ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

ANALYSIS OF EUROPEAN X.25 NETWORKS

TR/15

September 1983

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BRIEF HISTORY

In order to be able to write a standard for a DTE that would be able to connect to and operate with the majority of the European X.25 Networks, it was first necessary to study and analyse the national implementations of X.25. This study concentrated on the optional facilities and those parts of X.25 that give the greatest scope for variable implementation. The study is related to the 1980 version of Rec. X.25 as published in the CCITT Yellow Book, Volume VIII.2.

The results of the study to date are contained in this TR. Although some sections are still incomplete it is considered worthwile to publish in the present form.

ECMA wishes to acknowledge the help and co-operation of the European PTT authorities in the preparation of this TR, and to thank CCITT COM VII for considering the findings. A draft version of the analysis and ECMA's comments were sent to CCITT as COM VII No. 170 and 169 respectively. The CCITT response is published in COM VII - Temp. 57-E, App. 3

This Technical Report ECMA TR/15 was accepted by the General Assembly of June 16, 1983.

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1. SCOPE

The information in this document has been derived by ECMA members from the documents listed below and by discussion with the PTT administrations.

	National documentation ref.	Operational Status
UK PSS	Tech. Guide 17, Iss 1, Nov. 1980	Operational nation-wide
FRANCE TRANSPAC	STUR. 7th Revision Jan. 1982	Operational nation-wide
NETHERLANDS DATANET 1	Td 334. Iss. 1 Aug. 1982	Operational from mid Dec. 81. Geographical availability?
SWEDEN TELEPAK	Draft Specification	Limited availability
LUXEMBOURG LUXPAC	Not yet available	Nation-wide,End 1982 International, Early 1983
SWITZERLAND EDWP	TELEPAC	P Jan. 1983
BELGIUM DCS	RTT Recommendation X.25 Levels 1 & 2 Ed.? Level 3 Ed.?	Commercial operations started Dec. 1982.
FED. REPUBLIC OF GERMANY DATEXP	Technical user guide. "Benutzerhandbuch DATEX-P"	Operational nation-wide
ITALY	"Specifiche della rete publica per dati" Version 1, June 82	P 1983
SPAIN, IBERPAC	Preliminary information only.	Operational

Key to symbols:

Y (Yes)	= Available
x	= Not provided
?	= Not known
NA	= Not applicable
P	= Planned Year

2. PHYSICAL LEVEL

2.1 Physical Level Options

	UK PSS	FRANCE TRANSPAC	NETHERLANDS DN 1	SWITZERLAND Note 1
X.21 bis 2400 bps	Y	Y	Y	Y
4800 bps	Y (A1. 2.1.2)	Y	Y	Y
9600 bps	Y	Y	Y	Y
19,2 kbps	x	Y	x	x
48 kbps	Y V35	Y V35	x	Y V35 and V36
X.21 2400 bps	P1983 See A1. 2.1.3	x	Y	x
4800 bps		x	Y	x
9600 bps		x	Y	x
48 kbps		x	Y	x

2.2 Physical Level Monitoring

Does the network monitor physical level failure	No	Yes	Yes	?
Action if failure is detected	Not monitored	A2.2.1.2	No	?

Note 1

Expected to be aligned with Datex P.

3. LINK LEVEL

3.1 Link Monitoring

Does the network monitor the Link Active/Link Idle States	No	No	Yes See A3.2.4. 6. & 2.4.11.2.	?
Action by Network when Link Idle is detected	Not monitored	Not monitored		?

2. PHYSICAL LEVEL (Cont'd)

2.1 Physical Level Options

	ITALY	SPAIN	BELGIUM	FRG DATEX-P
X.21 bis 2400 bps	Y	Y	Y	Y
4800 bps	Y	Y	Y	Y
9600 bps	Y	Y	Y	Y
19,2 kbps	x	x	x	x
48 kbps	Y V35 or V36	x	Y V.35 or V.11 based interface	Y V36 See A6.2.1.1
X.21 2400 bps	x	x	x	Y 1981
4800 bps	x	x	x	Y 1981
9600 bps	x	x	x	Y 1981
48 kbps	x	x	x	P

See A6.2.1.1.

2.2 Physical Level Monitoring

Does the network monitor physical level failure	?	?	Yes	Yes
Action if failure is detected	?	?	As X.25 sec.3.5 & 4.6	If down more than 15s. SVC Clear PVC Reset

3. LINK LEVEL (Cont'd)

3.1 Link Monitoring

Does the network monitor the Link Active/Link Idle States	?	?	No See A5.2.2.3	No
Action by Network when Link Idle is detected	?	?		No

2. PHYSICAL LEVEL (cont'd)

2.1 Physical Level Options

	SWEDEN	LUXEMBOURG
X.21 bis 2400 bps	Y	Y
4800 bps	Y	Y
9600 bps	Y	Y
19,2 kbps	x	x
48 kbps	x	x
X.21 2400 bps	x	Y
4800 bps	x	Y
9600 bps	x	Y
48 kbps	x	Y

2.2 Physical Level Monitoring

Does the network monitor physical level failure	?	Yes
Action if failure is detected	?	As X.25

3. LINK LEVEL (cont'd)

3.1 Link Monitoring

Does the network monitor the Link Active/Link Idle States	Yes	No
Action by Network when Link Idle is detected	Reset	N/A

		UK PSS	FRANCE TRANSPAC	NETHERLANDS DN 1	SWITZERLAND EDWP
3.2	Mode of Operation				
	LAP	Y	Y	x	x
	LAPB	Y	Y	Y	Y
	Method of selection	By Link Command	By Link Command	N/A	N/A
	Link set-up initiative	DTE only	DTE only	DTE or DCE	DTE
3.3	Parameters (Note 2)				
	K	7 (fixed)	7 max	7 max	7 max
	N1 (octets)	default 135 other sizes facility dependent	319 max	1080 max	263 max
	N2	20 (fixed)	10	5	10
	T1	100 ms-10s increments of 100 ms	100, 200, 400 800, 1600 or 2550 ms	See A3.2.4.11.1 2.125 s up to 9600 bps, 125 ms for 48 kbps	3 s
3.4	FRMR coding	As X.25	See App. 2	As X.25	As X.25
	DCE response to FRMR	SABM	DM See A2	SABM	SABM

Note 2 *The definitions are given in the X.25 Preferred Facilities standard, but this table defines the network values.*

		BELGIUM	FRG DATEX-P	ITALY	SPAIN
3.2	Mode of Operation				
	LAP	x	x	x	x
	LAPB	Y	Y	Y	Y
	Method of selection	N/A	N/A	N/A	N/A
	Link set-up initiative	DTE or DCE see A5.2.2.1	DTE or DCE	DTE or DCE	
3.3	Parameters (Note 2)				
	K	2 to 7	7 max	7 max	2 to 7
	N1 (octets) N.B. this will determine the L3 capability	132 max	135 max	135 max	as per max packet size
	N2	10 if T1 $\geqslant$ 2 s 20 if T1 $\leqslant$ 1 s	10	4	3
	T1	0.5, 1, 2, 3 or 4 s	3 s	4 s at 2400 bps 2 s at 4800 bps 1 s at 9600 bps 1 s at 48 kbps	1,5 s
3.4	FRMR coding	As X.25	As X.25	As X.25	?
	DCE response to FRMR	SABM	SABM	SABM	?

		SWEDEN	LUXEMBOURG
3.2	Mode of Operation		
	LAP	x	Y
	LAPB	Y	Y
	Method of selection	N/A	By Link Command
	Link set-up initiative	DTE or DCE. Repeated SABM from DCE	DTE only
3.3	Parameters (Note 2)		
	K	7 max	7 max
	N1 (octets) N.B. this will determine the L3 capability	Depend on max. packet size	263 max
	N2	10 max	10 fixed
	T1	3 s fixed	100/200/400 800/1600/2550 ms
3.4	FRMR coding	As X.25	As X.25
	DCE response to FRMR	DM	DM

		UK PSS	FRANCE TRANSPAC	NETHERLANDS DN 1	SWITZERLAND EDWP
4.	PACKET LEVEL				
4.1	Basic Services				
	SVC	Y	Y	Y	Y
	PVC	Y	Y	Y	Y
	Datagrams	x	x	x	x
4.2	Optional user facilities assigned for an agreed contractual period				
X2 Ref.					
1.1	Extended packet sequence numbering (modulo 128)	x	x	x	x
1.2	Nonstandard default window sizes	See A1.2. 3.4	Y	P 2/83	x
1.3	Nonstandard default packet sizes 16, 32, 64, 256, 512, 1024		Y	x	x
1.4	Default throughput class assignment	Y (SVC only)	Y	P 3/82	x
1.5	Flow control parameter negotiation	Y	Y	P 2/83	x
1.6	Throughput class negotiation	Y (SVC only)	Y	P 3/82	x
1.7	Packet retransmission	Y	x	Y	x
1.8	Incoming calls barred	Y	x	Y	Y
1.9	Outgoing calls barred	Y	x	Y	Y
1.10	One-way logical channel outgoing	Y	Y	Y	Y
1.11	One-way logical channel incoming	Y	Y	Y	Y
1.12	Closed user group	Y	Y	Y	Y
1.13	Closed user group with outgoing access	Y	P 1984	Y	Y
1.14	Closed user group with incoming access	Y	Y	Y	Y
1.15	Incoming calls barred within a closed user group	x	Y	P 3/82	Y
1.16	Outgoing calls barred within a closed user group	x	Y	P 3/82	Y

