ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-141

DATA LINK LAYER PROTOCOL AT THE Q REFERENCE POINT FOR THE SIGNALLING CHANNEL BETWEEN TWO PRIVATE TELECOMMUNICATION NETWORK EXCHANGES

June 1990

BRIEF HISTORY

This Standard ECMA-141 is one of a series of Standards for the interconnection of Private Telecommunications Network Exchanges (PTNXs) to form Private Telecommunications Networks (PTNs).

It uses ISDN concepts as developed by the CCITT and conforms to the framework of Standards on Open Systems Interconnection as defined by ISO 7498. It has been prepared under work item 5.1.1 of the supplement to ITSTC Memorandum M-IT-05 (Issue 1, November 1989); it has been contributed to CENELEC as a proposed ENV.

It is based on the practical experience of ECMA member companies and results from their active and continuous participation in the work of ISO, CCITT and ETSI, as well as numerous national Standardisation bodies throughout Europe and North America. It represents a pragmatic and widely based consensus.

This Standard ECMA-141 describes the Data Link Layer Protocol to be used on the signalling channel between two PTNXs where the Data Link Layer protocol is to operate transparently across the intervening network. The Standard references prETS 300xxx in order to avoid large duplication of text.

Adopted as an ECMA Standard by the General Assembly on 28th June 1990.

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1 SCOPE

This ECMA Standard specifies the Data Link Layer Protocol to be used at the Q reference point on the signalling channel between two Private Telecommunication Network Exchanges (PTNXs). The purpose of the Data Link Layer protocol is to convey signalling information between network layer entities using the signalling channel. The protocol is visible at the interface at the C reference point between a PTNX and an intervening network. Intervening networks and the C and Q reference points are defined in Standard ECMA-133.

This ECMA Standard is applicable to interconnected PTNXs where the Data Link Layer protocol is to operate end to end across an intervening network, using a Physical Layer providing continuous bit stream operation.

Appendix F provides an overview of the functions and procedures of the Data Link Layer protocol.

2 REFERENCES

ECMA-133	Reference configurations for calls through exchanges of Private Telecommunication Networks
ECMA-143	Layer 3 protocol For Signalling Between Exchanges Of Private Telecommunications Networks for the Control of Circuit Switched calls, June 1990.
prETS 300xxx	User-Network Data Link Layer Specification
ENV-41007	Definition of terms in Private Telecommunication Networks

In this ECMA Standard, most clauses refer to prETS 300xxx for their content. As a result, references within the text of prETS 300xxx shall be interpreted, for this ECMA Standard, as indicated in Table 1 below:

Reference in prETS 300xxx	Interpretation for the purpose of this Standard:
Q.930/Q.931	ECMA-143

Table 1 - prETS 300xxx Reference Interpretation

3 DEFINITIONS

The following terms used in the text of prETS 300xxx shall be interpreted as shown in table 2:

ETSI Term	ECMA Term
User	Slave
Network	Master

Table 2 - prETS 300xxx Terminology Interpretation

In addition to the definitions already given in prETS 300xxx, the following shall apply for the purpose of this Standard:

3.1 ECMA-QSIG

The generic name given to the signalling protocols that exist conceptually at the Q reference point and are defined in this and in other ECMA Standards. These protocols are visible and indirectly testable at the C reference point (see Appendix A of ECMA-133).

3.2 Master

The Data Link entity which provides the functionality of the "network" as described in prETS 300xxx for a particular Data Link.

3.3 Slave

The Data Link entity which provides the functionality of the "user" as described in prETS 300xxx for a particular Data Link.

4 CONCEPTS AND TERMINOLOGY

4.1 General

The concepts and terminology described in clause Q.920/2 of prETS 300xxx shall apply with the following additional information.

All data link entities at one end of a particular inter-PTNX signalling channel shall be designated as either 'master' or 'slave'.

