ANNEX A

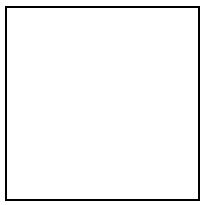
(to Recommendation X.25)

Range of logical channels used for virtual calls and permanent virtual circuits

In the case of a single logical channel DTE, logical channel 1 will be used.

For each multiple logical channel DTE/DCE interface, a range of logical channels will be agreed upon with the Administration according to Figure A–1/X.25.

Figure A–1/X.25 - CCITT 34901



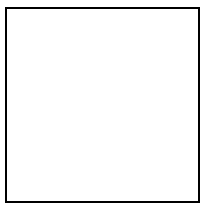
ANNEX B

(to Recommendation X.25)

Packet layer DTE/DCE interface state diagrams

B.1 *Symbol definition of the state diagrams*

Figure CCITT 19172



B.2 *Order definition of the state diagrams*

For the sake of clarity, the normal procedure at the interface is described in a number of small state diagrams. In order to describe the normal procedure fully, it is necessary to allocate a priority to the different figures and to relate a higher order diagram with a lower one. This has been done by the following means:

- The figures are arranged in order of priority with Figure B–1/X.25 (restart) having the highest priority and subsequent figures having lower priority. Priority means that when a packet belonging to a higher order diagram is transferred, that diagram is applicable and the lower order one is not.
- The relation with a state in a lower order diagram is given by including that state inside an ellipse in the higher order diagram.

FIGURE B–1/X.25 - CCITT 34910

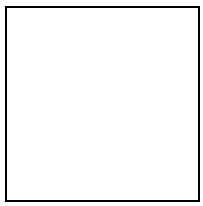


FIGURE B–2/X.25 - CCITT 18551

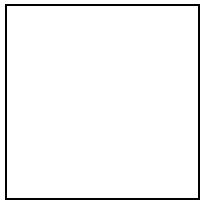
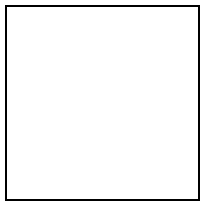


FIGURE B–3/X.25 - CCITT 18561



ANNEX C

(to Recommendation X.25)

Actions taken by the DCE on receipt of packets in a given state of the packet layer DTE/DCE interface as perceived by the DCE

Introduction

This annex specifies the actions taken by the DCE on receipt of packets in a given state of the packet layer DTE/DCE interface as perceived by the DCE.

It is presented as a succession of chained tables.

The following rules are valid for all these tables:

1) there may be more than one error associated with a packet. The network will stop normal processing of a packet when an error is encountered. Thus only one diagnostic code is associated with an error indication by the DCE. The order of packet decoding and checking on networks is not standardized;
2) for those networks which are octet aligned, the detection of a non–integral number of octets may be made at the data link or packet layer. In this annex, only those networks which are octet aligned and detect the non–integral number of octets at the packet layer are concerned with the considerations about octet alignment;
3) in each table, the actions taken by the DCE are indicated in the following way:
   - DISCARD: the DCE discards the received packet and takes no subsequent action as a direct result of receiving that packet; the DCE remains in the same state;
   - DIAG ## x: the DCE discards the received packet and, for networks which implement the *diagnostic* packet, transmits to the DTE a *diagnostic* packet containing the diagnostic ## x. The state of the interface is not changed;
   - NORMAL or ERROR: the corresponding action is specified after each table.
4) Annex E gives a list of the diagnostic codes which may be used.

TABLE C–1/X.25

Special cases

Packet from DTE	Any state
Any packet with packet length shorter than 2 octets, including data link layer valid I–frame containing no packet	DIAG ## 38
Any packet with invalid general format identifier (GFI)	DIAG ## 40
Any packet with unassigned logical channel	DIAG ## 36
Any packet with correct GFI and assigned logical channel, or with correct GFI and bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to 0	(see Table C–2/X.25)

TABLE C–2/X.25

Action taken by the DCE on receipt of packets in a given state of the packet layer DTE/DCE interface as perceived by the DCE: restart and registration procedure

Packet from the DTE \ State of the interface as perceived by the DCE	Packet layer ready r1	DTE restart request r2	DCE restart indication r3
Restart request with bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to zero	NORMAL (r2)	DISCARD	NORMAL (r1)
DTE restart confirmation with bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to zero	ERROR (r3) ## 17	ERROR (r3) ## 18	NORMAL (r1)
Registration request (when supported by the DCE) with bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to zero	NORMAL (r1)	NORMAL (r2)	NORMAL (r3)
Packet supported by the DCE other than restart request, DTE restart confirmation and registration request (when supported by the DCE) with bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to zero	DIAG ## 36	DIAG ## 36	DIAG ## 36
Packet having a packet type identifier which is shorter than 1 octet, with bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to zero	DIAG ## 38	ERROR (r3) ## 38	DISCARD
Packet having a packet type identifier which is undefined or not supported by the DCE (i.e., reject or registration packets), with bits 1 to 4 of octet 1 and bits 1 to 8 of octet 2 equal to zero	DIAG ## 33	ERROR (r3) ## 33	DISCARD
Data, interrupt, call set–up and clearing, flow control or reset, with assigned logical channel	See Table C–3/X.25 or C–4/X.25 (see Note)	ERROR (r3) ## 18	DISCARD
Restart request, DTE restart confirmation or registration request (when supported by the network) with bits 1 to 4 of octet 1 or bits 1 to 8 of octet 2 unequal to zero	See Table C–3/X.25 or C–4/X.25 (see Note)	ERROR (r3) ## 41	DISCARD
Packet having a packet type identifier which is shorter than 1 octet, with assigned logical channel	See Table C–3/X.25 or C–4/X.25 (see Note)	ERROR (r3)	DISCARD ## 38
Packet having a packet type identifier which is undefined or not supported by the DCE (i.e., reject or registration packets), with assigned logical channel	See Table C–3/X.25 or C–4/X.25 (see Note)	ERROR (r3) ## 33	DISCARD

Note – Table C–3/X.25 for logical channels assigned to virtual calls, Table C–4/X.25 for logical channels assigned to permanent virtual circuits.