4.2 cont'd		UK PSS	FRANCE TRANSPAC	NETHERLANDS DNI	SWITZERLAND EDWP
1.17	Bilateral closed user group	x	x	x	
1.18	Bilateral closed user group with outgoing access	x	x	x	
1.19	Reverse charging acceptance	Y	Y	Y	Y
1.20	Fast select acceptance	Y	P 1984	x	x
1.21	Datagram queue length selection	x	x	x	x
1.22	Datagram service signal logical channel	x	x	x	x
1.23	Datagram nondelivery indication	x	x	x	x
1.24	Datagram delivery confirmation	x	x	x	x
1.25	Multiple circuits to the same DTE	x	Y see A.2.2.1.1	x	
1.26	Charging information	Y	P 1984		x
1.27	Direct call	x	x		
1.28	Multiple terminals with the same data number	Y	P 1984	x	
1.29	On-line facility registration	x	P 1984	x	
1.30	D-bit modification	P 1983	x	P 2/82	x

4. PACKET LEVEL		BELGIUM	FRG DATEX-P	ITALY	SPAIN
4.1	Basic Services				
	SVC	Y	Y	Y	Y
	PVC	Y	Y	Y	Y
	Datagrams	x	x	x	?
4.2	Optional user facilities assigned for an agreed contractual period				
X2 Ref.					
1.1	Extended packet sequence numbering (modulo 128)	x	x	x	x
1.2	Nonstandard default window sizes	A5.1.3.2	Y	x	Y
1.3	Nonstandard default packet sizes 16, 32, 64, 256, 512, 1024	x	x	x	x
1.4	Default throughput class assign.	A5.1.3.2	x	Y	x
1.5	Flow control parameter negotiation	P Jan.'84	P March'84	x	Y
1.6	Throughput class negotiation	A5.1.3.2	P March'84	Y	x
1.7	Packet retransmission	x	x	x	x
1.8	Incoming calls barred	P Jan.'84	Y	Y	Y
1.9	Outgoing calls barred	P Jan.'84	Y	Y	Y
1.10	One-way logical channel outgoing	P Jan.'84	Y	Y	Y
1.11	One-way logical channel incoming	P Jan.'84	Y	Y	Y
1.12	Closed user group	Y	Y See	Y	Y
1.13	Closed user group with outgoing access	Y	Y A6.2.3.1	Y	Y
1.14	Closed user group with incoming "	Y	Y	Y	Y
1.15	Incoming calls barred within a closed user group	x	x	x	Y
1.16	Outgoing calls barred within a closed user group	x	x	x	Y
1.17	Bilateral closed user group	x	x	x	
1.18	Bilateral closed user group with outgoing access	x	x	x	

4.2 cont'd

		BELGIUM	FRG DATEX-P	ITALY	SPAIN
1.19	Reverse charging acceptance	Y	Y	Y	Y
1.20	Fast select acceptance	x	P March'84	x	Y
1.21	Datagram queue length selection	x	x	x	
1.22	Datagram service signal logical channel	x	x	x	
1.23	Datagram nondelivery indication	x	x	x	
1.24	Datagram delivery confirmation	x	x	x	
1.25	Multiple circuits to the same DTE	A5.1.3.3	in discussion	Y	
1.26	Charging information	x	" "	x	x
1.27	Direct call	x	P March'84	x	
1.28	Multiple terminals with the same data number	A5.1.3.3	x	x	
1.29	On-line facility registration	x	x	?	
1.30	D-bit modification	x	P March '84	x	

4. PACKET LEVEL		SWEDEN	LUXEMBOURG
4.1	Basic Services		
	SVC	Y	Y
	PVC	P 1984	Y
	Datagrams	x	x
4.2	Optional user facilities assigned for an agreed contractual period		
X2 Ref.			
1.1	Extended packet sequence numbering (modulo 128)	See Appendix 9.3.12	x
1.2	Nonstandard default window sizes		1,2,3 or 4
1.3	Nonstandard default packet sizes 16, 32, 64, 256, 512, 1024		32,64,128 or 256
1.4	Default throughput class assignment		Y
1.5	Flow control parameter negotiation		P 2/83
1.6	Throughput class negotiation		Y
1.7	Packet retransmission		x
1.8	Incoming calls barred		Y
1.9	Outgoing calls barred		Y
1.10	One-way logical channel outgoing		Y
1.11	One-way logical channel incoming		Y
1.12	Closed user group		Y
1.13	Closed user group with outgoing access		Y
1.14	Closed user group with incoming access		Y
1.15	Incoming calls barred within a closed user group		Y
1.16	Outgoing calls barred within a closed user group		x
1.17	Bilateral closed user group		x
1.18	Bilateral closed user group with outgoing access		

4.2 cont'd

		SWEDEN	LUXEMBROUG
1.19	Reverse charging acceptance	See Appendix 9.3.12	Y
1.20	Fast select acceptance		P 2/83
1.21	Datagram queue length selection		x
1.22	Datagram service signal logical channel		x
1.23	Datagram nondelivery indication		x
1.24	Datagram delivery confirmation		x
1.25	Multiple circuits to the same DTE		Y
1.26	Charging information		x
1.27	Direct call		x
1.28	Multiple terminals with the same data number		x
1.29	On-line facility registration		x
1.30	D-bit modification		x

4.3 Optional user facilities requested by the DTE on a per-call basis

X2 Ref.		UK PSS	FRANCE TRANSPAC	NETHERLANDS DN 1	SWITZERLAND EDWP
2.1	Closed user group selection	Y	Y		Y
2.2	Bilateral closed user group selection	x	x	x	
2.3	Reverse charging	Y	Y		Y
2.4	RPOA selection	x	x	x	
2.5	Flow control parameter negotiation	Y	Y		x
2.6	Fast select	Y	P 1984	x	x
2.7	Throughput class negotiation	Y	Y		x
2.8	Abbreviated address calling	x	x		
2.9	Datagram nondelivery indication	x	x	x	x
2.10	Datagram delivery confirmation	x	x	x	x
2.11	Multi-address calling	x	x		
2.12	Charging information	Y	P 1984		

4.4 Delivery Confirmation

P(R) significance	End-to-end	Local	Local (See A3.4.4.1.2)	Local
"D" bit procedure (Ref. X.25 4.3.3)	x	P 1984	x	x

4.3 Optional user facilities requested by the DTE on a per-call basis

X2 Ref.		BELGIUM	FRG DATEX-P	ITALY	SPAIN
2.1	Closed user group selection	Y	Y	x	Y
2.2	Bilateral closed user group selection	x	x	x	
2.3	Reverse charging	Y	Y	Y	Y
2.4	RPOA selection	x	x	x	
2.5	Flow control parameter negotiation	P Jan.'84	P March'84	x	?
2.6	Fast select	x	P March'84	x	Y
2.7	Throughput class negotiation	A5.1.3.2	P March'84	Y (see A7)	x
2.8	Abbreviated address calling	x	x	x	
2.9	Datagram nondelivery indication	x	x	x	
2.10	Datagram delivery confirmation	x	x	x	
2.11	Multi-address calling	x	x	x	
2.12	Charging information	x	in discussion	x	

4.4 Delivery Confirmation

P(R) significance	local	End-to-end depending on options	local	local
"D" bit procedure (X.25 Ref. 4.3.3)	P Jan.'84	P March '84	x	Y

4.3 Optional user facilities requested by the DTE on a per-call basis

X2 Ref.		SWEDEN	LUXEMBOURG
2.1	Closed user group selection	x	Y
2.2	Bilateral closed user group selection	x	x
2.3	Reverse charging	x	Y
2.4	RPOA selection	x	x
2.5	Flow control parameter negotiation	?	P 2/83
2.6	Fast select	x	P 2/83
2.7	Throughput class negotiation	?	Y
2.8	Abbreviated address calling	?	x
2.9	Datagram nondelivery indication	x	x
2.10	Datagram delivery confirmation	x	x
2.11	Multi-address calling	?	x
2.12	Charging information	?	x

4.4 Delivery Confirmation

P(R) significance	Local	Local
"D" bit procedure (X.25 Ref. 4.3.3)	P 1984	x

4.5 Use of fields within Call Request and Incoming Call Pkts	UK PSS	FRANCE TRANSPAC	NETHERLANDS DN 1
i) Called DTE address	12, 13 or 14 digits see App. 1.2.3.2	Up to 14 digits See App. A2.2.3.1	Up to 14 digits
ii) Calling DTE address	Not mandatory Will be inserted by the network if ommitted	Not mandatory See App. 2.2.3.2	Not mandatory
iii) Call User Data field	Free use of 16 octets for packet mode connections. First 4 octets used for protocol identifier for PAD connections	Same as UK PSS	Free use of 16 octets for packet mode connection. Unknown for PAD connections
iv) Facility Field	Not mandatory Needed only to request optional facilities	Same as UK PSS	Not mandatory

4.6 Coding of field in Clear Reset & Restart Packets			
i) Cause field	As X.25	As X.25	As X.25
ii) Diagnostic field	As X.25 but see A1.2.2.3	See A2.1.3.1	?