PTNXs conforming to this Standard shall be capable of providing both master and slave functions on different inter-PTNX signalling channels. Thus, the configuration shown in figure 1 may exist.
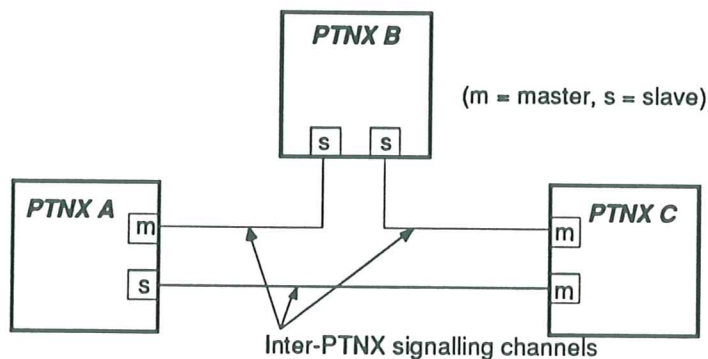
Figure 1 - Example of PTNX configuration

The assignment of the master or slave shall occur on initialisation (or reinitialisation) of the inter-PTNX signalling channels and the designation shall be decided at network configuration time. The assignment of master/slave relationships at the Data Link Layer shall not preclude different master/slave relationships at other layers in the OSI model.

4.2 Data Link Connection Identification (DLCI)

Clause Q.920/3.4.1 of prETS 300xxx shall apply with the following exception:

Automatic TEI-assignment procedures shall not be used by equipment conforming to this Standard.

4.3 Data Link States

A point to point Data Link Entity shall use only two of the three basic states defined in clause Q.920/3.4.2 of prETS 300xxx:

i) The TEI-assigned state. In this state, a TEI value has been assigned. Acknowledged information transfer is not possible in this state; or

ii) The multiple-frame-established state. This state is established by means of the multiple frame establishment procedure. Acknowledged information transfer is possible in this state.

NOTE 1:

For the detailed description of Data Link procedures in section Q.921 of prETS 300xxx, an expansion of the basic set of states listed above is required. The TEI unassigned state defined in clause Q.920/3.4.2 of prETS 300xxx is not used in ECMA-141 because only non-automatic (i.e. fixed) TEI values are used.

4.4 Service Characteristics

4.4.1 General

Clause Q.920/4.1 of prETS 300xxx shall apply.

4.4.2 Service Provided to Layer 3

Clause Q.920/4.2 of prETS 300xxx and its sub-clauses shall apply with the exception that the Unacknowledged information Transfer Service and associated primitives (DL_UNIT_DATA) are not part of this Standard.

4.4.3 Services Provided to Layer Management

In equipment conforming to this Standard, all Layer management functions shall be performed locally. Therefore no links for peer to peer management information are required.

4.4.4 Administrative Services

The procedures for assignment, checking and removal of TEIs referenced in clause Q.920/4.4 of prETS 300xxx shall apply internally, but not on a peer to peer basis, to PTNXs conforming to this Standard. The following primitives are, however, defined:

(i)   MDL_ASSIGN_REQUEST

The primitive is used by the Layer Management Entity (LME) to deliver to the Data Link Entity (DLE) the TEI value that is to be used for communication.

(ii)   MDL_ERROR_INDICATION/RESPONSE

These primitives are used to report error situations between layer management and the Data Link Layer entities.

4.4.5 Services Required From the Physical Layer

Clause Q.920/4.6 of prETS 300xxx shall apply.

5 FRAME STRUCTURE FOR PEER TO PEER COMMUNICATION

5.1 General

Clause Q.921/2.1 of prETS 300xxx shall apply.

5.2 Flag Sequence

Clause Q.921/2.2 of prETS 300xxx shall apply.

5.3 Address Field

The address field shall consist of two octets as illustrated in Figure 1/Q.921 of prETS 300xxx. The address field identifies the intended receiver of the command frame and the transmitted of a response frame. The format of the address field is defined in clause 6.2 of this Standard.

5.4 Control Field

Clause Q.921/2.4 of prETS 300xxx shall apply.

5.5 Information Field

Clause Q.921/2.5 or prETS 300xxx shall apply.