ERROR (r3): ## x The DCE discards the received packet, indicates a restarting by transmitting to the DTE a *restart indication* packet, with the cause "Local procedure error" and the diagnostic ## x, and enters state r3. If connected through a virtual call, the distant DTE is also informed of the restarting by a *clear indication* packet, with the cause "Remote procedure error" (same diagnostic). In the case of a permanent virtual circuit, the distant DTE will be informed by a *reset indication* packet, with the cause "Remote procedure error" (same diagnostic).

NORMAL (ri): Provided none of the following error conditions has occurred, the action taken by the DCE follows the procedure as defined in §§ 3 and 6.1 and DTE/DCE interface enters state ri:

a) If a *restart request* packet or *DTE restart confirmation* packet received in state r3, or a *registration request* packet received in state r2 or r3, exceeds the maximum permitted length, is too short or is not octet aligned (see rule 2 in the introduction of this annex), the DCE will invoke the ERROR ## 39, ## 38 or ## 82 procedure, respectively.

Note – In the case of a *registration request* packet received in state r2 or r3 with the error(s) as noted above, alternative behavior by the DCE is for further study.

Some networks may invoke the ERROR ## 81 procedure if the restarting cause field is not "DTE originated" in the *restart request* packet received in state r3.

b) If a *restart request* or a *registration request* packet received in state r1 exceeds the maximum permitted length, is too short or is not octet aligned (see rule 2 in the introduction of this annex), the DCE shall invoke the DIAG ## 39, ## 38 or ## 82 procedure, respectively.

Some networks may invoke the DIAG ## 81 procedure if the restarting cause field is not "DTE originated" in the *restart request* packet received in state r1.

c) If a *registration request* packet is received from the DTE when the *on–line facility registration* facility is supported by the DCE but not subscribed by the DTE, the DCE shall transmit to the DTE a *registration confirmation* packet with the cause "Local procedure error", the diagnostic ## 42, and no registration field. If a *registration request* packet modifying one or more of the facilities which can take effect only when all logical channels used for virtual calls are in state p1 (see Annex F), is received when it is possible to make the modification, the DCE shall transmit a *restart indication* packet with the cause "Registration/cancellation confirmed" and diagnostic ## 0 and enter state r3, if there is one or more logical channels assigned to permanent virtual circuits. This action ensures that the permanent virtual circuits are reset so that all of the negotiated facilities can properly take effect.

TABLE C–3/X.25

Action taken by the DCE on receipt of packets in a given state of the packet layer DTE/DCE interface as perceived by the DCE: call set–up and clearing on logical channel assigned to virtual call (see Note 1)

State of the interface as perceived by the DCE	Packet layer ready r1						
	Ready	DTE waiting	DCE waiting	Data transfer	Call collision	DTE clear request	DCE clear indication
Packet from the DTE with logical channel assigned to virtual call	p1	p2 (see Note 3)	p3 (see Note 2)	p4	p5 (see Notes 2 and 3)	p6	p7
Call request	NORMAL (p2)	ERROR (p7) ## 21	NORMAL (p5)	ERROR (p7) ## 23	ERROR (p7) ## 24	ERROR (p7) ## 25	DISCARD
Call accepted	ERROR (p7) ## 20	ERROR (p7) ## 21	NORMAL (p4)	ERROR (p7) ## 23	ERROR (p7) ## 24	ERROR (p7) ## 25	DISCARD
Call request	NORMAL (p6)	NORMAL (p6)	NORMAL (p6)	NORMAL (p6)	NORMAL (p6)	DISCARD	NORMAL (p1)
DTE clear confirmation	ERROR (p7) ## 20	ERROR (p7) ## 21	ERROR (p7) ## 22	ERROR (p7) ## 23	ERROR (p7) ## 24	ERROR (p7) ## 25	NORMAL (p1)
Data, interrupt, reset or flow control	ERROR (p7) ## 20	ERROR (p7) ## 21	ERROR (p7) ## 22	See Table C–4/X.25	ERROR (p7) ## 24	ERROR (p7) ## 25	DISCARD
Restart request, DTE restart confirmation or registration request with bits 1 to 4 of octet 1 or bits 1 to 8 of octet 2 unequal to zero	ERROR (p7) ## 41	ERROR (p7) ## 41	ERROR (p7) ## 41	See Table C–4/X.25	ERROR (p7) ## 41	ERROR (p7) ## 41	DISCARD
Packets having a packet type identifier which is shorter than one octet	ERROR (p7) ## 38	ERROR (p7) ## 38	ERROR (p7) ## 38	See Table C–4/X.25	ERROR (p7) ## 38	ERROR (p7) ## 38	DISCARD
Packet having a packet type identifier which is undefined or not supported by the DCE (i.e., reject or registration packet)	ERROR (p7) ## 33	ERROR (p7) ## 33	ERROR (p7) ## 33	See Table C–4/X.25	ERROR (p7) ## 33	ERROR (p7) ## 33	DISCARD

Note 1 – On permanent virtual circuit, only state p4 exists and the DCE takes no action except those specified in Table C–4/X.25.

Note 2 – This state does nos exist in the case of an outgoing one–way logical channel (as perceived by the DTE).

Note 3 – This state does not exist in the case of an incoming one–way logical channel (as perceived by the DTE).

ERROR (p7): ## xThe DCE discards the received packet, indicates a clearing by transmitting to the DTE a *clear indication* packet, with the cause "Local procedure error" and the diagnostic ## x, and enters state p7. If connected through a virtual call, the distant DTE is also informed of the clearing by a *clear indication* packet, with the cause "Remote procedure error" (same diagnostic).