4.5 Use of fields within Call Request and Incoming Call Pkts	SWITZERLAND EDWP	BELGIUM	FRG DATEX-P
i) Called DTE address	14 digits (nat.& int.)	11 digits national 14 digits internat.	11 digits national 15 digits internat.
ii) Calling DTE address	Not mandatory 14 digits (int.)	See A5.2.3.1	Not mandatory 15 digits internat. 11 digits national
iii) Call User Data field		No restriction May be bit structured up to the max. length (16 octets)	Same as UK, PSS
iv) Facility Field		Not mandatory Only Class A (single octet) parameters are used	Not mandatory for DTE Class B only. See A6.2.3.2. Always used by DCE

4.6 Coding of field in Clear Reset and Restart Packets			
i) Cause field	As X.25	As X.25	As X.25 See A6.1.3.2
ii) Diagnostic field	As X.25	As X.25 See A5.2.3.2	See A6.1.3.3

4.5 Use of field within Call Request and Incoming Call Pkts		ITALY	SPAIN	SWEDEN	LUXEMBOURG
i)	Called DTE address	up to 15 digits	?	See A9.3.13	Not clearly defined
ii)	Calling DTE address	Up to 15 digits Not mandatory, see A7.2.3.2	optio-nal	See A9.3.6	Not mandatory
iii)	Call User Data field	Up to 16 octets	?	As Luxembourg	Free use of 16 octets for packet mode. First 4 octets used for protocol identifier for PAD connections.
iv)	Facility Field	Up to 63 octets	?	Not required. See A9	Not mandatory

4.6 Coding of field in Clear Reset & Restart Packets					
i)	Cause field	As X.25 See A7.2.3.3	?	As X.25	As X.25
ii)	Diagnostic field	As X.25 See A7.2.3.3	?	See App. 9	As X.25

4.7 Logical Channel Assignments

X.25 Reference	Annex A and Section 6.1.2
X.25 Assignment Order	0 (Restart only) PVC's & Datagrams VC's One-way incoming VC's Two-way VC's One-way outgoing
UK PSS	Assignment order as X.25 Two logical channel groups are reserved for each type of logical channel. (see App. 1)
France TRANSPAC	Assignment order as X.25 Channel 0 not currently reserved for re-starts. (See App. 2)
Netherlands DN 1	See Appendix 3 (A3.2.3.1)
Switzerland EDWP	As X.25
Belgium DCS	Assignment order as X.25. One-way logical channels will not be provided before 1984.
FRG DATEXP	As X.25 (No datagrams)
Italy	As X.25 (No datagrams) otherwise as TRANSPAC
Spain	
Sweden	See App. 9
Luxembourg	As X.25 (No datagrams)

4.8 DCE TIME-OUTS

X.25 Ref.	Started when	UK PSS	FRANCE TRANSPAC	NETHERLANDS DN 1	SWITZERLAND EDWP
T10	DCE issues a Restart Ind.	Repeated at 6 s intervals indefinately	Retransmission after 40 s After further 40 s DCE sends DM (LAP B) or DISC (LAP B)	See A3. Table D1/X.25	waits indefinitely
T11	DCE issues an incoming Call	Waits 180 s for call accept or Clear request. Then sends Clear Ind.	As PSS	See A3 Table D1/X.25	waits indefinitely
T12	DCE issues a Reset indication	Repeated every 6 s for 90 s. Then, for SVC Clear Ind. sent to both DTE's. For PVC Reset Ind. (out of order) sent to remote DTE. Reset Ind. repeated to local DTE	Retransmission after 40 s. After further 40 s Clear Ind. sent to both DTE's. As PSS	See A3 Table D1/X.25	waits indefinitely.
T13	DCE issues a Clear Ind.	Repeated every 6 s for 90 s. Then Clear Conf. sent to initiating DTE. Clear Ind. repeated to non-responding DTE for further 90 s. Then DCE goes to "Channel Ready" state.	Retransmits Clear Ind. after 40 s. After a further 40 s goes to "Channel Ready" state.	See A3 Table D1/X.25	waits indefinitely.

4.8 DCE TIME-OUTS

X.25 Ref.	Started when	BELGIUM	FRG DATEX-P	ITALY	SPAIN
T10	DCE issues a Restart Ind.	Retransmission after 60 s. After 2nd time-out the DCE enters the "rf" state. See A5.2.3.3	Waits indefinitely	See A7.2.3.4	Waits 60 s for restart request or restart confirmation
T11	DCE issues an incoming call	As PSS	Waits indefinitely (nat.) For intern. limited by X.75 (3 min. max)	Waits 180 s for Call Accept or Clear Request. Then sends Clear Ind.	Waits 180 s for call accept, clear request or restart. Then sends Clear Ind.
T12	DCE issues a Reset Indication	Retransmission after 60 s. After 2nd time-out the DCE sends clear ind. to both DTE's (Reset for remote PVC)	Waits indefinitely (nat.) For intern. limited by X.75 (3 min. max)	See A7.2.3.4	Waits 60 s for reset conf. or Reset req. If timer expires, the DCE clears the call.
T13	DCE issues a Clear Ind.	Retransmission after 60 s. After 2nd time-out the DCE goes to Channel Ready State.	Waits indefinitely. (nat.) For intern. limited by X.75 (3 min. max)	See A7.2.3.4	x

4.8 DCE TIME-OUTS

		SWEDEN	LUXEMBOURG
X.25 Ref.	Started when		
T10	DCE issues a Restart Ind.	60 s	To be added
T11	DCE issues an incoming call	180 s	To be added
T12	DCE issues a Reset Indication	60 s	To be added
T13	DCE issues a Clear Ind.	60 s	To be added

APPENDIX 1

PSS - UK

A1.1 Deviations from X.25

A1.1.1 Physical Level

None known.

A1.1.2 Link Level

Ref. X.25 Section 2.4.5.1. Link set-up procedure.

When the DCE is operational but not in the "Information Transfer" state it will be in the "Down" state. The DISC command with the P bit set to ONE is retransmitted indefinitely at intervals of T1 by the DCE in the "Down" state to indicate to the DTE that the DCE is operational and awaiting initiation of the link set-up procedure.

The DTE must respond to the DISC with DM or UA (F=1) before the DCE will accept a link set-up command. The DCE waits N2 x T1 (=T3) for the link set-up command after receipt of DM or UA. If T3 expires the DCE returns to the "Down" state.

A1.1.3 Packet Level

Ref. X.25 Section 3.5. The link idle state and physical level failure are not monitored, therefore no action can be taken.

A1.2 Network specific characteristics

A1.2.1 Physical Level

A1.2.1.1 Multiple circuits to the same DTE (X2 Ref. 1.25). Multiple physical circuits from PSS to a DTE is permitted with a single DTE address. Each physical circuit has a separate link and physical level implementation. The required physical circuit is selected by the DTE or DCE at virtual call set-up time. The DCE assigns incoming calls equally among the available physical circuit. (i.e. A balance of calls, not throughput). Each physical circuit can use the full range and quantity of logical channels.

A1.2.1.2 X.21 bis at 4800 bps. Limited availability.

A1.2.1.3 Limited geographical availability initially.

A1.2.2 Link Level

None known.

A1.2.3 Packet Level

A1.2.3.1 Logical Channel Assignment

Type	Logical Channel		Remarks
	Group Number	First Number in group available	
PVC	0	1	Although a contiguous range of channel numbers will be allocated initially (see Note 3 below) cessations may introduce gaps into the numbering Note Channel 0 Group 0 is not available.
	1	0	
SVC Incoming only	2	0	Available for use by DCE only i.e. for incoming calls
	3	0	
SVC Bothway	4	0	Available for use by both DCE and DTE, however, Bothway SVC will only be used by the DCE when no free Incoming Only SVC is available. DCE will always choose lowest numbered free channel, DTE will reduce probability of collision by always choosing highest numbered free channel.
	5	0	
SVC Outgoing only	6	0	Available for use by DTE only, i.e. for outgoing calls.
	7	0	

Note 3 *Two contiguous Logical Channel Groups are reserved for each type of logical channel as shown.*

Note 4 *Channel numbers within groups are allocated at subscription time ascending number order filling the lowest numbered group of the reserved pair first.*

A1.2.3.2 DTE Addresses

The address length may be 12, 13 or 14 digits as shown below.

Address Digit	Remarks
1 2 3 4 5 6 7 8 9 10 11 12	1. Digits 1-4 comprise the DNIC. Present for both national and international calls. 2. Digits 4-12 comprise the national number.
13 14	Digits 13-14 comprise an optional sub-address. When present the sub-address may consist of 1 or 2 digits.

Calling and Called DTE Addresses

The Data Network Identification Code (DNIC) consists of 4 digits, the first 3 identify the country and the 4th identifies the particular network within the country.

The National Number consists of the 4th digit of the DNIC plus 8 further digits and identifies the DTE within the network.

The Sub-Address is provided for optional use by the DTE on an per call basis and when present will pass transparently through the network, the 1 or 2 decimal digits may be used to address a particular application within the called DTE when attempting to set up a call. The network does not check the validity of the sub-address and its format and meaning is arranged between users.

A1.2.3.3 Diagnostic Codings

DTE provided diagnostic information in Clear, Reset and Restart packets may become lost if both ends initiate clear, reset, or restart.

Diagnostic code values 128-255 (Ref. X.25 Annex 5) have been assigned specific definitions for PSS.

A1.2.3.4 Non-standard default window sizes (X2 facility 1.2)
Non-standard default packet sizes (X2 facility 1.3)

These facilities are available on SVC's but will be restricted to CUG's or bilateral agreements.
Planned for PVC's in 1983.

APPENDIX 2

TRANSPAC - France

A2.1 Deviations from X.25

A2.1.1 Physical Level

X.21bis provided only. There are no plans for X.21 access.

A2.1.2 Link Level

Ref. X.25 Section 2.4.3.10

For FRMR/CMDR bit Y is always "0" because I frames exceeding the maximum agreed length are ignored by Transpac.

A2.1.3 Packet Level

A2.1.3.1 Diagnostic codes

The diagnostic codes from the network in reset, restart and clear indication packets are totally different from X.25. Conformance with X.25 is planned for 1984 or 1985.

A2.1.3.2 Ref. X.25 Section 3.5

The link idle state is not monitored, therefore no action can be taken.

A2.1.3.3 Logical Channel 0

Logical channel 0 is not currently reserved for restarts. The expected date for conformance with X.25 (1980) is early 1984.

A2.1.3.4 Calling DTE address in call request packet

The calling DTE is permitted only to provide its subaddress. The remainder of the calling DTE address is inserted by the network. If provided by the DTE the call request packet will be rejected.
(Reason-Address length violation)

A2.2 Network Specific Characteristics

A2.2.1 Physical Level

A2.2.1.1 Multiline procedure

A multiline procedure is available. This specific multiline procedure uses a non HDLC frame format and is limited to level 2 so that it is not visible from the packet level.

A2.2.1.2 TRANSPAC does monitor physical level failure. In case of failure, it clears SVCs and reset PVCs with the cause

"out of order". When the physical level goes on, TRANSPAC sends DM. After the link set-up by the DTE, TRANSPAC sends a restart packet.