5.6 Transparency

Clause Q.921/2.6 of prETS 300xxx shall apply.

5.7 Frame Check Sequence (FCS) Field

Clause Q.921/2.7 of prETS 300xxx shall apply

5.8 Format Convention

Clause Q.921/2.8 of prETS 300xxx and its sub-clauses shall apply.

5.9 Invalid Frames

Clause Q.921/2.9 of prETS 300xxx shall apply.

5.10 Frame Abort

Clause Q.921/2.10 of prETS 300xxx shall apply

6 ELEMENTS OF PROCEDURES AND FORMATS OF FIELDS FOR DATA LINK LAYER PEER TO PEER COMMUNICATION

6.1 General

Clause Q.921/3.1 of prETS 300xxx shall apply.

6.2 Address Field Format

Clause Q.921/3.2 of prETS 300xxx shall apply.

6.3 Address Field Variables

6.3.1 Address Field Extension Bit (EA)

Clause Q.921/3.3.1 of prETS 300xxx shall apply.

6.3.2 Command Response Field Bit (C/R)

The C/R bit identifies a frame as either a command or response. In the case of the interconnection of two PTNXs, the setting of the C/R bit for a particular data link depends on the assignment of "master" and "slave" sides of the inter-PTNX signalling channel. The coding of the C/R bit is shown in Table 3 below.

Command/ Response	Direction	C/R Value
Command	master side to slave side	1
	slave side to master side	0
Response	master side to slave side	0
	slave side to master side	1

Table 3 - C/R Field Bit Usage

6.3.3 Service Access Point Identifier (SAPI)

Clause Q.921/3.3.3 of prETS 300xxx shall apply with the exception that the use of any SAPI value other than 0 (e.g. 16 for X.25 packet mode) is beyond the scope of this Standard.

6.3.4 Terminal Endpoint Identifier (TEI)

A TEI is associated with a specific point to point data link between two PTNXs. The TEI value used by equipment conforming to this Standard shall be the value ZERO. The use of TEI values other than 0 are beyond the scope of this Standard. PTNXs conforming to this Standard shall assign the value TEI = 0 independently at each end of a particular inter-PTNX signalling channel.

6.4 Control Field Format

Clause Q.921/3.4 of prETS 300xxx and its sub-clauses shall apply.

6.5 **Control Field Parameters and Associated State Variables**

Clause Q.921/3.5 of prETS 300xxx and its sub-clauses shall apply.

6.6 **Frame Types**

6.6.1 **Commands and Responses**

Clause Q.921/3.6.1 of prETS 300xxx shall apply with the exception that the UI-command and XID-command/-response frames (defined in table 5/Q.921 of prETS 300xxx) shall be considered undefined for the purpose of this Standard.

6.6.2 **Information (I) Command**

Clause Q.921/3.6.2 of prETS 300xxx shall apply.

6.6.3 **Set Asynchronous Balanced Mode Extended (SABME) Command**

Clause Q.921/3.6.3 of prETS 300xxx shall apply.

6.6.4 **Disconnect (DISC) Command**

Clause Q.921/3.6.4 of prETS 300xxx shall apply.

6.6.5 **Unnumbered Information (UI) Command**

UI frames (as defined in clause Q.921/3.6.5 of prETS 300xxx) are used for the unacknowledged information transfer service which is not defined by this Standard.

6.6.6 **Receive Ready (RR) Command/Response**

Clause Q.921/3.6.6 of prETS 300xxx shall apply.

6.6.7 **Reject (REJ) Command/Response**

Clause Q.921/3.6.7 of prETS 300xxx shall apply.

6.6.8 **Receive Not Ready (RNR) Command/Response**

Clause Q.921/3.6.8 of prETS 300xxx shall apply.

6.6.9 **Unnumbered Acknowledgement (UA) Response**

Clause Q.921/3.6.9 of prETS 300xxx shall apply.

6.6.10 **Disconnected Mode (DM) Response**

Clause Q.921/3.6.10 of prETS 300xxx shall apply.