NORMAL (pi): Provide none of the following error conditions has occurred, the action taken by the DCE follows the procedures as defined in § 4 and the DTE/DCE interface enters state pi. In all the cases specified hereunder, the DCE will transmit to the DTE a *clear indication* with the appropriate cause and diagnostic, and enter state p7. If connected through a virtual call, the distant DTE is also informed of the clearing by a *clear indication* packet with the cause "Remote procedure error" (same diagnostic).

a) *Call request packet*

Error condition	Cause	Specific diagnostics (see Note 3 of Annex E)
1. Packet not octet aligned (see rule 2 in the introduction of this annex)	Local procedure error	## 82
2. Packet too short	Local procedure error	## 38
3. Incoming one–way logical channel (as perceived by the DTE)	Local procedure error	## 34
4. Address length larger than remainder of packet	Local procedure error	## 38
5. Address contains a non–BCD digit	Local procedure error	## 67, ## 68
6. Invalid calling DTE address (see Note)	Local procedure error	## 68
7. Invalid called DTE address (see Note)	Local procedure error or not obtainable	## 67

Note – Possible reasons for invalid address are:

– Prefix digit not supported;

– Invalid type of address/numbering plan identification informations (A bit set to 1);

– National address smaller than permitted by the national address format;

– National address larger than permitted by the national address format;

– DNIC less than four digits, etc.

	Error condition	Cause	Specific diagnostics (see Note 3 of Annex E)
8.	Value of the facility length field geater than 109	Local procedure error	## 69
9.	No combination of facilities could equal facility length	Local procedure error	## 69
10.	Facility length larger than remainder of packet	Local procedure error	## 38
11.	Facility code not allowed	Invalid facility request	## 65
12.	Facility value not allowed or invalid	Invalid facility request	## 66
13.	Class coding of the facility corresponding to a length of parameter larger than remainder of packet	Local procedure error	## 69
14.	Facility code repeated	Local procedure error	## 73
15.	Invalid network user identifier	Invalid facility request	## 84
16.	*NUI selection* facility expected by the DCE and not provided by the DTE	Local procedure error	## 84
17.	Invalid/unsupported NUI value or missing NUI detected at inter–network interface	Access barred	## 84
18.	RPOA selection required	RPOA out of order	## 76
19.	Facility values conflicts (e.g., a particular combination not supported)	Invalid facility request	## 66
20.	CCITT–specified DTE facility code or parameter not allowed or invalid	Invalid facility request	## 77
21.	Call user data larger than 16, or 128 in case of *fast select* facility	Local procedure error	## 39

If the virtual call cannot be established by the network, the DCE should use a *call progress* signal and diagnostic code among the following:

Error condition	Cause	Specific diagnostics (see Note 3 of Annex E)
22. Requested RPOA out of order	RPOA out of order	## 0
23. Requested RPOA invalid or not supported	RPOA out of order	## 119
24. Unknown number	Not obtainable	## 67
25. Incoming call barred	Access barred	## 70
26. Closed user group protection	Access barred	## 65
27. Ship absent	Ship absent	## 0
28. Reverse charging rejected	Reverse charging acceptance not subscribed	## 0
29. Fast select rejected	Fast select acceptance not subscribed	## 0
30. Called DTE out of order	Out of order	## 0 ## greater than 127
31. No logical channel available	Number busy	## 71
32. Call collision	Number busy	## 71, ## 72
33. The remote DTE/DCE interface or the transit network does not support a function or a facility requested	Incompatible destination	## 0

Note – Precise definition of error condition 30 necessitates further study, and should take into account the possible non–support of the virtual call service (only permanent virtual circuit) by the destination DTE.

Error condition	Cause	Specific diagnostics (see Note 3 of Annex E)
34. Procedure error at the remote DTE/DCE interface	Remote procedure error	[see b) and c) below and Annex D]
35. Temporary network congestion or fault condition within the network	Network congestion	## 0, ## 122 or ## greater than 127

b) *Call accepted packet*

Error condition	Cause	Specific diagnostics (see Note 3 of Annex E)
1. Packet not octet aligned (see rule 2 in the introduction of this annex)	Local procedure error	## 82
2. Address length larger than remainder of packet	Local procedure error	## 38
3. Address contains a non–BCD digit	Local procedure error	## 67, ## 68
4. Invalid calling DTE address [see Note under a)]	Local procedure error	## 68
5. Invalid called DTE address [see Note under a)]	Local procedure error	## 67
6. Value of the facility length greater than 109	Local procedure error	## 69
7. No combination of facilities could equal facility length	Local procedure error	## 69
8. Facility length larger than remainder of packet	Local procedure error	## 38
9. Facility code not allowed	Invalid facility request	## 65
10. Facility value not allowed or invalid	Invalid facility request	## 66
11. Class coding of the facility corresponding to a length of parameter field larger than remainder of packet	Local procedure error	## 69
12. Facility code repeated	Local procedure error	## 73
13. Invalid network user identifier	Invalid facility request	## 84
14. *NUI selection* facility expected by the DCE and not provided by the DTE	Local procedure error	## 84
15. Invalid/unsupported NUI value or missing NUI detected at inter–network interface	Access barred	## 84
16. Facility value conflict (e.g., a particular combination not supported)	Invalid facility request	## 66
17. CCITT–specified DTE facility code or parameter not allowed or invalid	Invalid facility request	## 77
18. Call user data larger than 128 (if *fast select* facility requested)	Local procedure error	## 39
19. Call user data present (if *fast select* facility not requested)	Local procedure error	## 39
20. The *incoming call* packet indicated fast select with restriction on response	Local procedure error	## 42

Some networks may invoke the ERROR ## 74 procedure if the calling and/or called DTE address length fields are not equal to 0 in the *call accepted* packet, except when the *called line address modified notification* facility is present in the facility field.