A2.2.2 Link Level

A2.2.2.1 FRMR/CMDR coding

FRMR bit Y is always "0", because I frames exceeding the maximum agreed length are ignored by Transpac.

A2.2.2.2 DCE response to FRMR

TRANSPAC, as a response to an FRMR, sends a DM and therefore clears SVCs and resets PVCs. In an operational environment, we consider that FRMR is to be used only in case of very important procedure error at frame level precluding DTE malfunction. So, the clearing of SVCs is not such a drastic solution. Moreover, this behaviour is the only one which guarantees that an eventual loss of frame will be indicated to packet level.

A2.2.3 Packet Level

A2.2.3.1 Called DTE address

National format Prefix 1
8 digits DTE address
Up to 6 digits DTE sub-address

International format Prefix 0
4 digits for DNIC
Up to 8 digits DTE address
Up to 2 digits DTE sub-address.

In both cases the max. address length is 14 digits. Sub-addresses are passed transparently to the called DTE.

APPENDIX 3

DATANET-1 - The Netherlands

A3.1 Deviations from X.25 (reproduced from TD 334)

This Appendix specifies the procedures for data exchange between the DTE and the DCE as implemented in Datanet-1. This Appendix is a completely updated version of the PTT documents TG/8 edition 2.0, TG/3 edition 2.2, TG/6 edition 1.0, TG/7 edition 1.0, TG/9 edition 1.0 and TG/10 edition 1.0, but differs completely in make-up. It has been found to be more tractable to indicate all deviations from the Recommendation X.25 (Yellow Book, Volume VIII - fascicle VIII-2, November 1980) and to give supplementary information where necessary, pertaining to X.25 and the implementation thereof in Datanet-1. The numbering of the sections complies with the Yellow Book. Recommendation X.25 and the relevant parts of Recommendations X.21 and X.21bis are attached as as Annex 1.

In some places of this Appendix the action to be taken in certain conditions is only specified for the DCE. It is however recommended that users should implement similar or compatible procedures for the DTE.

If further information is required, please consult in writing with the PTT at the following address:

Centrale Directie der P.T.T.
Centrale Afdeling Telegrafie en
Datacommunicatie
Bureel TG3
Postbus 30 000

NL-2500 GA DEN HAAG
The Netherlands

Physical Level

1.1.1.1 Replace "section 2" by "sections 2.1, 2.2, 2.3, 2.5 and 2.6".

X.21

2.3
Interchange circuit B (Byte timing) is not implemented.

2.5
Replace whole of the paragraph by:

"Quiescent phase

During the quiescent phase, the DTE and the DCE signal their ability to enter operational phases.

2.5.1 DTE Ready

The DTE indicates its readiness to enter the operational phase, by signalling c = ON, t = 1, i.e. transmission of frames, flags or abort sequences (active channel state, see Section 2.2.12.1).

2.5.2. DTE Not Ready

The DTE indicates that it is unable to exchange binary data with the DCE by signalling c = OFF.

2.5.3. DCE Ready

The DCE indicates its readiness to enter operational phases by signalling i = ON and r = 1.

2.5.4. DCE Not Ready

DCE Not Ready indicates that no service is available and will be signalled, whenever possible, during network fault conditions and when test loops are activated by the network. This state is signalled by i = OFF and r = 0."

7.1.

Replace, in the third paragraph, "should" by "is".
Add to third paragraph: "See Recommendation V.54, Section 2.2".

7.2.

Replace whole of paragraph by:
"For network maintenance purposes, a Loop 2 is implemented in the DCE. Loop 2 is controlled automatically from the network.
When the test in progress, the DCE will signal r = 0, i = OFF.".

1.1.1.3.d. Replace "DTE Ready or DTE Uncontrolled Not Ready" by "DTE Not Ready", and delete "DCE Ready or".

Add to text:
"1.1.1.4. Action taken by the DCE upon detection of DTE Not Ready:

1) When the DTE disconnects the link (see Section 2.4.5.3) before entering this state, no recovery action will be taken.

2) When the network detects a DTE Not Ready state which was not preceded by disconnection of the link (see Section 2.4.5.3), the network will not undertake any recovery action because it is not possible at this stage to differentiate between a NOT READY situation under full control of the DTE, e.g. power off, or a network related failure."

1.1.2. X.21bis

1.2.

Replace, in the first sentence of the first paragraph "may comply" by "will comply".

Delete, in the first sentence of the first paragraph: "either", and "or with Recommendation X.26...." to end of Section.

1.2.1.1. Not applicable.

1.2. Not applicable.

Link Level

2.1.1. Note: Only LAPB is supported by Datanet-1. Therefore all paragraphs pertaining to LAP do not apply.

2.2.2. Replace whole of paragraph by:
"Flag sequence.

All frames shall start and end with the flag sequence consisting of one 0 followed by six contiguous 1's and one 0. The DTE and DCE hunt continuously for this sequence on a bit-by-bit basis, and thus use the flag sequence for frame synchronisation.

The receipt of the sequence 011111101111110 is interpreted as two flag sequences. The DTE and DCE only send complete eight-bit flag sequences when sending multiple flag sequences. A single flag may be used as both the closing flag for one frame and the opening flag for the next frame.

Note: Datanet-1 is capable of synchronising on flags with so called "overlapping zeroes", but DTE manufacturers and implementors must be aware that this is not guaranteed in the future".

2.3.4. Note on Table 3: SARM-command and CMDR-response will not be implemented (LAP).

2.3.4.9. The DCE will never send a DM-response to request a set mode command from the DTE.

2.3.4.10. Add to the text, Table 4bis and the following text:

" Table 4bis. Error conditions causing a FRMR-response

Only applicable to the following frame types	Error conditions	Coding W X Y Z
U, S, I	Invalid or not implemented command or response	1 0 0 0
U, S	Information field not permitted or has incorrect length	1 1 0 0
I	Information field exceeds the maximum established length	0 0 1 0
S, I	Invalid N(R)	0 0 0 1

A received frame (without FCS error) may contain more than one error which causes the transmission of a FRMR-response. However, only one error will be indicated in the information field of the FRMR. To determine which one of the errors should be indicated, the order in which it has to be chosen, as well as the appropriate coding is listed in Table 4bis. Bit 13 will always be used to indicate the address of the received frame.

A received frame (without FCS error) may contain more than one error which should cause the transmission of a FRMR-response and a SABM-command (see Section 2.4.10). In this case the FRMR-response shall not be transmitted.

An invalid/not implemented command or response is defined as a frame with a control field that is unknown to the receiver of this frame, i.e. not explicitly mentioned in Table 3."

2.4.1. Not applicable.

2.4.3. Add to text: "When not used, the P/F bit is set to 0".
Note on Note: "The use of the P/F bit must always be possible in U- and S-commands/responses".

2.4.4. Not applicable.

2.4.5. For "DCE" read "a station, DCE or DTE" throughout this Section.

2.4.5.1. Replace, in the last paragraph "appropriate recovery action will be initiated" by "the DCE will consider the link to be in the disconnected mode".

2.4.5.3. Add to the text:
"A station which has initiated the disconnection of the link is in principle also responsible for setting up the link again".

2.4.5.4.2. Delete: "after detecting error conditions as listed in Section 2.4.10 below, or".

2.4.5.6. Not applicable.

2.4.6. For "DCE" read "a station, DCE or DTE" throughout this Section.
Add to the text:
"Note: To monitor the state of the line in order to significantly reduce the time normally spent in error recovery situations or even in an indeterminate state, Datanet-1 has implemented a mechanism in its Link Level, which continuously sends a Received Ready supervisory command with the Poll bit set to 1, at regular intervals of 10 seconds".

2.4.6.1. Add to second paragraph:
"The DCE will restart its Timer T1 when it is running".

2.4.6.6. Replace the last sentence by: "In any case the station will not transmit any other Information frame before receiving a RR or REJ, or the completion of a resetting procedure".

2.4.6.8. Delete, in the last paragraph:

"or transmit an appropriate supervisory command with the Poll bit set to 1".

Replace the fith paragraph by:

"If, while in the timer recovery condition, the DCE receives correctly a supervisory frame with the F-bit set to 1 and the N(R) within the range from its current Send State Variable to X included, it will clear the timer recovery condition. If the frame was a RNR-response, the Send State Variable will be set to X, and the Send State Variable will be set to the received N(R) if the frame was a RR or REJ response. If the frame was a supervisory command with the P-bit set to 1, the N(R) will be ignored and the reaction described in Section 2.4.3. undertaken".

Replace the sixth paragraph by:

"If, while in the timer recovery condition, the DCE receives correctly a supervisory frame with the F-bit set to 0 and the N(R) within the range from its current Send State Variable to X included, it will not clear the timer recovery condition (Timer T1 is not stopped), and the frame will be discarded".

2.4.7. Not applicable.

2.4.8. Not applicable.

2.4.9.2. Replace whole of paragraph by:

"A station shall indicate a resetting by transmitting a SABM-command and starting its timer T1. After receiving a SABM-command, a station will return, at the earliest opportunity, a UA-response and reset its Send and Receive State Variable V(S) and V(R) to zero. This also clears a DCE and/or DTE busy condition, if present. The station receiving the UA-response will reset its V(S) and V(R) to zero and stop its timer T1.

If a DM-response is received the station will enter the disconnected phase and stop its timer T1. If timer T1 runs out before a UA or DM response is received, the SABM command will be retransmitted and the timer T1 will be started. After the timer T1 runs out N2 times, the station enters the disconnected phase. The value of N2 is defined in Section 2.4.11.2. When a DISC or SABM command is received after the indication of a resetting by the transmission of a SABM command, the received SABM command will be acknowledged by a UA response and a DM response will be sent in reaction to a received DISC command. Other commands or responses received by the station before completion of the reset procedure will be discarded.

When the reset procedure is completed the DCE will retransmit the content of the information field of unacknowledged Information frames, if any".