6.6.11 **Frame Reject (FRMR) Response**

Clause Q.921/3.6.11 of prETS 300xxx shall apply.

6.6.12 **Exchange Identification (XID) Command/Response**

XID frames (as defined in clause Q.921/3.6.12 of prETS 300xxx) are not defined by this Standard.

7 ELEMENTS FOR LAYER TO LAYER COMMUNICATION

7.1 General

Clause Q.921/4.1 of prETS 300xxx shall apply except the following generic primitive types which are not part of this Standard:

DL_UNIT_DATA   for the support of unacknowledged information transfer.

MDL_UNIT_DATA   for the support of peer to peer layer management information procedures.

MDL_XID   for the support of parameter negotiation procedures.

MPH_ACTIVATE   not applicable to the Data Link Layer.

MPH_DEACTIVATE   not applicable to the Data Link Layer.

MPH_INFORMATION   not applicable to the Data Link Layer.

7.2 Primitive Procedures

7.2.1 General

Clause Q.921/4.2.1 of prETS 300xxx shall apply.

7.2.2 Layer 3 - Data Link Layer Interactions

Clause Q.921/4.2.2 of prETS 300xxx shall apply with the exception that the Data Link Connection Identifier (DLCI) state "information transfer" defined in support of broadcast data link procedures is not part of this Standard. Figure 8/Q.921 of prETS 300xxx shall apply, with the exception of the state transitions as a result of the receipt of the DL_UNIT_DATA_REQUEST/INDICATION primitives.

8 DEFINITION OF THE PEER TO PEER PROCEDURES OF THE DATA LINK LAYER

Clause Q.921/5 of prETS 300xxx shall apply, with the exception that neither the unacknowledged information transfer nor the connection management information transfer procedures are part of this Standard.

8.1 Procedures for the Use of the P/F Bit

Clause Q.921/5.1.2 of prETS 300xxx shall apply.

8.2 Procedures for Unacknowledged Information Transfer

The procedures for Unacknowledged Information Transfer as defined in clause Q.921/5.2 of prETS 300xxx are not part of this Standard.

8.3 Terminal Endpoint Identifier (TEI) Management Procedures

8.3.1 General

PTNXs conforming to this Standard shall implement non-automatic TEI assignment procedures. The TEI Management procedures defined in the

following clauses are defined internally to the PTNX as no peer to peer management information transfer procedures are part of this Standard.

The applicability of automatic TEI assignment procedures and peer to peer management information transfer to PTNX interconnection scenarios shall not be used by equipment conforming to this Standard.

8.3.2 TEI Assignment Procedures

The TEI value to be used for a particular data link shall be delivered by the Layer Management Entity (LME) to the Data Link Layer entity via the MDL__ASSIGN__REQUEST primitive.

8.3.3 TEI Check Procedures

The procedures defined in clause Q.921/5.3.3 of prETS 300xxx to enable checking of a previously assigned TEI value are not part of this Standard. Equipment conforming to this Standard shall only implement non-automatic (i.e. fixed) TEI assignment procedures and therefore, on a physical point to point connection, multiple TEI assignment cannot occur.

8.3.4 TEI Removal Procedures

The procedures defined in clause Q.921/5.3.4 of prETS 300xxx to enable removal of a previously assigned TEI value are not part of this Standard. Equipment conforming to this Standard may initiate TEI removal procedures internally.

8.3.5 TEI Identify Verify Procedures

The procedures defined in clause Q.921/5.3.5 of prETS 300xxx to enable checking of a previously assigned TEI value are not part of this Standard.

8.3.6 Formats and Codes

As no peer to peer messages are defined in this Standard for the support of management procedures, the format and codes defined in clause Q.921/5.3.6 of prETS 300xxx are not part of this Standard.

8.4 Automatic Negotiation of Data Link Layer Parameters

The procedures described in Appendix IV of prETS 300xxx are not part of this Standard.

8.5 Procedures for Establishment and Release of Multiple Frame Operation

The provision of extended multiple frame operation (modulo 128 sequencing) shall be supported by equipment conforming to this Standard.

