Excerpts from ITU-T X.25

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DATA COMMUNICATION NETWORKS: SERVICES AND FACILITIES, INTERFACES

RECOMMENDATIONS X.1-X.32

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3.8 *Circuit F – Frame start identification*

Direction: From DCE

Signals on this circuit continuously provide the DTE with a multiplex frame start indication when connected to a multiplexed DTE/DCE interface.

The condition on this circuit shall be OFF for the nominal period of one bit, indicating the last bit of the multiplex frame. At other times the circuit shall remain ON.

The first data bit on subscriber channel 1 shall be transmitted or received beginning nominally at the OFF to ON transition of circuit F.

3.9 *Circuit X – DTE transmit signal element timing* (see Note)

Direction: To DCE

Signals on this circuit provide signal element timing information for the transmit direction in cases where circuit S only provides signal element timing for the receive direction. The condition of this circuit shall be ON and OFF for nominally equal periods of time. However, for burst isochronous operations, longer periods of OFF condition may be permitted equal to an integer odd number of the nominal period of the ON condition as specified by the relevant procedural characteristics of the interface.

The DTE shall present a binary signal on the circuit T-*Transmit* and a condition on circuit C-*Control*, in which the transitions nominally occur at the time of the transitions from OFF to ON condition of this circuit.

The transition from ON to OFF condition shall nominally indicate the centre of each signal element on circuit T.

Note – The use and termination of this circuit by the DCE is a national matter.

Recommendation X.25

INTERFACE BETWEEN DATA TERMINAL EQUIPMENT (DTE) AND DATA CIRCUIT-TERMINATING EQUIPMENT (DCE) FOR TERMINALS OPERATING IN THE PACKET MODE AND CONNECTED TO PUBLIC DATA NETWORKS BY DEDICATED CIRCUIT

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

The establishment in various countries of public data networks providing packet switched data transmission services creates a need to produce standards to facilitate international interworking.

The CCITT,

considering

(a) that Recommendation X.1 includes specific user classes of service for data terminal equipments operating in the packet mode, Recommendation X.2 defines user facilities, Recommendation X.10 defines categories of access, Recommendations X.21 and X.21 *bis* define DTE/DCE physical layer interface characteristics, Recommendation X.92 defines the hypothetical reference connections for packet switched data transmission service and Recommendation X.96 defines *call progress* signals;

(b) that data terminal equipments operating in the packet mode will send and receive network control information in the form of packets;

(c) that certain data terminal equipments operating in the packet mode will use a packet interleaved synchronous data circuit;

5 Packet formats

5.1 *General*

The possible extension of packet formats by the addition of new fields is for further study.

Note – Any such field:

a) would only be provided as an addition following all previously defined fields, and not as an insertion between any of the previously defined fields;

b) would be transmitted to a DTE only when either the DCE has been informed that the DTE is able to interpret this field and act upon it, or when the DTE can ignore the field without adversely affecting the operation of the DTE/DCE interface (including charging);

c) would not contain any information pertaining to a user facility to which the DTE has not subscribed, unless the DTE can ignore the facility without adversely affecting the operation of the DTE/DCE interface (including charging).

Bits of an octet are numbered 8 to 1 where bit 1 is the low order bit and is transmitted first. Octets of a packet are consecutively numbered starting from 1 and are transmitted in this order.

5.1.1 *General format identifier*

The general format identifier field is a four bit binary coded field which is provided to indicate the general format of the rest of the header. The general format identifier field is located in bit positions 8, 7, 6 and 5 of octet 1, and bit 5 is the low order bit (see Table 16/X.25).

TABLE 16/X.25

General format identifier

General format identifier		Octet 1 Bits 8	7	6	5
Call set-up packets	Sequence numbering scheme modulo 8	X	X	0	1
	Sequence numbering scheme modulo 128	X	X	1	0
Clearing packets	Sequence numbering scheme modulo 8	X	0	0	1
	Sequence numbering scheme modulo 128	X	0	1	0
Flow control, interrupt, reset, restart, registration and *diagnostic* packets	Sequence numbering scheme modulo 8	0	0	0	1
	Sequence numbering scheme modulo 128	0	0	1	0
Data packets	Sequence numbering scheme modulo 8	X	X	0	1
	Sequence numbering scheme modulo 128	X	X	1	0
General format identifier extension		0	0	1	1
Reserved for other applications		*	*	0	0

* Undefined.