2.4.9.3. Replace whole of paragraph by:

"Under certain rejection conditions listed in Section 2.4.10.2 the DCE will reset the link by transmitting a SABM command".

2.4.9.4. Add to the text:

"In the frame rejection condition additional Information or Supervisory frames will not be transmitted, and received Information and Supervisory frames will be discarded by the DCE.
The Final bit in a FRMR response, transmitted by the DCE, will always be set to 0.

Note: Although the DCE will implement a timeout function in the frame rejection condition, this function is not necessarily implemented in the DTE".

2.4.11.1. Replace the first and second paragraph by:

"Timer T1 is started in the DCE upon transmission of the first bit of the relevant frame and is stopped upon recognition of a correct response as specified in the procedure.

The period of the timer T1, at the beginning of which retransmission of a frame may be initiated according to the procedures described in Sections 2.4.4 to 2.4.6 above, is equal to 2.125 s for the user classes 8, 9 and 10 and 125 ms for user class 11."

2.4.11.2. Add to the text:

N2 = 5.

2.4.11.3. Add to the text:

N1 = 1080.

2.4.11.4. Add to the text:

K = 7.

Packet Level

3. Delete Note 1.

Delete the second paragraph of Note 2.
N.B. Good notice should be given to Note 2, especially if DTE's wish to operate in an international environment.

Add to the text:

"Note 4: Datanet-1 does not support datagram service".

3.5. Replace the last paragraph by:

"In other out-of-order conditions on the physical and/or link level, the DCE will clear virtual calls and reset PVC's.

Note: An out-of-order condition on the link level includes receipt of a DISC command by the DCE in the case of a single link procedure".

4.1.7. Delete, in the second paragraph: "; however, within some Administrations' networks, Clear Confirmation may have end-to-end significance".

4.3.6. Replace the third paragraph by:

"When the Q-bit is not set to the same value by the transmitting DTE within a complete packet sequence, the network will reset the logical channel with cause "local procedure error" and diagnostic " invalid Q-bit in data packet"."

4.3.7. Add to third paragraph:

"The DCE will ignore further DTE Interrupt packets until the first one is confirmed with a DCE Interrupt Confirmation packet".

4.4.1.2. Add to the text:

"Note: In Datanet-1 a source credit mechanism is implemented. Under normal circumstances, this mechanism rotates the local window without awaiting the remote window rotation. Datanet-1 buffers the extra packets transferred across the interface. This mechanism therefore effectively doubles the window size normally allocated or negotiated with the DCE and can increase the throughput without additional costs. However, DTE's must be aware that in case of a Reset, Clear or Restart procedure, more packets may be lost than would have been the case if no source credit mechanism were implemented."

4.4.1.3. Delete the third paragraph: "Some networks...national network)."

4.4.1.6. Add to the first paragraph:

"An RNR packet does not have end-to-end significance, i.e. the network is not required to transmit this RNR situation to the remote DTE".

4.4.3.3. Add to the text:

"The DTE should follow the same procedure".

4.4.3.4. Delete, in the second paragraph:

"; however, within some Administrations' network, Reset Confirmation may have end-to-end significance."

4.5. Delete, in the first paragraph:

"either" and ", or be discarded by the network."

Delete, in the third paragraph:

" be either delivered to the initiating DTE before DCE confirmation of the initial Clear, Reset or Restart Request, or ".

Delete in Note:

"Provision of more precise information is for further study."

5. Not applicable.

6.1.4. Add to the text:

"*Note 2: DTE REJ is a standard facility in Datanet-1.*"

6.2.1.3. Add to the text:

Note 2: In case that subaddressing is used the complete DTE address should precede the subaddress."

6.4. Not applicable.

7.1.1. Not applicable.

7.1.4. Packet Retransmission is a standard user facility in Datanet-1.

7.1.14. Not applicable.

7.1.15. Not applicable.

7.1.18. Not applicable.

7.2.1. Not applicable.

7.2.2. Not applicable.

7.2.4. Not applicable.

7.2.5. Not applicable.

7.3. Not applicable.

Annex A. Add to Note 6:

"It is not obligatory for the DTE to use consecutive logical channels when setting up new virtual calls."

Annex D. Replace Table D1/X.25 by:

Time-out no.	Time-out value	State of the logical channel	Started when DCE issues	Actions to be taken when the time-out expires	
				Local side	Remote side
T10	35 s	r3	Restart Indication	DCE retransmits Restart Indication at regular intervals of t until a DTE Restart Conf. is received or a Rest. collision occurs.	For PVC's, DCE enters d3 signalling Reset Ind. For VC's, DCE enters p7 signalling Clear Ind.
T11	35 s	p3	Incoming Call	DCE enters p7 signalling Clear Ind. (lpe)	DCE enters p7 signalling Clear Indication (rpe)
T12	35 s	d3	Reset Indication	DCE retransmits Reset Ind. 3 times. If reset not completed within time-out period, DCE will:	Identical to local side.

				- clear VC with indication lpe - reset PVC (lpe). DCE retransmits Reset Ind. at regular intervals of t until a DTE Reset Conf. is received or a Reset collision occurs.	(rpe) (rpe)
T13	35 s	p7	Clear Indication	DCE retransmits Clear Ind. 3 times. After completion of time-out period, DCE will consider state of interface to be in r1.	Identical to local side.

Annex E. Add to the text:

"It has been found desirable to implement additional diagnostic fields in Clear, Reset and Restart Indication packets. These are defined in the range of 128 to 255 range. Two types of diagnostic codes have been defined, namely, user-related diagnostic codes to supplement the codes already defined and Datanet-1-related diagnostic codes which are not normally forwarded to the DTE. The former group encompasses the range 128 through 191 and the latter group 192 through 255.

Diagnostics	Decimal
Invalid Q-bit in data packet	129
Invalid Q-bit in non-data packet	130
	:
	:
Interrupt or Int. Conf. too long	146
Flow control packet too long	147
Clr Req, Clr Conf. or Res Req too long	148
Call Req. too long	149
Clr Req. Res Req. too long	150
Call Req. too short	151
	:
	:
Negotiation not allowed	160
Incoming access not allowed	161
CUG access not allowed	162
Parameter or facility not supported	163
Facility length field not present or incorrect	164
Facility occurs more than once	165

BCD error in calling or called address	166
Address length incorrect	167
DNIC not suported	168
Address length indicator incompatible with address	169
	:
	:
Subscriber not known to network	176
Non-zero Reset cause from DTE	177
Remote DTE disconnected due to failed retransmissions	178
Remote subscriber line in NOT READY state	179
Remote DTE in disconnected mode	180
	:
	:

- End of TD 334 -

A3.2 Network-specific Characteristics

A3.2.1 Physical Level

None known.

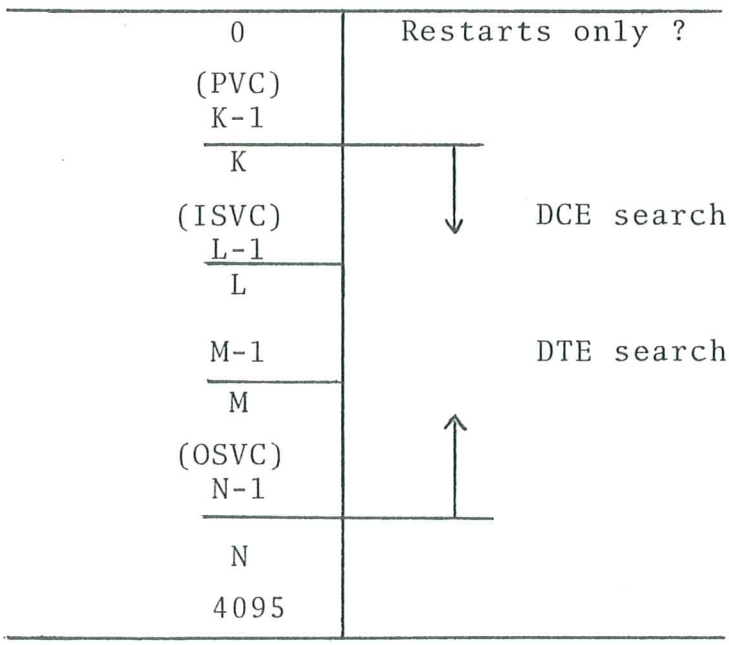
A3.2.2 Link Level

None known.

A3.2.3 Packet Level

A3.2.3.1 Logical channel assignment

For each DTE/DCE packet level interface a range of logical channels will be agreed upon with the Administration according to the following figure:



Legend

Logical channels 0 to K-1	: Range of logical channels for permanent virtual circuits.
Logical channels K to N-1	: Range of logical channels for virtual calls.
Logical channels N to 4095	: Range of non-assigned logical channels.
Logical channels K to L-1	: Range of optional one-way incoming logical channels.
Logical channels M to N-1	: Range of optional one-way outgoing logical channels.
DCE search	: Direction of search by the DCE for the logical channel in the READY state with the lowest number.
DTE search	: Direction of search by the DTE for the logical channel in the READY state with the highest number.

Note: It is not obligatory for the DTE to use consecutive logical channels when setting up new virtual circuits.

A3.2.3.2 Addressing

Packet connections:

- national A xxx YYY (ZZZZ)
  A should be 1
  xxx geographical area
  YYY sequence number
  ZZZZ not yet available, will be made available later for sub-addressing and may be 1, 2, 3 or 4 digits long, is transparently transferred.
- international (call request)
  called address: 0 {DNIC / DCC} foreign national number
  calling address: none or national number
- international (incoming call)
  called address: national address
  calling address: 0 {DNIC / DCC} foreign national number
- PTT services A 9xx

PAD Connections

- national A xxx YYYY

A 2 = leased line, (3 = Euronet, 4 = DABAS),
8 = telex, 9 = PSTN
xxx geographical area
YYYY sequence number

A3.2.3.3 Charging information

Detailed charging information can be provided by regularly sending a print-out from the Datanet management centre to the customer, other means are for further study.