8.5.1 Establishment of Multiple Frame Operation

Clause Q.921/5.5.1 of prETS 300xxx shall apply.

8.5.2 Information Transfer

Clause Q.921/5.5.2 of prETS 300xxx shall apply.

8.5.3 Termination of Multiple Frame Operation

Clause Q.921/5.5.3 of prETS 300xxx shall apply.

8.5.4   **TEI-assigned State**

Clause Q.921/5.5.4 of prETS 300xxx shall apply.

8.5.5   **Collision of Unnumbered Commands and Responses**

Clause Q.921/5.5.5 of prETS 300xxx shall apply.

8.5.6   **Unsolicited DM Response and SABME or DISC Command**

Clause Q.921/5.5.6 of prETS 300xxx shall apply with the exception that equipment supporting LAPB protocol procedures is beyond the scope of this Standard.

8.6   **Procedures for Information Transfer in Multiple Frame Operation**

Clause Q.921/5.6 of prETS 300xxx shall apply.

8.6.1   **Transmitting I Frames**

Clause Q.921/5.6.1 of prETS 300xxx shall apply.

8.6.2   **Receiving I Frames**

Clause Q.921/5.6.2 of prETS 300xxx shall apply.

8.6.3   **Sending and Receiving Acknowledgements**

Clause Q.921/5.6.3 of prETS 300xxx shall apply.

8.6.4   **Receiving REJ Frames**

Clause Q.921/5.6.4 of prETS 300xxx shall apply.

8.6.5   **Receiving RNR Frames**

Clause Q.921/5.6.5 of prETS 300xxx shall apply.

8.6.6   **Data Link Layer Own Receiver Busy Condition**

Clause Q.921/5.6.6 of prETS 300xxx shall apply.

8.6.7   **Waiting Acknowledgement**

Clause Q.921/5.6.7 of prETS 300xxx shall apply with the exception that equipment conforming to this Standard shall not retransmit the last transmitted I frame in the event of T200 expiry, but shall transmit the appropriate supervisory command with the P bit set to ONE.

NOTE 2:

For information on which is the appropriate supervisory frame to send, refer to Note 2 to clause Q.921/5.6.5 of prETS 300xxx.

8.7   **Re-establishment of Multiple Frame Operation**

8.7.1   **Criteria for Re-establishment**

Clause Q.921/5.7.1 of prETS 300xxx shall apply.

8.7.2   **Procedures**

Clause Q.921/5.7.2 of prETS 300xxx shall apply.

8.8 **Exception Conditions Reporting and Recovery**

Clause Q.921/5.8 of prETS 300xxx shall apply with the exception that the optional procedures of Q.921/Appendix I of prETS 300xxx are not part of this Standard. In addition, the procedures described in Q.921/Appendix II of prETS 300xxx are defined in Appendix A of this Standard

8.8.1 **N(S) Sequence Error**

Clause Q.921/5.8.1 of prETS 300xxx shall apply.

8.8.2 **N(R) Sequence Error**

Clause Q.921/5.8.2 of prETS 300xxx shall apply.

8.8.3 **Timer recovery Condition**

Clause Q.921/5.8.3 of prETS 300xxx shall apply.

8.8.4 **Invalid Frame Condition**

Clause Q.921/5.8.4 of prETS 300xxx shall apply.

8.8.5 **Frame Rejection Condition**

Clause Q.921/5.8.5 of prETS 300xxx shall apply.

8.8.6 **Receipt of an FRMR Response Frame**

Clause Q.921/5.8.6 of prETS 300xxx shall apply.

8.8.7 **Unsolicited Response Frames**

Clause Q.921/5.8.7 of prETS 300xxx shall apply.

8.8.8 **Multiple Assignment of a TEI Value**

Clause Q.921/5.8.8 of prETS 300xxx shall apply.

NOTE 3:

As equipment conforming to this Standard will only implement non-automatic TEI-assignment procedures, on a single data link connection, multiple TEI assignment cannot occur.