Note – A bit which is indicated as "X" may be set to either 0 or 1, as indicated in the text.

TABLE 17/X.25

Packet type identifier

Packet type		Octet 3 Bits							
From DCE to DTE	From DTE to DCE	8	7	6	5	4	3	2	1
Call set-up and clearing									
Incoming call	Call request	0	0	0	0	1	0	1	1
Call connected	Call accepted	0	0	0	0	1	1	1	1
Clear indication	Clear request	0	0	0	1	0	0	1	1
DCE clear confirmation	DTE clear confirmation	0	0	0	1	0	1	1	1
Data and interrupt									
DCE data	DTE data	X	X	X	X	X	X	X	0
DCE interrupt	DTE interrupt	0	0	1	0	0	0	1	1
DCE interrupt confirmation	DTE interrupt confirmation	0	0	1	0	0	1	1	1
Flow control and reset									
DCE RR (modulo 8)	DTE RR (modulo 8)	X	X	X	0	0	0	0	1
DCE RR (modulo 128) [a]	DTE RR (modulo 128) [a]	0	0	0	0	0	0	0	1
DCE RNR (modulo 8)	DTE RNR (modulo 8)	X	X	X	0	0	1	0	1
DCE RNR (modulo 128) [a]	DTE RNR (modulo 128) [a]	0	0	0	0	0	1	0	1
	DTE REJ (modulo 8) [a]	X	X	X	0	1	0	0	1
	DTE REJ (modulo 128) [a]	0	0	0	0	1	0	0	1
Reset indication	Reset request	0	0	0	1	1	0	1	1
DCE reset confirmation	DTE reset confirmation	0	0	0	1	1	1	1	1
Restart									
Restart indication	Restart request	1	1	1	1	1	0	1	1
DCE restart confirmation	DTE restart confirmation	1	1	1	1	1	1	1	1
Diagnostic									
Diagnostic [a]		1	1	1	1	0	0	0	1
Registration [a]									
	Registration request	1	1	1	1	0	0	1	1
Registration confirmation		1	1	1	1	0	1	1	1

[a] Not necessarily available on every network.

Note – A bit which is indicated as "X" may be set to either 0 or 1 as indicated in the text.

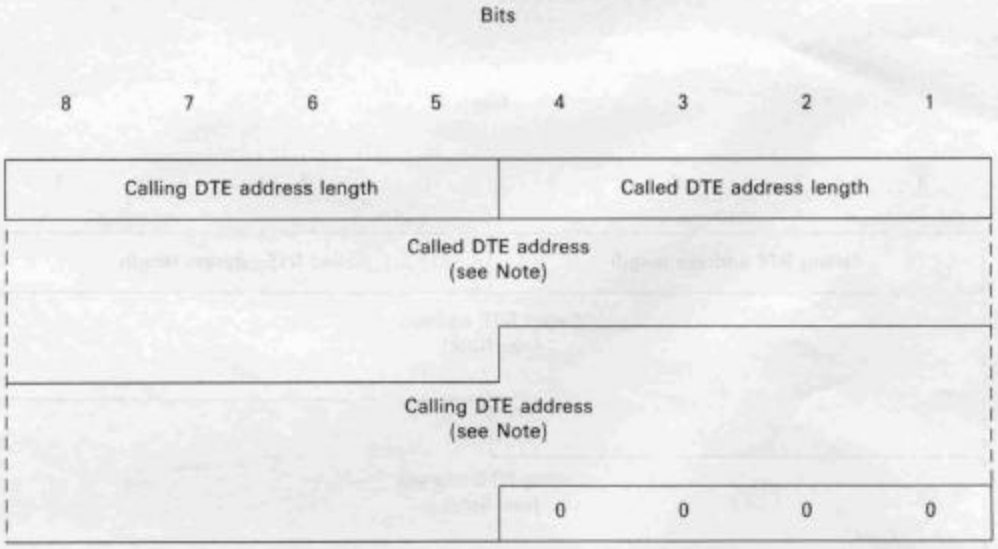
Note – The *TOA/NPI address subscription* facility is designated in Recommendation X.2 for further study (FS). In addition, there are several technical items associated with this TOA/NPI address format which are for further study.