c) *Clear request packet*

Error condition	Cause	Specific diagnostics (see Note 3 of Annex E)
1. Packet not octet aligned (see rule 2 in the introduction of this annex)	Local procedure error	## 82
2. Packet too short	Local procedure error	## 38
3. Packet length incorrectly larger than 5 octets	Local procedure error	## 39
4. Calling DTE address length field not set to zero (at any time); called DTE address length field not set to zero except when the *called line address modified notification* facility is present in clearing a call in state p3	Local procedure error	## 74
5. Invalid called DTE address when the *called line address modified notification* facility is present in clearing a call in state p3 [see Note under a)]	Local procedure error	## 67
6. Value of the facility length field greater than 109	Local procedure error	## 69
7. No combination of facilities could equal facility length	Local procedure error	## 69
8. Facility length larger than remainder of packet	Local procedure error	## 38
9. Facility code not allowed	Invalid facility request	## 65
10. Facility value not allowed or invalid	Invalid facility request	## 66
11. Class coding of the facility corresponding to a parameter field length larger than remainder of packet	Local procedure error	## 69
12. Facility code repeated	Local procedure error	## 73
13. *Call deflection selection* facility requested when the maximum number of call redirections and call deflections is reached	Invalid facility request	## 78
14. *Call deflection selection* facility requested after timer expiration	Invalid facility request	## 53
15. Clear user data larger than 128 (if *fast select* facility requested)	Local procedure error	## 39
16. Clear user data present (if *fast select* facility and *call deflection selection* facility not requested)	Local procedure error	## 39
17. Clear user data larger than 16 (if *fast select* facility not requested and *call deflection selection* facility requested)	Local procedure error	## 39

Some networks may invoke the ERROR ## 81 procedure if the clearing cause field is not “DTE originated” in the *clear request* packet.

d) *DTE clear confirmation packet*

Error condition	Cause	Specific diagnostics (see Note 3 of annex E)
1. Packet not octet aligned (see rule 2 in the introduction of this annex)	Local procedure error	## 82
2. Packet length greater than 3 octets	Local procedure error	## 39

TABLE C–4/X.25

Action taken by the DCE on receipt of packets in a given state of the packet layer DTE/DCE interface as perceived by the DCE: data transfer (flow control and reset) on assigned logical channels

	Data transfer (p4)		
State of the interface as perceived by the DCE Packet from the DTE with assigned logical channel	Flow control ready (d1)	DTE reset request (d2)	DCE reset indication (d3)
Reset request	NORMAL (d2)	DISCARD	NORMAL (d1)
DTE reset confirmation	ERROR (d3) ## 27	ERROR (d3) ## 28	NORMAL (d1)
Data, interrupt or flow control	NORMAL (d1)	ERROR (d3) ## 28	DISCARD
Restart request, DTE restart confirmation or registration request with bits 1 to 4 of octet 1 or bits 1 to 8 of octet 2 unequal to zero	ERROR (d3) ## 41	ERROR (d3) ## 41	DISCARD
Packet having a packet type identifier which is shorter than 1 octet	ERROR (d3) ## 38	ERROR (d3) ## 38	DISCARD
Packet having a packet type identifier which is undefined or not supported by the DCE (i.e., reject or registration packet)	ERROR (d3) ## 33	ERROR (d3) ## 33	DISCARD
Invalid packet type on a permanent virtual circuit	ERROR (d3) ## 35	ERROR (d3) ## 35	DISCARD
Reject packet not subscribed	ERROR (d3) ## 37	ERROR (d3) ## 37	DISCARD

ERROR (d3): ## x The DCE discards the received packet, indicates a reset by transmitting to the DTE a *reset indication* packet, with the cause "Local procedure error" and the diagnostic ## x, and enter state d3. The distant DTE is also informed of the reset by a *reset indication* packet, with the cause "Remote procedure error" (same diagnostic).

NORMAL (di): Provided none of the following error conditions or special situations has occurred, the actions taken by the DCE follows the procedure as defined in § 4:

a) if the packet exceeds the maximum permitted length, is too short, is not octet aligned (see rule 2 in the introduction of this annex), the DCE will invoke the ERROR ## 39, ## 38 or ## 82 procedure, respectively;

b) some networks may invoke the ERROR ## 81 procedure if the resetting cause field in a *reset request* packet does not have the value "DTE originated";

c) some networks may invoke the ERROR ## 83 procedure if the Q bit is not set to the same value within a complete packet sequence;

d) if the P(S) or the P(R) received is not valid, the DCE will invoke the ERROR ## 1 or ## 2 procedure respectively;

e) the DCE will consider the receipt of a *DTE interrupt confirmation* packet which does not correspond to a yet unconfirmed *DCE interrupt* packet as an error and will invoke the ERROR ## 43 procedure. The DCE will consider a *DTE interrupt* packet received before a previous *DTE interrupt* packet has been confirmed as an error, and will invoke the ERROR ## 44 procedure;

f) if the network has a temporary inability to handle data traffic for a permanent virtual circuit (see § 4.2), and if the packet is a *data, interrupt, flow control* or *reset request* packet received in state d1, the DCE shall transmit to the DTE a *reset indication* packet with the cause "Network out of order" and enter state d3 (*data, interrupt* or *flow control* packet) or d1 (*reset request* packet).

ANNEX D

(to Recommendation X.25)

Packet layer DCE time–outs and DTE time–limits

D.1 *DCE time–outs*

Under certain circumstances this Recommendation requires the DTE to respond to a packet issued from the DCE within a stated maximum time.

Table D–1/X.25 covers these circumstances and the actions that the DCE will initiate upon the expiration of that time.

The time–out values used by the DCE will never be less than those indicated in Table D–1/X.25.

D.2 *DTE time–limits*

Under certain circumstances, this Recommendation requires the DCE to respond to a packet from the DTE within a stated maximum time. Table D–2/X.25 gives these maximum times. The actual DCE response times should be well within the specified time–limits. The rare situation where a time–limit is exceeded should only occur when there is a fault condition.

To facilitate recovery from such fault conditions, the DTE may incorporate timers. The time–limits given in Table D–2/X.25 are the lower limits of the times a DTE should allow for proper operation. A time–limit longer than the values shown may be used. Suggestions on possible DTE actions upon expiration of the time–limits are given in Table D–2/X.25.

Note – A DTE may use a time shorter than the value given for T21 in Table D–2/X.25. This may be appropriate when the DTE knows the normal response time of the called DTE to an incoming call. In this case, the timer should account for the normal maximum response time of the called DTE and the estimated maximum call set–up time.