8.9 **List of System Parameters**

Clause Q.921/5.9 of prETS 300xxx shall apply with the following exceptions:

i) N202 and Timers T201 and T202 are not part of this Standard;

ii) The maximum number of outstanding I frames (k) shall have a value of 7 where a signalling channel of greater than or equal to 64 kbits/s is used and shall have a value of 3 where a signalling channel of less than 64 kbits/s is used.

Additional values of k may be used on particular inter-PTNX links by special arrangement between the two PTNXs.

8.10 **Data Link Layer Monitor Function**

The procedures described in clause Q.921/5.10 of prETS 300xxx are mandatory for equipment conforming to this Standard.

APPENDIX A

(This Appendix is not part of the Standard)

OCCURRENCE OF THE MDL_ERROR_INDICATION PRIMITIVE

A.1 Introduction

Table A.1 (derived from Table II-1/Q.921 of prETS 300xxx) describes the error situations in which the MDL_ERROR_INDICATION primitive will be generated. This primitive notifies the Data Link Layer's connection management entity of the occurred error situation. The table has been adapted from that in Q.921/Appendix II of prETS 300xxx to reflect the peer to peer nature of the configuration of PTNXs conforming to this Standard.

A.2 Layout of Table A.1

The entries in the various columns of table A.1 should be interpreted as indicated in this clause.

The "Error Code" column gives the identification value of each error condition which will be included as a parameter with the MDL_ERROR_INDICATION primitive.

The "Error Condition" column in conjunction with the "Affected States" column describe unique protocol error events and the basic state of the Data Link entity at the point that the MDL_ERROR_INDICATION primitive will be generated.

The columns entitled "Master management action" and "Slave management action" indicate the prefered action to be taken with in the PTNX concerned. The actions for Master and Slave Data Link configurations are identical.

A.3 Prefered Management Actions

In general, the "error log" described in Table A.1 to be undertaken on receipt of the MDL_ERROR_INDICATION primitive is an implementation option.

Error Type	Error Code	Error Condition	Affected States	Master management Action	Slave management Action
Receipt of unsolicited Response	A	Supervisory (F=1)	7	Error Log	Error Log
	B	DM (F = 1)	7,8	Error Log	Error Log
	C	UA (F=1)	4,7,8	Error Log	Error Log
	D	UA (F= 0)	4,5,6,7,8		
	E	DM (F= 0)	7,8	Error Log	Error Log
Peer Initiated Establishment	F	SABME	7,8	Error Log	Error Log
Unsuccessful retransmission (N200 times)	G	SABME	7,8	Indication that maintenance action is required since layer 2 is unable to provide services	Indication that maintenance action is required since layer 2 is unable to provide services
	H	SABME	6		
	I	Status Enquiry	8		
Other	J	N(R) Error	7,8	Error Log	Error Log
	K Note A.1	Receipt of FRMR response	7,8	Error Log	Error Log
	L	Receipt of frame with undefined control field	4,5,6,7,8	Error Log	Error Log
	M	Receipt of I field not permitted	4,5,6,7,8	Note A.2	Note A.2
	N	Receipt of frame with wrong size	4,5,6,7,8	Error Log	Error Log
	O	N201 Error	4,5,6,7,8	Error Log	Error Log

Table A.1 - Master and Slave management actions for MDL_ERROR _INDICATIONs

NOTE A.1:

The FRMR response will not be transmitted by a data Link Layer entity conforming to this Standard.

NOTE A.2:

According to clause Q.921/5.8.5 of prETS 300xxx this error code will never be generated.

APPENDIX B

(This Appendix is not part of the Standard)

SDL FOR POINT TO POINT PROCEDURES

The example SDL diagram shown in Q.921/Annex B of prETS 300xxx is also relevant for this Standard, with the following exceptions:

i)   In figure B-7 (2 of 10) the frame retransmission option of prETS 300xxx is not applicable to equipment conforming to this Standard.

ii)   In figure B-7 (8 of 10), Note 2; the procedures described in Q.921 Appendix 1 of prETS 300xxx are not applicable to equipment conforming to this Standard.

iii)   In figure B-8 (2 of 9) the frame retransmission option of prETS 300xxx is not applicable to equipment conforming to this Standard.

iv)   In figure B-8 (7 of 9), Note 2; the procedures described in Q.921 Appendix 1 of prETS 300xxx are not applicable to equipment conforming to this Standard.