When transmitting a call set-up or clearing packet, a DTE will use the TOA/NPI address format if the DTE has subscribed to the *TOA/NPI address subscription* facility, the non-TOA/NPI address format if it has not.

When the address format used by one DTE in a call set-up or clearing packet is different from the address format used by the remote DTE, the network (if it supports the TOA/NPI address format) converts from one address format to the other (see § 6.2.8).

5.2.1.1 *Format of the address block when the A bit is set to 0 (non-TOA/NPI address)*

Figure 4/X.25 illustrates the format of the address block when the A bit is set to 0.



Note – The figure is drawn assuming the number of address digits present in the called DTE address field is odd and the number of address digits present in the calling DTE address field is even.

FIGURE 4/X.25

Format of the address block when the A bit is set to 0

5.2.1.1.1 *Calling and called DTE address length fields*

These fields are four bits long each and consist of field length indicators for the called and calling DTE addresses. Bits 4, 3, 2 and 1 indicate the length of the called DTE address in semi-octets. Bits 8, 7, 6 and 5 indicate the length of the calling DTE address in semi-octets. Each DTE address length indicator is binary coded and bit 1 or 5 is the low order bit of the indicator.

5.2.1.1.2 *Called and calling DTE address fields*

Each digit of an address is coded in a semi-octet in binary coded decimal with bit 5 or 1 being the low order bit of the digit.

Starting from the high order digit, a DTE address is coded in consecutive octets with two digits per octet. In each octet, the higher order digit is coded in bits 8, 7, 6 and 5.

When present, the calling DTE address field starts on the first semi-octet following the end of the called DTE address field. Consequently, when the number of digits of the called DTE address field is odd, the beginning of the calling DTE address field, when present, is not octet aligned.

When the total number of digits in the called and calling DTE address fields is odd, a semi-octet with zeros in bits 4, 3, 2 and 1 will be inserted after the calling DTE address field in order to maintain octet alignment.

Further information on the coding of called and calling DTE address fields is given in Appendix IV.

The other semi-octets of a DTE address are digits, coded in binary coded decimal with bit 5 or 1 being the low order bit of the digit. Starting from the high order digit, the address digits are coded in consecutive semi-octets. In each octet, the higher order digit is coded in bits 8, 7, 6 and 5.

When present, the calling DTE address field starts on the first semi-octet following the end of the called DTE address field. Consequently, when the number of semi-octets of the called DTE address field is odd, the beginning of the calling DTE address field, when present, is not octet aligned.