TABLE D–1/X.25

DCE time–outs

Time–out number	Time–out value	Started when	State of the logical channel	Normally terminated when	Actions to be taken the first time the time–out expires		Actions to be taken the second time the time–out expires	
					Local side	Remote side	Local side	Remote side
T10	60 s	DCE issues a *restart indication*	r3	DCE leaves the r3 state (i.e., the *restart confirmation* or *restart request* is received)	DCE remains in r3, signals a *restart indication* (local procedure error ## 52) again, and restarts time–out T10	For permanent virtual circuits, DCE may enter the d3 state signalling a *reset indication* (remote procedure error ## 52)	DCE enters the r1 state and may issue a *diagnostic* packet (## 52)	For permanent virtual circuits, DCE may enter the d3 state signalling a *reset indication* (remote procedure error ## 52)
T11	180 s	DCE issues an *incoming call*	p3	DCE leaves the p3 state (e.g., the *call accepted*, *clear request* or *call request* is received)	DCE enters the p7 state signalling a *clear indication* (local procedure error ## 49)	DCE enters the p7 state signalling a *clear indication* (remote procedure error ## 49)		
T12	60 s	DCE issues a *reset indication*	d3	DCE leaves the d3 state (e.g., the *reset confirmation* or *reset request* is received)	DCE remains in d3, signals a *reset indication* (local procedure error ## 51) again, and restarts time–out T12	DCE may enter the d3 state signalling a *reset indication* (remote procedure error ## 51)	For virtual calls, DCE enters the p7 state signalling a *clear indication* (local procedure error ## 51). For permanent virtual circuits, DCE enters the d1 state and may issue a *diagnostic* packet (## 51)	For virtual calls, DCE enters the p7 state signalling a *clear indication* (remote procedure error ## 51). For permanent virtual circuits, DCE may enter the d3 state signalling a *reset indication* (remote procedure error ## 51)
T13	60 s	DCE issues a *clear indication*	p7	DCE leaves the p7 state (e.g., the *clear confirmation* or *clear request* is received)	DCE remains in p7, signals a *clear indication* (local procedure error ## 50) again, and restarts the time–out T13	DCE enters the p1 state and may issue a *diagnostic* packet (## 50)		

TABLE D–2/X.25

DTE Time–limits

Time–out number	Time–limit value	Started when	State of the logical channel	Normally terminated when	Preferred action to be taken when time–limit expires
T20	180 s	DTE issues a *restart request*	r2	DTE leaves the r2 state (i.e., the *restart confirmation* or *restart indication* is received)	To retransmit the *restart request* (see Note 1)
T21	200 s	DTE issues a *call request*	p2	DTE leaves the p2 state (e.g., the *call connected, clear indication* or *incoming call* is received)	To transmit a *clear request*
T22	180 s	DTE issues a *reset request*	d2	DTE leaves the d2 state (e.g., the *reset confirmation* or *reset indication* is received)	For virtual calls, to retransmit the *reset request* or to transmit a *clear request.* For virtual permanent call circuits, to retransmit the *reset request* (see Note 2)
T23	180 s	DTE issues a *clear request*	p6	DTE leaves the p6 state (e.g., the *clear confirmation* or *clear indication* is received)	To retransmit the *clear request* (see Note 2)
T28 (see Note 3)	300 s	DTE issues a *registration request*	any	DTE receives the *registration confirmation* or a *diagnostic* packet	May retransmit the *registration request,* but should at some point recognize that the *on–line facility registration* facility is not offered

Note 1 – After unsuccessful retries, recovery decisions should be taken at higher layers.

Note 2 – After unsuccessful retries, the logical channel should be considered out of order. The restart procedure should be invoked for recovery if reinitialization of all logical channels is acceptable.

Note 3 – The DTE timers T24 through T27 have been assigned by ISO in the specification of the packet layer for X.25 DTEs. To avoid ambiguity and confusion, the time–out number has therefore been assigned T28.

ANNEX E

(to Recommendation X.25)

Coding of X.25 network generated diagnostic fields in clear, reset and restart indication, registration confirmation and diagnostic packets

TABLE E–1/X.25

(see Notes 1, 2 and 3)

Diagnostics	Bits								
	8	7	6	5	4	3	2	1	Decimal
No additional information	0	0	0	0	0	0	0	0	0
Invalid P(S)	0	0	0	0	0	0	0	1	1
Invalid P(R)	0	0	0	0	0	0	1	0	2
	0	0	0	0	1	1	1	1	15
Packet type invalid	0	0	0	1	0	0	0	0	16
For state r1	0	0	0	1	0	0	0	1	17
For state r2	0	0	0	1	0	0	1	0	18
For state r3	0	0	0	1	0	0	1	1	19
For state p1	0	0	0	1	0	1	0	0	20
For state p2	0	0	0	1	0	1	0	1	21
For state p3	0	0	0	1	0	1	1	0	22
For state p4	0	0	0	1	0	1	1	1	23
For state p5	0	0	0	1	1	0	0	0	24
For state p6	0	0	0	1	1	0	0	1	25
For state p7	0	0	0	1	1	0	1	0	26
For state d1	0	0	0	1	1	0	1	1	27
For state d2	0	0	0	1	1	1	0	0	28
For state d3	0	0	0	1	1	1	0	1	29
	0	0	0	1	1	1	1	1	31
Packet not allowed	0	0	1	0	0	0	0	0	32
Unidentifiable packet	0	0	1	0	0	0	0	1	33
Call on one–way logical channel	0	0	1	0	0	0	1	0	34
Invalid packet type on a permanent virtual circuit	0	0	1	0	0	0	1	1	35
Packet on unassigned logical channel	0	0	1	0	0	1	0	0	36
Reject not subscribed to	0	0	1	0	0	1	0	1	37
Packet too short	0	0	1	0	0	1	1	0	38
Packet too long	0	0	1	0	0	1	1	1	39
Invalid general format identifier	0	0	1	0	1	0	0	0	40
Restart or registration packet with nonzero in bits 1 to 4 of octet 1, or bits 1 to 8 of octet 2	0	0	1	0	1	0	0	1	41
Packet type not compatible with facility	0	0	1	0	1	0	1	0	42
Unauthorized interrupt confirmation	0	0	1	0	1	0	1	1	43
Unauthorized interrupt	0	0	1	0	1	1	0	0	44
Unauthorized reject	0	0	1	0	1	1	0	1	45
	0	0	1	0	1	1	1	1	47
Time expired	0	0	1	1	0	0	0	0	48
For incoming call	0	0	1	1	0	0	0	1	49
For clear indication	0	0	1	1	0	0	1	0	50
For reset indication	0	0	1	1	0	0	1	1	51
For restart indication	0	0	1	1	0	1	0	0	52
For call deflection	0	0	1	1	0	1	0	1	53
	0	0	1	1	1	1	1	1	63