APPENDIX 4

EDWP - Switzerland

Not available at time of publication of this report.

APPENDIX 5

DCS - Belgium

A5.1 Deviations from X.25

A5.1.1 Physical Level

None known.

A5.1.2 Link Level

None known.

A5.1.3 Packet Level

A5.1.3.1 Resetting causes

Ref. X.25 Table 11.

Two resetting causes ('Remote DTE Operational' and 'Incompatible destination') are suppressed from Table 6.5 in the current version of the documentation. This point is being reconsidered by the RTT.

A5.1.3.2 A specific facility "throughput class selection" which allows a throughput class facility field in the call request and incoming call packet is provided. There is a relation table between the throughput class (either requested or by default) and the window sizes applicable on the virtual circuit. See X.25-7.2.3

A5.1.3.3 The facilities "multiple circuits to the same DTE" and "multiple terminals with the same data number" are combined in the optional facility "collective number group". This facility is identical to the hunt group facility as defined by C.C.I.T.T. (Geneva, may 1982).

A5.2 Network specific characteristics

A5.2.1 Physical Level

None known.

A5.2.2 Link Level

A5.2.2.1 Link set-up by the network

After initial switch-on or when the DCE is in the "Link Disconnect" state the DCE tries repeatedly to set-up the link.

A5.2.2.2 The DCE will accept TEST commands and will return appropriate TEST responses. See X.25-2.3.4.11.

A5.2.2.3 The network polls the DTE with RR commands during periods of absence of information transfer.

A5.2.3 Packet Level

A5.2.3.1 Address fields in Call establishment packets (X.25 6.2.1.3)

DTE address = Network address (for routing)
+ (possibly) subaddress

Max. length = 11 digits
Basic requirements only.

The calling DTE address is included in every Incoming Call packet. See X.25-4.1.3 and 6.2.1.
Calling DTE address not mandatory in Call Request packets.

A5.2.3.2 Clear, Reset and Restart packets (X.25: Table 9, 11 & 12, 6.6.1)

Clearing causes are coded as in X.25, in a way coherent with the limited implementation, i.e. 'Fast Select acceptance not subscribed' and 'RPOA out of order' are not coded.

Diagnostic fields in these packets: no deviation from X.25. DTE provided information is passed end-to-end. No 'Reset clash' should occur as State d2 (DTE Reset Request) is not implemented.

Remarks. Some diagnostic codes are not used, a few others are added (Annex E).

Diagnostic packets are not used by the network.

A5.2.3.3 The DCE enter the rf state as a result of Restart failure or Line/DTE failure. It remains in this state until Restart Request or Restart Confirmation is received from the DTE. See X.25-3.5 & Table C-2.

A5.2.3.4 The facilities "call priority" and "data transfer priority" will not be offered at the commercial opening (December 1982).

A5.2.3.5 In all cases the packet window size at each interface is a function of the applicable throughput class. For instance window sizes equal to 4, 5, 6 and 7 are associated with the throughput classes corresponding to bit rates 2400, 4800, 9600 and 48000 bps respectively. See Table 4.2/X.25.

A5.3 Miscellaneous

- In this Appendix references to X.25 must be understood as references to the Belgian documentation given in Section 1. An updated documentation is not yet available.
- The tariffs to be applied have been distributed.
- International operations with UK PSS, TRANSPAC and DN1 are planned for the end of 1982.
- Administration address (RTT):

Regie des Telegraphes et Telephones
Tour R.T.T.
Boulevard E. Jacqmain 164

B-1000 Brussels

Tel. +32 2 213 35 53
Telex 29257 DATA B

APPENDIX 6

DATEX-P - FRG

A6.1 Deviations from X.25

A6.1.1 Physical Level

None known with exception of V.36, see A6.2.1.1.

A6.1.2 Link Level

None known.

A6.1.3 Packet Level

A6.1.3.1 Ref X.25 Section 3.5. Link idle state not monitored, therefore no action can be taken.

A6.1.3.2 Cause codes

The following cause codes are not used.

- Table 9/X.25:

  Incompatible destination
  Fast select acceptance not subscribed
  RPOA out of order

- Table 11/X.25:

  Remote DTE operational
  Network operational
  Incompatible destination

- Table 12/X.25:

  Network operational
  Because of missing network operational network starts with "network congestion"

A6.1.3.3 Diagnostic codes

Planned to conform with X.25 but details are not yet available. DTE diagnostic codes are passed transparently.

A6.2 Network specific characteristics

A6.2.1 Physical Level

A6.2.1.1 48 Kbps for about two years from introduction the DCE will have an interface similar to DIS 4902 (1976).

A6.2.1.2 X.21 interface. With local restrictions for a time.

A6.2.2 Link Level

No reaction on RNR by the DCE in all cases.

A6.2.3 Packet Level

A6.2.3.1 (X2 Ref. 1.12, 13, 14, 15, 16). One physical connection may belong to the open part of the network and to one CUG only.

A6.2.3.2 Facility field coding for reverse charging

Bit 1 of the facility code field is always set to ONE with bit 1 equal to ZERO in the facility parameter field.

APPENDIX 7

ITAPAC - Italy

A7.1 Deviations from X.25

A7.1.1 Physical Level

None known.

A7.1.2 Link Level

None known.

A7.1.3 Packet Level

None known.

A7.2 Network-specific Characteristics

A7.2.1 Physical Level

The Italian network will provide X.21bis access.

A7.2.2 Link Level

A7.2.2.1 Link set-up

After transmitting unsuccessfully SABM N2 times, the DCE generates an alarm.

A7.2.2.2 Disconnected phase

When the DCE enters the disconnected phase after error conditions detection or exceptionally after a recovery from internal malfunctions, it transmits a DISC command. The transmission of DISC will be repeated N2 times, separated by T1 intervals, if UA or DM is not received. After transmission of DISC N2 times an alarm is generated.

A7.2.2.3 I frames length

I frames with information field length equal to 0 are ignored by the DCE.

A7.2.2.4 FRMR transmission by DCE

The DCE will start timer T1 on transmission of the FRMR response. If timer T1 runs out before the reception of an SABM, DISC or DM from the DTE, the DCE will restart timer T1 without retransmission of the FRMR. After restarting timer T1 N2 times, the DCE will reset the link.

A7.2.3 Packet Level

A7.2.3.1 Window description

The window sizes are allocated for each direction by the network according to the throughput classes, as expressed in bit/s, that have been requested either explicitly in the Call Request packet or by default. Within the network there is a fixed relationship between throughput class and window size. In the following table the correlation between throughput class and window size is given.

CORRELATION BETWEEN THROUGHPUT CLASS AND WINDOW SIZE

Throuput class requested	bit/s	Window size allocated
0	75	2
1	75	2
2	75	2
3	75	2
4	150	2
5	300	3
6	600	3
7	1200	3
8	2400	4
9	4800	5
10	9600	6
11	19200	7
12	48000	7
13	48000	7
14	48000	7
15	48000	7

A7.2.3.2 Address field in Call Packets

Octet 5 and the following octets consist of the called DTE address and, in the Call Request packet, of the calling DTE address when present. The calling DTE address is always present in the incoming call packet. The calling DTE address that might have been given by the calling DTE in the call request packet will be overwritten.

Note: The calling address field is present in the call connected packet only if the called DTE has provided this address field in the call accepted packet. The address field is transmitted transparently through the network. The DCE enters the address of the called DTE in the call connected packet. In this manner a called DTE address that might have been given by the called DTE in the call accepted packet will be overwritten.

A7.2.3.3 Cause field

The DCE checks for a valid cause field in the Clear request packet. If invalid the DCE will clear the call with cause "local procedure error" and diagnostic 129. "Incompatible destination" cause is not provided among Reset causes.

The bits of the restarting cause field in Restart request packets should be set to 0 by the DTE. Other values of these bits are handled in the same way as they would have been all zeroes.

A7.2.3.4 Facilities

A7.2.3.4.1 Collective number group

Collective number group is an optional user facility agreed for a period of time.

With a collective number group a subscriber DTE can be connected over multiple physical lines to one network address. Up to 16 subscriber DTEs can be connected each with one physical line to one network address. The line selection by the destination network node is done with the non homing principle dependent on the operational state of the line at the DTE. If a line falls during a call a new call has to be set up.

At present this facility is available only for users directly connected to the node.

A7.2.3.4.2 Throughput class negotiation

Throughput class negotiation is an optional user facility agreed for a period of time which can be used by a DTE for virtual calls. Dynamic negotiation of the throughput classes between the calling and the called DTE is not provided. This facility, if subscribed to, permits selection by the calling DTE and indication to the called DTE on a per call basis of the throughput classes. The throughput classes are considered independently for each direction of data transmission

Default values are agreed between the DTE and the Administration. The default values correspond to the maximum throughput classes which may be associated with any virtual call at the DTE/DCE interface.

When the calling DTE has subscribed to the throughput class negotiation facility, it may separately request the throughput classes of the virtual call in the call request packet. If particular throughput classes are not requested, or the facility is

not subscribed by the DTE, the DCE will assume the default value.

When a called DTE has subscribed to the throughput class negotiation facility, each incoming call packet will indicate the throughput classes requested by the calling DTE (or the default values).

When a called DTE has not subscribed to the throughput class negotiation facility, the DCE will indicate in the incoming call packet the throughput classes corresponding to the default values defined at the called DTE/DCE interface.

Matching of the throughput classes between originating and destination DTE/DCE interfaces is performed in the destination node.

The following situations are possible:

- the called DTE has subscribed to the throughput class negotiation facility: the throughput classes (and the window size) are equal on the two sections (calling DTE/destination node and destination node/called DTE);
- the called DTE has not subscribed to the throughput class negotiation facility: the throughput classes are generally different on the two sections.

The throughput class for transmission from the calling DTE is indicated in bits 4, 3, 2 and 1. The throughput class for 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 the table below.