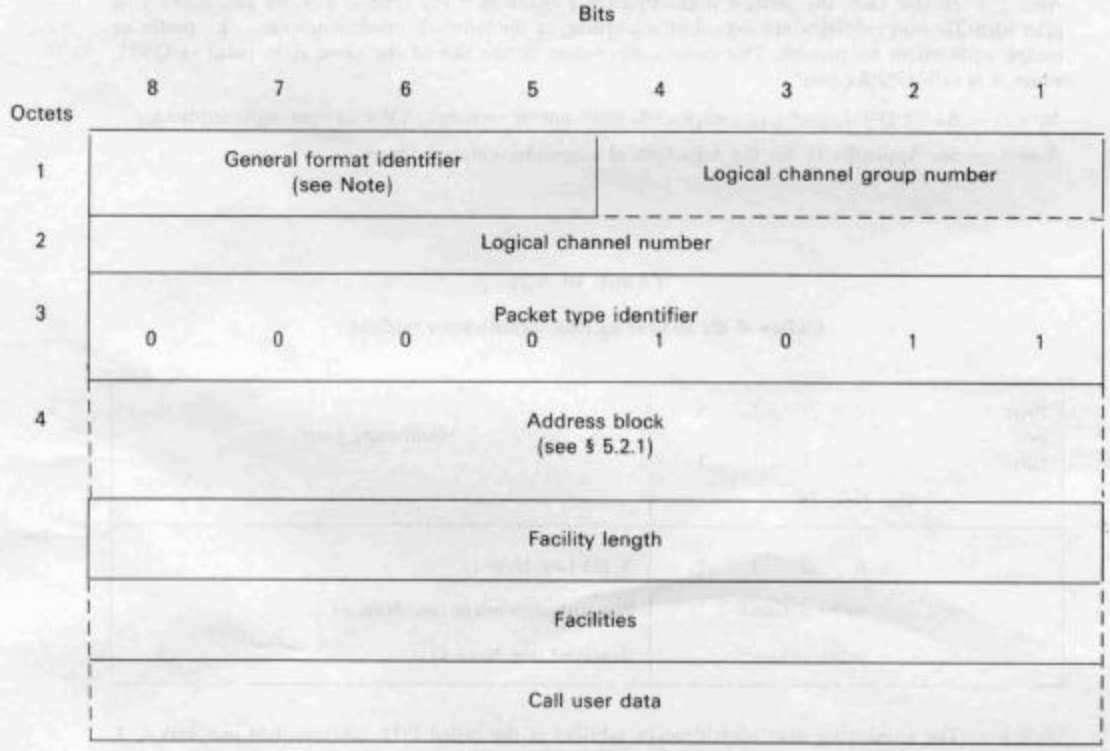
When the total number of semi-octets in the called and calling DTE address fields is odd, a semi-octet with zeros in bits 4, 3, 2 and 1 will be inserted after the calling DTE address field in order to maintain octet alignment.

Further information on the coding of called and calling DTE address fields is given in Appendix IV.

Note – These fields may be used for optional addressing facilities such as abbreviated addressing. The optional addressing facilities employed as well as the coding of those facilities are for further study.

5.2.2 *Call request and incoming call packets*

Figure 6/X.25 illustrates the format of *call request* and *incoming call* packets.



Note – Coded XX01 (modulo 8) or XX10 (modulo 128).

FIGURE 6/X.25

Call request and incoming call packet format

5.2.2.1 *General format identifier*

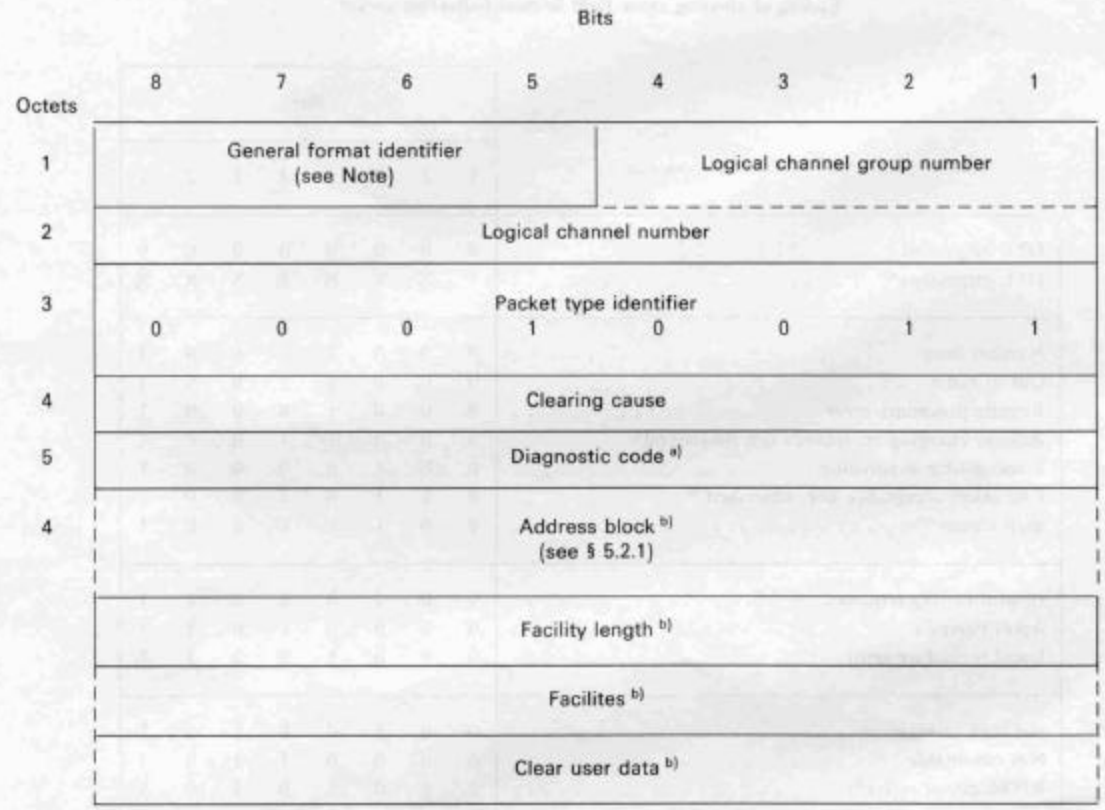
Bit 8 of octet 1 (A bit) should be set as described in § 5.2.1.