TABLE E–1/X.25 *(cont.)*

Diagnostics	Bits								
	8	7	6	5	4	3	2	1	Decimal
Call set–up, call clearing or registration problem	0	1	0	0	0	0	0	0	64
Facility/registration code not allowed	0	1	0	0	0	0	0	1	65
Facility parameter not allowed	0	1	0	0	0	0	1	0	66
Invalid called DTE address	0	1	0	0	0	0	1	1	67
Invalid calling DTE address	0	1	0	0	0	1	0	0	68
Invalid facility/registration length	0	1	0	0	0	1	0	1	69
Incoming call barred	0	1	0	0	0	1	1	0	70
No logical channel available	0	1	0	0	0	1	1	1	71
Call collision	0	1	0	0	1	0	0	0	72
Duplicate facility requested	0	1	0	0	1	0	0	1	73
Non zero address length	0	1	0	0	1	0	1	0	74
Non zero facility length	0	1	0	0	1	0	1	1	75
Facility not provided when expected	0	1	0	0	1	1	0	0	76
Invalid CCITT–specified DTE facility	0	1	0	0	1	1	0	1	77
Maximum number of call redirections or call deflections exceeded	0	1	0	0	1	1	1	0	78
	0	1	0	0	1	1	1	1	79
Miscellaneous	0	1	0	1	0	0	0	0	80
Improper cause code from DTE	0	1	0	1	0	0	0	1	81
Not aligned octet	0	1	0	1	0	0	1	0	82
Inconsistent Q bit setting	0	1	0	1	0	0	1	1	83
NUI problem	0	1	0	1	0	1	0	0	84
	0	1	0	1	1	1	1	1	95
Not assigned	0	1	1	0	0	0	0	0	96
	0	1	1	0	1	1	1	1	111
International problem	0	1	1	1	0	0	0	0	112
Remote network problem	0	1	1	1	0	0	0	1	113
International protocol problem	0	1	1	1	0	0	1	0	114
International link out of order	0	1	1	1	0	0	1	1	115
International link busy	0	1	1	1	0	1	0	0	116
Transit network facility problem	0	1	1	1	0	1	0	1	117
Remote network facility problem	0	1	1	1	0	1	1	0	118
International routing problem	0	1	1	1	0	1	1	1	119
Temporary routing problem	0	1	1	1	1	0	0	0	120
Unknown called DNIC	0	1	1	1	1	0	0	1	121
Maintenance action (see Note 4)	0	1	1	1	1	0	1	0	122
	0	1	1	1	1	1	1	1	127
Reserved for network specific diagnostic information	1	0	0	0	0	0	0	0	128
	1	1	1	1	1	1	1	1	255

Note 1 – Not all diagnostic codes need apply to a specific network, but those used are as coded in the table.

Note 2 – A given diagnostic need not apply to all packet types (i.e., *reset indication, clear indication, restart indication, registration confirmation* and *diagnostic* packets).

Note 3 – The first diagnostic in each grouping is a generic diagnostic and can be used in place of the more specific diagnostics within the grouping. The decimal 0 diagnostic code can be used in situations where no additional information is available.

Note 4 – This diagnostic may also apply to a maintenance action within a national network.

ANNEX F

(to Recommendation X.25)

Applicability of the on–line facility registration facility to other facilities

Name of facility or interface parameter	Reference to definition (§)	Negotiable in *registration request* and *registration confirmation* packets	Indication in *registration confirmation* packets whether the facility is supported by the DCE	Negotiable only when every logical channel used for virtual calls is in state p1
Extended packet sequence numbering	6.2	Yes (see Note 1)	Yes (see Note 1)	Yes
D bit modification	6.3	Yes	Yes	Yes
Packet retransmission	6.4	Yes	Yes	Yes
Incoming calls barred	6.5	Yes	No	No
Outgoing calls barred	6.6	Yes	No	No
One–way logical channel outgoing	6.7	(see Note 2)		
One–way logical channel incoming	6.8	(see Note 2)		
Non–standard default packet sizes	6.9	Yes	Yes	No
Non–standard default window sizes	6.10	Yes	Yes	No
Default throughput classes assignment	6.11	Yes	Yes	No
Flow control parameter negotiation	6.12	Yes	No	No
Throughput class negotiation	6.13	Yes	No	No
Closed user group related facilities	6.14	No	No	–
Bilateral closed user group related facilities	6.15	No	No	–
Fast select	6.16	No	No	–
Fast select acceptance	6.17	Yes	No	No
Reverse charging	6.18	No	Yes	–
Reverse charging acceptance	6.19	Yes	Yes	No
Local charging prevention	6.20	No	Yes	–
NUI related facilities	6.21	No	No	–
Charging information	6.22			
(per interface basis)	Yes	Yes	No	
(per call basis)	No	Yes	–	
RPOA related facilities				
RPOA subscription	6.23.1	(see Note 1)	(see Note 1)	(see Note 1)
RPOA selection	6.23.2	No	Yes	–
Hunt group	6.24	No	No	–
Call redirection	6.25.1	(see Note 1)	(see Note 1)	(see Note 1)
Call deflection related facilities	6.25.2	(see Note 1)	(see Note 1)	(see Note 1)
Call redirection or call deflection notification	6.25.3	No	No	–
Called line address modified notification	6.26	No	No	–
Transit delay selection and indication	6.27	No	Yes	–
Allocation of logical channel type range	Annex A	Yes	Yes	Yes

Note 1 – Further study is needed.