Bits: 4 3 2 1 or Bits: 8 7 6 5	Throughput class (bit/s)
0 0 0 0	75
0 0 0 1	75
0 0 1 0	75
0 0 1 1	75
0 1 0 0	150
0 1 0 1	300
0 1 1 0	600
0 1 1 1	1200
1 0 0 0	2400
1 0 0 1	4800
1 0 1 0	9600
1 0 1 1	19200
1 1 0 0	48000
1 1 0 1	48000
1 1 1 0	48000
1 1 1 1	48000

Note: Facilities providing classes B, C and D as described in Table 15/X.25 are not implemented at the present stage.

A7.2.3.5 Diagnostic packet

The diagnostic packet is not implemented.

A7.2.3.6 Call set-up and clear states

Action taken by the DCE, on receipt of packets during call set-up and clearing on assigned logical channel.

State of the interface as perceived by the DCE / Packet from the DTE with assigned logical channel	Packet level ready r1				
	Ready p1	DTE Waiting p2 (see Note 3)	DCE Waiting p3 (see Note 2)	Data transfer p4	Clear waiting p5
Call request	NORMAL (p2) (see Note 4)	ERROR (p5) # 21	NORMAL (p3) (see Note 4, 6)	ERROR (p5) (see Note 5) # 27/29	DISCARD (p5)
Call accepted	ERROR (p5) # 20	ERROR (p5) # 21	NORMAL (p4)	ERROR (p5) (see Note 5) # 27/29	DISCARD (p5)
Clear request	NORMAL (p1) note 7	NORMAL (p1) note 7	NORMAL (p1) note 7	NORMAL (p1) (see Note 5, 7	NORMAL (p1)
DTE Clear confirmation	ERROR (p5) # 20	ERROR (p5) # 21	ERROR (p5) # 22	ERROR (p5) (see Note 5) # 27/29	NORMAL (p1)
Data, interrupt, reset or flow control	ERROR (p5) # 20	ERROR (p5) # 21	ERROR (p5) # 22	See Table C-4/X.25	DISCARD (p5)
Restart request or DTE Restart confirmation with bits 1 to 4 of octet 1 or bits 1 to 8 of octet 2 unequal to zero	ERROR (p5) # 41	ERROR (p5) # 41	ERROR (p5) # 41	See Table C-4/X.25	DISCARD (p5)
Packets having a packet type identifier which is shorter than one octet or is not supported by the DCE	ERROR (p5) # 33	ERROR (p5) # 33	ERROR (p5) # 33	See Table C-4/X.25	DISCARD (p5)

The figures in brackets are the new states to be entered. The number following the symbol # is the diagnostic code (see Note 1).

NORMAL:

The action taken by the DCE follows the procedures as defined in para. 4. If the packet exceeds the maximum permitted length the DCE will invoke the ERROR procedure with diagnostic # 39 and enter state p5.

If the DTE Clear request or the DTE Clear confirmation packet exceeds the length of 5 and respectively 3 bytes, the DCE will ignore additional data fields after these bytes. Additional data fields are not transported through the network. The maximum length is limited in level 2 by the maximum frame length. The DCE checks if the call user data field in the Call request packet exceeds 16 bytes. If so the DCE will send a Clear indication packet with cause "local procedure error" and diagnostic 39. The DCE will ignore data field if present after the address field in the Call accepted packet. Additional data fields are not transported through the network. The maximum length is limited in level 2 by the maximum frame length.

DISCARD:

The DCE discards the received packet and takes no subsequent action as a direct result of receiving that packet.

ERROR:

The DCE discards the received packet and indicates a clearing by transmitting to the DTE a Clear indication packet with the cause "local procedure error" (diagnostic per Table C-3/X.25). If connected through the virtual call, the distant DTE is also informed of the clearing by a Clear indication packet, with the cause "remote procedure error" (same diagnostic).

Note 1

There may be more than one error associated with a packet (e.g. packet too long and transmitted in a wrong state). The network will stop processing of the 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.

Note 2

This state does not 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).

Note 4

a) In the case of an incoming one-way logical channel (as perceived by the DTE) the DCE will transmit a Clear indication with the cause "local procedure error" and diagnostic # 34.

b) The DCE will transmit a Clear indication if the Call request contains an improper address format or facility field; call progress signals and diagnostic codes are listed below:

Error condition	Cause	Possible diagnostics
1. Address contains a non BCD digit	Local procedure error	# 67, 68
2. Prefix digit not supported	Local procedure error	# 67, 68
2. National address smaller than national address format permits	Local procedure error	# 67, 68
4. National address larger than national address format permits	Local procedure error	# 67, 68
5. DNIC less than four digits	Local procedure error	# 67, 68
6. Facility length larger than 63	Local procedure error	# 64
7. No combination of facilities could equal facility length	Local procedure error	# 64
8. Facility length larger than remainder of packet	Local procedure error	# 38
9. Facility values conflict (e.g. a particular combination not supported)	Local procedure error	# 66
10. Facility code not allowed	Invalid facility request	# 65
11. Facility value not allowed	Invalid facility request	# 66
12. DCE unavailable resources	net. cong.	# 128

c) The DCE will transmit a Clear indication if the remote DTE makes a procedure error, either for one of the above reasons associated with its call acceptance, or because of an expired time-out (diagnostic 49).

Note 5

In the case of a permanent virtual circuit, the DCE discards the received packet and indicates a reset by transmitting to the DTE a reset indication packet, with the cause "local procedure error" (diagnostic 35). The distant DTE is also informed of the reset by a Reset indication packet, with the cause "remote procedure error" (same diagnostic).

For virtual call the diagnostic is: 27 (in state d1), 29 (in d2).

Note 6

In case of call collision the DCE will send a Clear indication to the remote DTE with cause "number busy", 0. The DCE will then enter state p2 and treat the local Call request packet. Before entering state p2 no additional packets from the DTE are considered.

Note 7

The Clear request packet is checked for a valid cause field. If valid the DCE responds immediately with a Clear confirmation and enters p1. Before entering p1 no packets from DTE are considered. If invalid the DCE will clear the call with cause "local procedure error", 129.

A7.2.3.7 Timers

DCE Time-outs

Time-out number	Time-out value	State of the logical channel	Started when	Normally terminated when	Actions to be taken when the time-out expires (see Note 1)	
					Local side	Remote side
T10	60 s	r3	DCE issues a *restart indication*	DCE leaves the r3 state (i.e., the *restart confirmation* or *restart request* is received)	DCE remains in r3 (see Note 2)	For pvc, the remote DTE is informed with Reset("out of order", 52) after n unsuccessful retransmissions.
T11	180 s	p3	DCE issues an *incoming call*	DCE leaves the p3 state (e.g., the *call accepted*, *clear request* or *call request* is received)	DCE enters the p5 state signalling a *clear indication* (local procedure error, diagn.49).	DCE enters the p5 state signalling a *clear indication* (remote procedure error, diagn.49).
T12	60 s	d2	DCE issues a *reset indication*	DCE leaves the d2 state (e.g., the *reset confirmation* or *reset request* is received)	DCE retransmit the reset ind. and remains in d2. After n retransmissions: see note 3.	See note 3.
T13	60 s	p5	DCE issues a *clear indication*	DCE leaves the p state (e.g., the *clear confirmation* or *clear request* is received)	DCE retransmits the Clear ind. and remains in p5. After n retransm. see note4	

Note 1

The values assigned to the time-out t are in accordance with Table D-1/X.25. The maximum number of retries n applying to the following notes is equal to 3.

Note 2

The DCE will retransmit the restart indication at regular intervals of t until a DTE restart confirmation is received or a restart collision occurs or a period (n+1)t elapses since the first transmission of the restart indication. If the restart procedure is not completed within the time-out period the interface will be declared out of order.

Note 3

The DCE will transmit the reset indication at regular invervals of t until a DTE reset confirmation is received or a reset collision occurs or a period (n+1)t elapses since the first transmission of the reset indication. If the reset procedure is not completed within the time-out period the DCE will either:

i) clear the virtual call with an indication of out of order (51). The remote DTE is informed by a clear indication (out of order, 51) or

ii) in the case of pvc the logical channel is placed in state d1. The distant DTE will be informed by a Reset indication (out of order, 51), only if the previous d2 state was not caused by a reset "out of order".

Note 4

The DCE will retransmit a clear indication at regular intervals of t until a DTE clear confirmation is received or a clear collision occurs or a period (n+1)t elapses since the first retransmission of the clear indication. If the clear procedure is not completed within the time-out period, the logical channel is places in state p1.

A7.2.3.8 Diagnostic codes

Coding of X.25 network generated diagnostic fields in clear, reset and restart indication (see Notes 1 and 2)

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	1	17
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 p5	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	1	29
	0	0	0	1	1	1	1	1	31
Packet not allowed	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 too short	0	0	1	0	0	1	1	0	38
Packet too long	0	0	1	0	0	1	1	1	39
Restart with nonzero in bits 1-4, 9-16	0	0	1	0	1	0	0	1	41
	0	0	1	0	1	1	1	1	47
Timer expired									
For incoming call	0	0	1	1	0	0	0	1	49
For reset indication	0	0	1	1	0	0	1	1	51
For restart indication	0	0	1	1	0	1	0	0	52
	0	0	1	1	1	1	1	1	63
Call set-up problem	0	1	0	0	0	0	0	0	64
Facility 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 address	0	1	0	0	0	0	1	1	67
Invalid calling address	0	1	0	0	0	1	0	0	68
	0	1	0	0	1	1	1	1	79
Not assigned	0	1	0	1	0	0	0	0	80
	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

Diagnostics	Bits								Decimal
	8	7	6	5	4	3	2	1	
Not assigned	0	1	1	1	0	0	0	0	112
	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	0	0	0	0	0	0	1	129
	1	0	0	0	0	0	1	0	130
	1	0	0	0	0	0	1	1	131
	1	1	1	1	1	1	1	1	255

Note 1

A given diagnostic need not apply to all packet types (i.e. reset indication, clear indication, restart indication and diagnostic packets).