Bit 7 of octet 1 should be set to 0 unless the mechanism defined in § 4.3.3 is used.

When the virtual call is being established between two packet-mode DTEs, the network does not act on any part of the called user data field. See Recommendation X.244.

5.2.4 *Clear request and clear indication packets*

Figure 8/X.25 illustrates the format of *clear request* and *clear indication* packets, in basic and extended formats.



a) This field is not mandatory in the basic format of *clear request* packets (see § 5.2.4.1).

b) Used only in the extended format (see § 5.2.4.2).

Note – Coded X001 (modulo 8) or X010 (modulo 128).

FIGURE 8/X.25

Clear request and clear indication packet format

5.2.4.1 *Basic format*

5.2.4.1.1 *Clearing cause field*

Octet 4 is the clearing cause field and contains the reason for the clearing of the call.

In the *clear request* packets, the clearing cause field should be set by the DTE to one of the following values:

bits:	8 7 6 5 4 3 2 1
value:	0 0 0 0 0 0 0 0
or:	1 X X X X X X X

where each X may be independently set to 0 or 1 by the DTE.

The DCE will prevent values of the clearing cause field other than those shown above from reaching the other end of the call by either accepting the *clear request* packet and forcing the clearing cause field to all zeros in the corresponding *clear indication* packet, or considering the *clear request* as an error and following the procedure described in Annex C.

The coding of the clearing cause field in *clear indication* packets is given in Table 20/X.25.

TABLE 20/X.25

Coding of clearing cause field in clear indication packet

	Bits							
	8	7	6	5	4	3	2	1
DTE originated	0	0	0	0	0	0	0	0
DTE originated [a]	1	X	X	X	X	X	X	X
Number busy	0	0	0	0	0	0	0	1
Out of order	0	0	0	0	1	0	0	1
Remote procedure error	0	0	0	1	0	0	0	1
Reverse charging acceptance not subscribed [b]	0	0	0	1	1	0	0	1
Incompatible destination	0	0	1	0	0	0	0	1
Fast select acceptance not subscribed [b]	0	0	1	0	1	0	0	1
Ship absent [c]	0	0	1	1	1	0	0	1
Invalid facility request	0	0	0	0	0	0	1	1
Acces barred	0	0	0	0	1	0	1	1
Local procedure error	0	0	0	1	0	0	1	1
Network congestion	0	0	0	0	0	1	0	1
Not obtainable	0	0	0	0	1	1	0	1
RPOA out of order [b]	0	0	0	1	0	1	0	1

[a] When bit 8 is set to 1, the bits represented by Xs are those included by the remote DTE in the clearing or restarting cause field of the *clear* or *restart request* packet respectively.

[b] May be received only if the corresponding optional user facility is used.

[c] Used in the conjunction with mobile maritime service.

5.2.4.1.2 *Diagnostic code*

Octet 5 is the diagnostic code and contains additional information on the reason for the clearing of the call.

In a *clear request* packet, the diagnostic code is not mandatory.

In a *clear indication* packet, if the clearing cause field indicates "DTE originated", the diagnostic code is passed unchanged from the clearing DTE. If the clearing DTE has not provided a diagnostic code in its *clear request* packet, then the bits of the diagnostic code in the resulting *clear indication* packet will all be zero.

