12	
			8	Character 2/3	
			16	Character 5/15	
			32	Sequence of the two characters 1/11 4/10 or sequence of the two characters 1/11 4/11	
			64	Sequence of three characters 2/10 3/0 x/y	
			128	Either character 1/3 or character 2/10	
26	Display interrupt (A)	0		No display interrupt	
			1 to 127	One character from IA5	
			128	Any character	
			129	Characters 2/10, 5/15, or 3/0 to 3/9 inclusive	
			130	Characters 1/3, 1/12, or 3/0 to 3/9 inclusive	
27	Display interrupt confirmation (A)	0		No display interrupt confirmation	
			1 to 127	One character from IA5	
28	Diacritic character coding (A)	0		Basic coding	Value 4 may be combined with one among 1 to 3
			1	Composit coded diacritic rule 1 (SS2)	
			2	Composite coded diacritic rule 2 (G1)	
			3 4	Direct coded diacritic character rule Coding of SS2	
29	Extended echo mask (A)	0		No extended echo mask	
			1	Character 1/10 is echoed as 2/3	
			2	Character 1/3 is echoed as 2/10	
			4	No echo of character 1/15	

Table 1/X.3 – Possible values and combination of values of PAD parameters
(Note 1) *(continued)*

Parameter reference number	Parameter description	Selectable possible values		PAD parameter meaning	Remarks
		Mandatory	**Optional** (Note 2)		
29 *(cont.)*	Extended echo mask (A) *(cont.)*	0	8	No echo of all characters in columns 8 and 9	
			16	No echo of all characters in columns 8 and 9 except 9/11	
			32	No echo of the sequence of two characters 1/3 x/y (x between 2 and 7, y between 0 and 7)	
30	Selection of the default packet size (A)	0		The default packet size is network dependent	
			4	The default packet size *is 16 bytes*	
			5	The default packet size *is 32 bytes*	
			6	The default packet size *is 64 bytes*	
			7	The default packet size *is 128 bytes*	
			8	The default packet size *is 256 bytes*	
			9	The default packet size *is 512 bytes*	
			10	The default packet size *is 1024 bytes*	
			11	The default packet size *is 2048 bytes*	
			12	The default packet size *is 4096 bytes*	

E An essential parameter to be made available internationally.

A An additional parameter which may be available on certain data networks and may also be available internationally.

NOTE 1 – Other values and possible combination of values are for further study.

NOTE 2 – These parameter values provide additional user facilities which are not necessarily provided in all PADs.

NOTE 3 – Some PAD implementations may not offer all possible values of idle timer delay within the selectable range. In such cases where the value selected is not available, the PAD will assume the next higher value available.

NOTE 4 – There is no padding after CR except that *PAD service* signals will contain a number of padding characters according to the data signalling rate of the start-stop mode DTE.

NOTE 5 – When parameter 15 is implemented, the values of parameters 16, 17, 18 and 19 are either default values or are selectable from the optional range shown. The editing function is provided during the *PAD command* state whether parameter 15 is implemented or not. If parameters 16, 17, 18 and 19 are implemented, the editing characters and editing *PAD service* signals during the *PAD command* state are defined by the appropriate values of these parameters. If parameters 16, 17, 18 and 19 are not implemented, the default values for the functions of these parameters are applicable to the *PAD command* state.

NOTE 6 – This parameter does not apply if parameter 2 is set to zero.

NOTE 7 – If parameter 5, 12 or 22 is set to a non-zero value, then the X-ON and X-OFF characters are not echoed.

NOTE 8 – Parameter 20 value 64 (in combination) does not apply if editing is not enabled.

NOTE 9 – Characters generated by the PAD itself (e.g. *PAD service* signals) have even parity when parameter 21 is set to zero unless the parity is determined by alternate means.

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