Note 2

The first dianostic 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.

APPENDIX 8

IBERPAC - Spain

Not available at time of publication of this report.

APPENDIX 9

TELEPAK - Sweden

Deviations from Rec. X.25 and Network Specific Characteristics are covered by the following sections which are a complete reproduction of the draft specification from the Swedish PTT.

General

This document gives a description of the implementation of the CCITT Recommendation X.25 in the Swedish Packet Switching network, called TELEPAK.

In general the above interface will be supported in accordance to the CCITT Recommendation as described in the Yellow Book. However, as the Recommendation contains several options this document indicates which of these options are not applicable for TELEPAK.

X.25 INTERFACE

CCITT Yellow Book Volume VIII fascicle VIII.2, is used as a reference.

Those paragraphs that are not commented below will be fully supported in accordance to the reference document.

1. DTE/DCE Interface Characteristics

1.1 Only the physical interface according to CCITT Recommendation X.21bis is supported (i.e. sections 1.1.1 and 1.2 are not applicable).

2. Link Access Procedure

2.1 Only link access procedure according to LAP B is supported (i.e. sections 2.3.4.5, 2.4.1, 2.4.4, 2.4.7 and 2.4.8 are not applicable).

2.2 Use of Receive Ready (RR), Receive Not Ready (RNR) and Reject (REJ) with the P-bit set to 1 for request of the DTE status are not used (Ref. 2.3.4.2, 2.3.4.3 and 2.3.4.4).

2.3 Parameters:

The timer T1 is set to 3 seconds
Maximum number of transmissions (N2) is 10
Maximum number of outstanding frames (k) is 7

3. Packet Level

3.1 The data field of the packet has to be an integral number of octets (Ref. 3, note 2).

3.2 Datagram is not supported (i.e. section 5 is not applicable).

3.3 Permanent Virtual Circuits (PVC) is not yet supported (i.e. section 4.2 is not applicable).

3.4 Logical channels. Normally 15 logical channels in one logical channel group (group 0) will be assigned for each connection.

3.5 Diagnostic packets are not supported (Ref. 3.4.1).

3.6 If the calling DTE address is given in Call Request packets the address must be correct. Otherwise the call is cleared. If not provided the calling address will be inserted by the network.

3.7 Procedure for virtual circuit services (Ref. section 4).

After the normal link set-up procedure (Ref. 2.4.5.1) the DCE will immediately initiate a restart procedure by transferring a Restart indication packet. This has to be acknowledged in accordance to section 3.3.2.

3.8 Clearing by the DTE (Ref. 4.1.7).

Clear confirmation will always have local significance.

3.9 The delivery confirmation bit (D bit) will be supported from 1984 on.

3.10 Flow control (Ref. 4.4.1).

Only modulo 8 is supported.

3.11 The diagnostic codes which are supported are given in Annex 1.

3.12 Currently no optional user facilities are offered to customers. However, the Administration is currently reviewing this and will offer optional user facilities from 1984. Most of these facilities exist in the network and can be provided by special arrangement.

3.13 Called DTE address.

National prefix: 2405
International : DNIC + NTN.

Annex 1 to APPENDIX 9

CAUSE / DIAGNOSTIC LIST

NOTE: [] indicate packet state

DIAG#	CAUSE#	PACKET EMITTED	EXPLANATION
000	00	CLEAR	DTE CLEARING, RECEIVING ZAPPER FROM TYMNET OR CALL REQUEST ABORTED WHEN RECEIVING CIRCUIT COMPLETE MESSAGE
	07	RESTART	LINK START UP
001	05	RESET	INVALID P(S)
002	05	RESET	INVALID P(R)
017	01	RESTART	INVALID PACKET [PACKET LEVEL READY]
	17	CLEAR	(REMOTE)
018	01	RESTART	INVALID PACKET [DTE RESTART]
	17	CLEAR	(REMOTE)
020	19	CLEAR	INVALID PACKET [READY]
021	19	CLEAR	INVALID PACKET DTE WAITING
022	19	CLEAR	INVALID PACKET [DCE WAITING]
023	19	CLEAR	INVALID PACKET [DATA TRANSFER]
025	19	CLEAR	INVALID PACKET [DTE CLEAR]
027	05	RESET	INVALID PACKET [FLOW CONTROL READY]
028	05	RESET	INVALID PACKET [DTE RESET]

CAUSE AND DIAGNOSTIC VALUES

033	01	RESTART	UNIDENTIFIABLE PACKET
	05	RESET	UNIDENTIFIABLE PACKET
	19	CLEAR	UNIDENTIFIABLE PACKET
	17		(REMOTE)
037	05	RESET	REJECT PACKET NOT ALLOWED
038	19	CLEAR	PACKET TOO SHORT
039	19	CLEAR	PACKET TOO LONG
	05	RESET	PACKET TOO LONG
040	11	RESET	INVALID GFI, D-BIT NOT IMPLEMENTED
	21	CLEAR	
041	14	CLEAR	LOGICAL CHANNEL NON-ZERO IN RESTART, RESTART CONF.
	17		(REMOTE)
	05	RESET	LOGICAL CHANNEL NON-ZERO IN RESTART, RESTART CONF.
	01	RESTART	LOGICAL CHANNEL NON-ZERO IN RESTART, RESTART CONF.
043	05	RESET	UNAUTHORIZED INTERRUPT CONF.
044	05	RESET	UNAUTHORIZED INTERRUPT IND.
049	19	CLEAR	TIMER EXPIRED FOR INCOMING CALL (LOCAL)
	17		TIMER EXPIRED FOR INCOMING CALL (REMOTE)
050	19	CLEAR	TIMER EXPIRED FOR CLEAR INDICATION (LOCAL)
	17		TIMER EXPIRED FOR CLEAR INDICATION (REMOTE)

CAUSE AND DIAGNOSTIC VALUES

051	19	CLEAR	TIMER EXPIRED FOR RESET INDICATION (LOCAL)
	17		TIMER EXPIRED FOR RESET INDICATION (REMOTE)
052	01	RESTART	TIMER EXPIRED FOR RESTART INDICATION
	17	CLEAR	(REMOTE)
064	19	CLEAR	CALL SET UP PROBLEM FAC/UTIL LENGTH >63, INCORRECT LENGTHS, ETC.
065	03	CLEAR	FACILITY CODE NOT ALLOWED
066	19	CLEAR	FACILITY PARAMETER NOT ALLOWED
067	19	CLEAR	INVALID CALLED ADDRESS
068	19	CLEAR	INVALID CALLING ADDRESS
128	19	CLEAR	INTERNAL MULFUNCTION (DPORT NOT ASSIGNED)
129	01	CLEAR	OUT OF PORTS SUP MESSAGE
	05		CIRCUITS BUSY SUP MESSAGE
	09		HOST SHUT SUP MESSAGE
	11		ACCESS NOT PERMITTED SUP MESSAGE
	13		HOST NOT AVAILABLE SUP MESSAGE
130	05	CLEAR	TRY AGAIN SUP MESSAGE
	09		HOST DOWN SUP MESSAGE
	11		PLS SEE YOUR REP SUP MESSAGE
	13		BAD HOST # SUP MESSAGE
131	05	CLEAR	BAD MUD SUP MESSAGE
133	05	CLEAR	NO HOST SPECIFIED SUP MESSAGE
134	05	CLEAR	MUD ERROR SUP MESSAGE
135	19	CLEAR	CALLING ADDRESS DOES NOT MATCH CHKCLG (adr)
138	05	CLEAR	LOGIN ERROR
139	19	CLEAR	LOGIN ERROR- 'ERROR, TYPE USERNAME' MESSAGE

140	05	CLEAR	RECEIVED CLEAR WHEN GETTING NORMAL CIRCUIT COMPLETE
141	05	CLEAR	CIRCUIT TIME OUT WHILE SENDING CALL ACCEPT
142	05	CLEAR	LOGIN TIME-OUT
143	05	CLEAR	INFOSWITCH- CALL ACCEPT TIME-OUT
144	07	RESET	BREAK GENERATED RESET
146	19	CLEAR	NON CCITT-DEFINED PROTOCOL ID, OR PROTOCOL ID FIELD TOO SHORT
147	19	CLEAR	CALL USER DATA FIELD IN CALL ACCEPT AND FAST SELECT NOT IMPLEMENTED
148	05	CLEAR	INTERNAL MALFUNCTION UNKNOWN DIALECT RESPONSE OR UNACCEPTABLE DIALECT CHOICE
149	05	RESET	Q BIT VIOLATION - LAST PACKET M=1, Q=1, THIS HAS Q=0 - LAST PACKET Q=0, M=1, THIS HAS Q=1
150	19	CLEAR	Q BIT SET ON NON-DATA PACKET
	05	RESET	"
151	19	CLEAR	CALL USER DATA FIELD TOO LONG >16 FOR NON FAST SELECT,>128 FOR FAST SELECT
152	19	CLEAR	TOO MANY LOGINS
153	05	CLEAR	LOGON FAILURE - NODE UNABLE TO COMPLETE REQUEST
154	05	CLEAR	LOGON FAILURE - FORMAT ERROR
155	05	CLEAR	LOGON FAILURE - BAD USER NAME
156	05	CLEAR	LOGON FAILURE - BAD MUD
157	05	CLEAR	LOGON FAILURE - SYSTEM UNAVAILABLE
158	05	CLEAR	LOGON FAILURE- DOWN-LINE LOAD OR DIAL-OUT FAIL
159	05	CLEAR	LOGON FAILURE - TIMEOUT

160	05	CLEAR	LOGON FAILURE - ACCESS NOT PERMITTED
161	05	CLEAR	LOGON FAILURE - OUT OF ORIGINATION PORTS
162	05	CLEAR	LOGON FAILURE - TRY AGAIN LATER
163- 168	05	CLEAR	LOGON FAILURE - UNKNOWN REASON