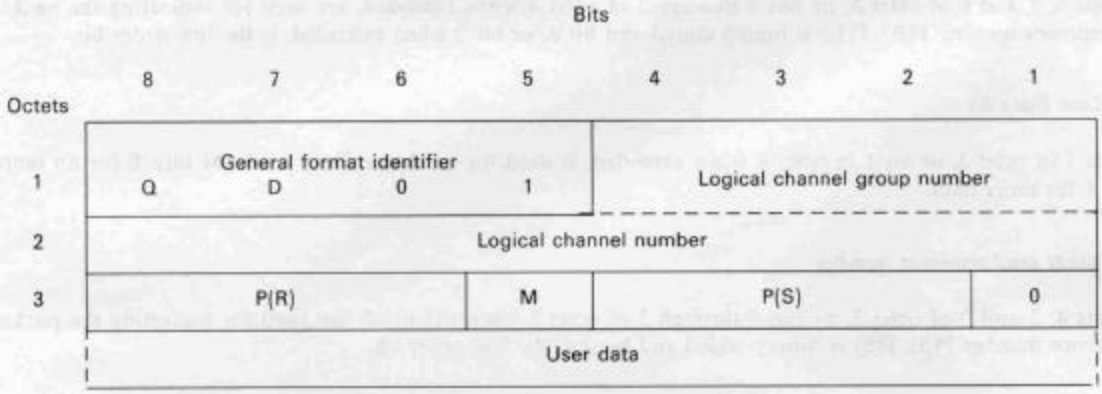
When a *clear indication* packet results from a *restart request* packet, the value of the diagnostic code will be that specified in the *restart request* packet, or all zeros in the case where no diagnostic code has been specified in the *restart request* packet.

When the clearing cause field does not indicate "DTE originated", the diagnostic code in a *clear indication* packet is network generated. Annex E lists the codings for network generated diagnostics. The bits of the diagnostic code are all set to 0 when no specific additional information for the clearing is supplied.

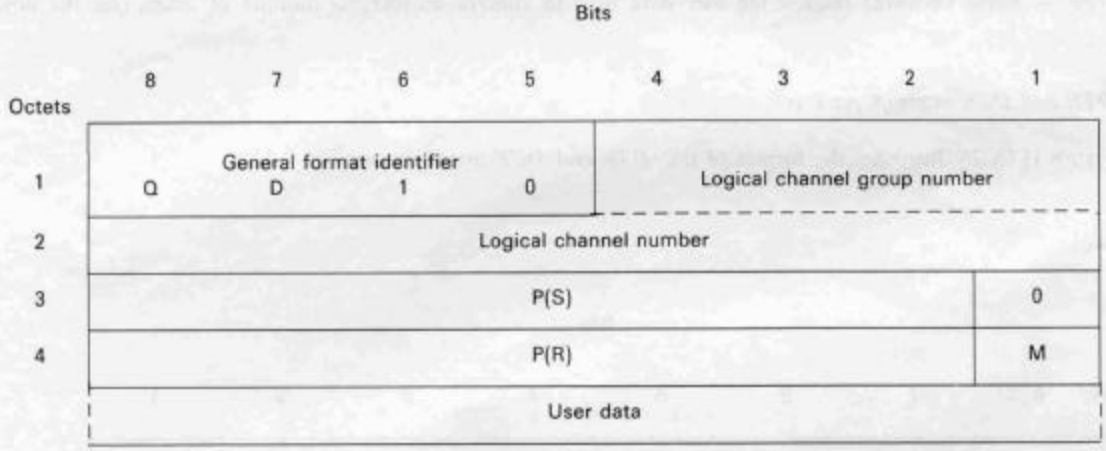
5.3 *Data and interrupt packets*

5.3.1 *DTE and DCE data packets*

Figure 10/X.25 illustrates the format of the *DTE* and *DCE data* packets.



(Modulo 8)



(When extended to modulo 128)

D Delivery confirmation bit
M More data bit
Q Qualifier bit

FIGURE 10/X.25

DTE and DCE data packet format