APPENDIX C

(This Appendix is not part of the Standard)

STATE TRANSITION TABLES FOR POINT TO POINT PROCEDURES

The state transition tables given in Q.921/Annex D of prETS 300xxx may also be used to provide additional clarification of the procedures described in this Standard, with the following exceptions:

i)   In figure D-2.9, on expiry of T200, the frame retransmission option of prETS 300xxx is not used by equipment conforming to this Standard in states 7.0, 7.1, 7.2 and 7.3.

ii)   In figure D-3.9, on expiry of T200, the frame retransmission option of prETS 300xxx is not used by equipment conforming to this Standard in states 8.0 and 8.2.

In case of conflict between the state diagrams shown in Q.921/Annex D of prETS 300xxx and the text of the mandatory clauses of this Standard, the latter shall take precedence over the former.

APPENDIX D

(This Appendix is not part of the Standard)

EXAMPLES OF THE USE OF PRIMITIVES

Clause Q.920/2 of prETS 300xxx is applicable.

APPENDIX E

(This Appendix is not part of the Standard)

LIST OF ACRONYMS

C/R	Command/Response
CME	Connection Management Entity
DISC	Disconnect
DLCI	Data Link Connection Identifier
DLE	Data Link Entity
DM	Disconnected Mode
ETS	European Telecommunications Standard
FCS	Frame Check Sequence
FRMR	FRaMe Reject
ISDN	Integrated Services Digital Network
LME	Layer Management Entity
N(R)	Receive Sequence Number
N(S)	Send Sequence Number
P/F	Poll/Final
PTN	Private Telecommunications Network
PTNX	Private Telecommunications Network Exchange
REJ	Reject
RNR	Receive Not Ready
RR	Receive Ready
SABME	Set Asynchronous Balanced Mode Extended
SAP	Service Access Point
SAPI	Service Access Point Identifier
TEI	Terminal Endpoint Identifier
UA	Un-numbered Acknowledgement
UI	Un-numbered Information
XID	eXchange IDentification

APPENDIX F

(This Appendix is not part of the Standard)

OVERVIEW OF THE FUNCTIONS AND PROCEDURES OF THE DATA LINK LAYER

F.1   General

All Data Link Layer messages are transmitted in frames which are delimited by flags. (A flag is a unique bit pattern.) The frame structure is defined in clause 5.

The Data Link Layer protocol (as defined in this Standard) includes functions for:

- frame delimiting, alignment and transparency, allowing recognition of a sequence of bits transmitted over a signalling channel as a frame;

- sequence control, to maintain the sequential order of frames across a data link connection;

- detection of transmission, format and operational errors on a data link connection;

- recovery from detected transmission, format and operational errors;

- notification to the management entity of unrecoverable errors; and

- flow control.

Data Link Layer functions (as defined in this Standard) provide the means for information transfer via point to point data link connections. In this case frames are directed onto a single endpoint.

Figure F.1 shows point to point information transfer in the case of two interconnected PTNXs and depicts the point to point nature of both layers 1 and 2.