Note 2 – Negotiation of one–way logical channel ranges is accomplished by allocation of logical channel type ranges negotiation.

ANNEX G

(to Recommendation X.25)

CCITT–specified DTE facilities to support the OSI Network service

G.1 *Introduction*

The facilities described in this annex are intended to support end–to–end signalling required by the OSI Network service. They follow the CCITT–specified DTE facility marker defined in § 7.1. These facilities are passed unchanged between the two packet mode DTEs involved.

Procedures for use of these facilities by DTEs are specified in ISO 8208. Subsequent provision of X.25 facilities to be acted on by public data networks is for further study. Coding of the facilities in this annex is defined here in order to facilitate a consistent facility coding scheme in such future evolution.

G.2 *Coding of the facility code fields*

Table G–1/X.25 gives the coding of the facility code field for each CCITT–specified DTE facility and the packet types in which they may be present. These facilities are conveyed after the CCITT–specified DTE facility marker.

TABLE G–1/X.25

Coding of the facility code field

Facility	Packet types in which the facility may be used						Facility code							
	Call request	Incoming call	Call accepted	Call connected	Clear request	Clear indication	Bits 8	7	6	5	4	3	2	1
Calling address extension	X	X			X (see Note)		1	1	0	0	1	0	1	1
Called address extension	X	X	X	X	X	X	1	1	0	0	1	0	0	1
Quality of service negotiation:														
Minimum throughput class	X	X			X (see Note)		0	0	0	0	1	0	1	0
End–to–end transit delay	X	X	X	X	X (see Note)		1	1	0	0	1	0	1	0
Priority	X	X	X	X	X (see Note)		1	1	0	1	0	0	1	0
Protection	X	X	X	X	X (see Note)		1	1	0	1	0	0	1	1
Expedited data negotiation	X	X	X	X	X (see Note)		0	0	0	0	1	0	1	1

Note – Only when the *call deflection selection* facility is used (see § 6.25.2.2.).

G.3 *Coding of the facility parameter field*

G.3.1 *Calling address extension facility*

The octet following the facility code field indicates the length of the facility parameter field in octets. It has a value of $n + 1$, where n is the number of octets necessary to hold the calling address extension. The facility parameter field follows the length and contains the calling address extension.

The first octet of the facility parameter field indicates, in bits 8 and 7, the use of the calling address extension, as shown in Table G–2/X.25.

TABLE G–2/X.25

Coding of bits 8 and 7 in the first octet of the calling extension facility parameter field

Bits		Use of calling address extension
8	7	
0	0	To carry a calling address assigned according to Recommendation X.213/ISO 8348 AD2
0	1	Reserved
1	0	Other (to carry a calling address not assigned according to Recommendation X.213/ISO 8348 AD2)
1	1	Reserved

Bits 6, 5, 4, 3, 2 and 1 of this octet indicates the number of semi–octets (up to a maximum of 40) in the calling address extension. This address length indicator is binary coded, where bit 1 is the low–order bit.

The following octets contain the calling address extension.

If bits 8 and 7 of the first octet of the facility parameter field are coded "00", the following octets are encoded using the preferred binary encoding (PBE) defined in Recommendation X.213. Starting from the high–order digit of the Initial Domain Part (IDP), the address is coded in octet 2 and consecutive octets of the facility parameter field. Each digit, with padding digits applied as necessary, is coded in a semi–octet in binary coded decimal, where bit 5 or 1 is the low–order bit of the digit. In each octet, the higher–order bit is coded in bits 8, 7, 6 and 5. The Domain Specific Part (DSP) of the calling OSI NSAP follows the IDP and is coded in decimal of binary, according to the PBE. For example, if the syntax of the DSP is decimal, each digit is coded in binary coded decimal (with the same rules applying to the DSP as to the IDP above). If the syntax of the DSP is binary, each octet of the calling address extension contains an octet of the DSP.

If bits 8 and 7 of the first octet of the facility parameter field are coded "10", each digit of the calling address extension is coded in a semi–octet in binary coded decimal, where bit 5 or 1 is the low–order bit of the digit. Starting from the high–order digit, the address is coded in octet 2 and consecutive octets of the facility parameter field with two digits per octet. In each octet, the higher order digit is coded in bits 8, 7, 6 and 5. When necessary, the facility parameter field shall be rounded up to an integral number of octets by inserting zeros in bits 4, 3, 2 and 1 of the last octet of the field.

G.3.2 *Called address extension facility*

The octet following the facility code field indicates the length of the facility parameter field in octets. It has a value of $n + 1$, where n is the number of octets necessary to hold the called address extension. The facility parameter field follows the length and indicates the called address extension.

The first octet of the facility parameter field indicates, in bits 8 and 7, the use of the called address extension, as shown in Table G–3/X.25.

TABLE G–3/X.25

Coding of bits 8 and 7 in the first octet of the called extension facility parameter field

Bits		Use of calling address extension
8	7	
0	0	To carry a called address assigned according to Recommendation X.213/ISO 8348 AD2
0	1	Reserved
1	0	Other (to carry a called address not assigned according to Recommendation X.213/ISO 8348 AD2)
1	1	Reserved

Bits 6, 5, 4, 3, 2 and 1 of this octet indicates the number of semi–octets (up to a maximum of 40) in the called address extension. This address length indicator is binary coded, where bit 1 is the low–order bit.

The following octets contain the called address extension.

If bits 8 and 7 of the first octet of the facility parameter field are coded "00", the following octets are encoded using the preferred binary encoding (PBE) defined in Recommendation X.213. Starting from the high–order digit of the Initial Domain Part (IDP), the address is coded in octet 2 and consecutive octets of the facility parameter field. Each digit, with padding digits applied as necessary, is coded in a semi–octet in binary coded decimal, where bit 5 or 1 is the low–order bit of the digit. In each octet, the higher–order bit is coded in bits 8, 7, 6 and 5. The Domain Specific Part (DSP) of the called OSI NSAP follows the IDP and is coded in decimal of binary, according to the PBE. For example, if the syntax of the DSP is decimal, each digit is coded in binary coded decimal (with the same rules applying to the DSP as to the IDP above). If the syntax of the DSP is binary, each octet of the called address extension contains an octet of the DSP.

If bits 8 and 7 of the first octet of the facility parameter field are coded "10", each digit of the called address extension is coded in a semi–octet in binary coded decimal, where bit 5 or 1 is the low–order bit of the digit. Starting from the high–order digit, the address is coded in octet 2 and consecutive octets of the facility parameter field with two digits per octet. In each octet, the higher order digit is coded in bits 8, 7, 6 and 5. When necessary, the facility parameter field shall be rounded up to an integral number of octets by inserting zeros in bits 4, 3, 2 and 1 of the last octet of the field.

G.3.3 *Quality of service negotiation facilities*

G.3.3.1 *Minimum throughput class facility*

The minimum throughput class for the direction of data transmission from the calling DTE is indicated in bits 4, 3, 2 and 1. The minimum throughput class for the direction of data transmission from the called DTE is indicated in bits 8, 7, 6 and 5.

The four bits indicating each throughput class are binary coded and correspond to throughput classes as indicated in Table 30/X.25.

G.3.3.2 *End–to–end transit delay facility*

The octet following the facility code field indicates the length in octets of the facility parameter field and has the value 2, 4 or 6.

The first and second octets of the facility parameter field contain the cumulative transit delay. The third and fourth octets are optional and, when present, contain the requested end–to–end transit delay. If the third and fourth octets are present, then the fifth and sixth octets are also optional. The fifth and sixth octets, when present, contain the maximum acceptable end–to–end transit delay. The optional octets are not present in *call accepted* and *call connected* packets.

Transit delay is expressed in milliseconds and is binary–coded, with bit 8 of the first of a pair of octets being the high–order bit and bit 1 of the second of a pair of octets being the low–order bit. The value of all ones for cumulative transit delay indicates that the cumulative transit delay is unknown or exceeds 65 534 milliseconds.

G.3.3.3 *Priority facility*

The octet following the facility code field indicates the length, in octets, of the facility parameter field. This may take the value 1, 2, 3, 4, 5 or 6.

The first, second and third octets of the facility parameter field contain the target (*call request* packet), available (*incoming call* packet) or selected (*call accepted* and *call connected* packets) values for the priority of data on connection, priority to gain a connection and priority to keep a connection, respectively. The fourth, fifth and sixth octets of the facility parameter field in *call request* and *incoming call* packets contain the lowest acceptable values for the priority of data on connection, priority to gain a connection and priority to keep a connection, respectively. When the facility is present in *call request* and *incoming call* packets, octet 2 through 6 of the facility parameter field are optional. For example, if the only values to be specified are the target and lowest acceptable values for priority to gain a connection, then the facility parameter field will contain at least 5 octets with octets 1, 3 and 4 containing the value "unspecified", and octets 2 and 5 containing the specified values. When the facility is present in the *call accepted* and *call connected* packets, octets 2 and 3 are optional.

The potential range of specified values for each sub–parameter is 0 (lowest priority) to 254 (highest priority). The value 255 (1111 1111) indicates "unspecified".

G.3.3.4 *Protection facility*

The octet following the facility code indicates the length, in octets, of the facility parameter field.

The two highest order bits of the first octet (i.e., bits 8 and 7) of the facility parameter field specify the protection format code as indicated in Table G–4/X.25.

TABLE G–4/X.25

Coding of the two highest order bits in the first octet of the protection format code

Bits		Use of calling address extension
8	7	
0	0	Reserved
0	1	Source address specific
1	0	Destination address police
1	1	Globally unique

The remaining six bits of the octet are reserved and must be set to zero.

The second octet of the facility parameter field specifies the length "n", in octets, of the target (*call request* packet), available (*incoming call* packet) or selected (*call accepted* and *call connected* packets) protection level. The actual value is placed in the following "n" octets. Optionally, the "n + 3" octet of the facility parameter field specifies the length "m", in octets, of the lowest acceptable protection level in *call request* and *incoming call* packets. The actual value is placed in the following "m" octets. The optional octets are not present in *call accepted* and *call connected* packets.

Note – The values of "n" and "m" are bounded firstly by the overall length of the facility (first octet), and secondly by each other.

G.3.4 *Expedited data negotiation facility*

The coding of the facility parameter field is:

bit 1 = 0 for no use of expedited data

bit 1 = 1 for use of expedited data

Note – Bits 8, 7, 6, 5, 4, 3 and 2 may be assigned to other facilities in the future; presently, they are set to zero.

ANNEX H

(to Recommendation X.25)

Subscription–time optional user facilities that may be associated with a network user identifier in conjunction with the NUI override facility

(see § 6.21.2)

Subscription–time optional user facility	May be associated with an NUI
On–line facility registration	No
Extended packet sequence numbering	No
D bit modification	No
Packet retransmission	No
Incoming calls barred	No
Outgoing calls barred	No
One–way logical channel outgoing	No
One–way logical channel incoming	No
Non–standard default packet sizes	Yes
Non–standard default window sizes	Yes
Default throughput classes assignment	Yes
Flow control parameter negotiation (subscription–time)	Yes
Throughput class negotiation (subscription–time)	Yes
Closed user group related facilities	
Closed user group	Yes
Closed user group with outgoing access	Yes
Closed user group with incoming access	No
Incoming calls barred within a closed user group	No
Outgoing calls barred within a closed user group	No
Bilateral closed user group related facilities	
Bilateral closed user group	Yes
Bilateral closed user group with outgoing access	Yes
Fast select acceptance	No
Reverse charging acceptance	No
Local charging prevention	No
Charging information (subscription–time)	Yes
RPOA subscription	Yes
Hunt group	No
Call redirection and call deflection related facilities	
Call redirection	No
Call deflection subscription	No
“TOA/NPI address” subscription	No