Only acknowledged transfer of ECMA-QSIG Layer 3 information is defined as part of this Standard. Unacknowledged information transfer at the Data Link Layer is not used by equipment conforming to this Standard.
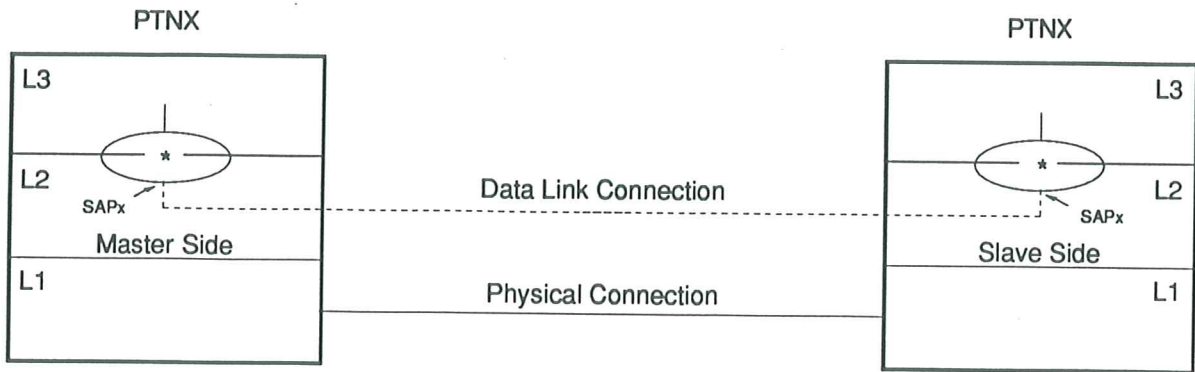
Figure F.1 - Point to Point Data Link Connection

F.2   Overview Of Data Link Layer Structure

F.2.1   Data Link Procedure

Clause Q.920/5.1 of prETS 300xxx is applicable.

F.2.2   Multiplex Procedure

Clause Q.920/5.2 of prETS 300xxx is applicable

F.2.3   Structure of the Data Link Procedure & Management Function

The functional model of the data link procedure (including management functions) is shown in figure F.2. This figure is shown for informative purposes only and is not intended to constrain implementations.

The layer management entity (LME) provides for the management of resources that have a layer wide impact. Access to the LME is provided by means of a specific SAPI.

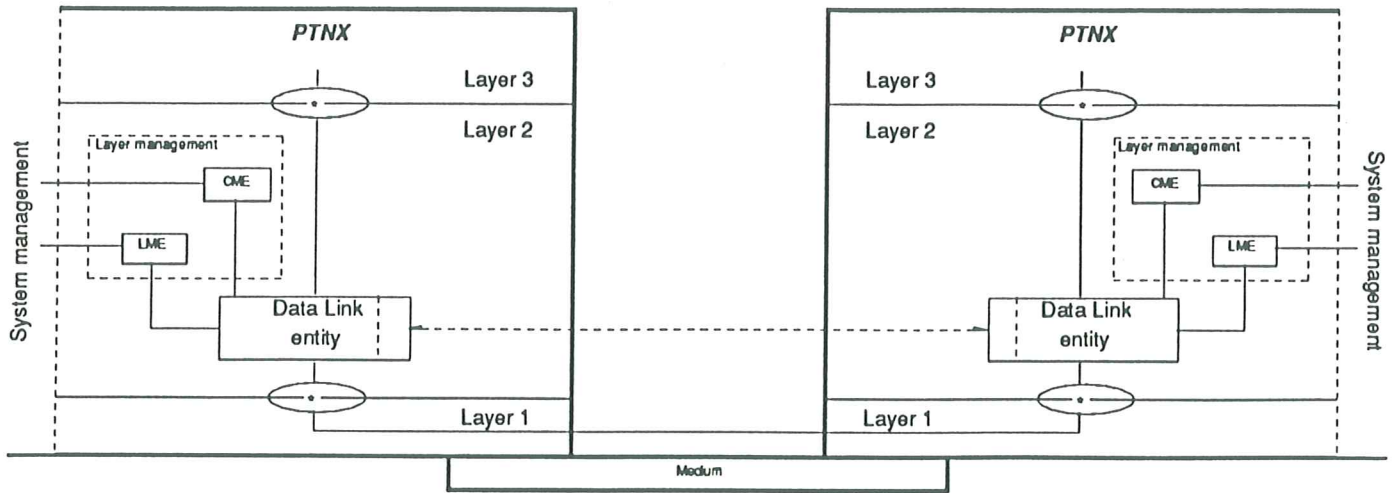The connection management entity (CME) provides for the management of resources that have an impact on individual connections.

Figure F.2 - Functional Model of Data Link Layer Structure