

# INTERNATIONAL STANDARD

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**AMENDMENT 1**  
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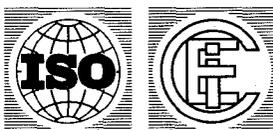
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## **Information processing systems – Data communication – High-level data link control procedures – Description of the X.25 LAPB- compatible DTE data link procedures**

### **AMENDMENT 1: Conformance requirements**

*Systèmes de traitement de l'information – Communication de données –  
Procédures de commande de liaison de données à haut niveau –  
Description des procédures de liaison d'équipement terminal de  
transmission de données ETTD compatible X.25 LAPB*

*AMENDEMENT 1: Exigences de conformité*



Reference number  
ISO 7776:1986/Amd.1:1992 (E)

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Amendment 1 to International Standard ISO 7776 : 1986 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*.

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## Introduction

Amendment 1 to ISO 7776:1986 introduces changes that have been agreed since the approval of ISO 7776.

Amendment 1 to ISO 7776:1986 introduces:

- an additional section in clause 0, Introduction, concerning conformance;
- an additional section in clause 1, Scope and field of application, describing what the new clause 7, Conformance, covers;
- two new references in clause 2, References, on conformance testing;
- a new clause 7 on conformance to this International Standard;
- a new annex A (normative) containing a Protocol Implementation Conformance Statement proforma (PICS proforma), for ISO 7776 Single Link Procedures and Multilink Procedures. This proforma will be completed by the provider of a particular implementation of the ISO 7776 International Standard in order to inform the user of the (permitted) options chosen in this realisation of the International Standard.

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# Information processing systems – Data communication – High-level data link control procedures – Description of the X.25 LAPB-compatible DTE data link procedures

## AMENDMENT 1: Conformance requirements

Page 1

### Clause 0

Last paragraph, change "An Annex" to "Annex B".

Page 1

### Clause 0

Add the following paragraph to the end of clause 0:

" To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented. Such a statement is called a " Protocol Implementation Conformance Statement" (PICS), as defined in ISO/IEC 9646-1. This International Standard provides such a PICS proforma in compliance with the relevant requirements, and in accordance with the relevant guidance, given in ISO/IEC 9646-2.

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### Clause 1

Add the following paragraph to the end of clause 1:

"Clause 7 covers the Static Conformance requirements, the Dynamic Conformance requirements, and the Protocol Implementation Conformance Statement (PICS)."

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### Clause 2

Add the following two references:

"ISO/IEC 9646-1:1991, *Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts.*

ISO/IEC 9646-2:1991, *Open Systems Interconnection — Conformance testing methodology and framework — Part 2: Abstract test suite specification.*"

Add a new clause 7 as follows:

## 7 Conformance

### 7.1. Static conformance

#### 7.1.1. General requirements

A DTE that claims conformance to this International Standard shall implement:

- a) Single link operation;
- b) operation with DTE address A (ie, A sent in response frames), and may implement operation with DTE address B, for DTE/DTE application;
- c) either basic (modulo 8) operation or extended (modulo 128) operation, and may implement both (3);
- d) link set-up as responder to a set-up initiated by the DCE/remote DTE (5.3.1);
- e) link disconnection as responder to a disconnection initiated by the DCE/remote DTE (5.3.3);
- f) link reset as responder to a reset initiated by the DCE/remote DTE (5.6.1);
- g) information transfer, in both directions (5.2, 5.4, 5.4.1, 5.4.2, 5.4.3, 5.4.4, 5.4.5, 5.4.6, 5.4.7, 5.4.9);
- h) sending of FRMR response on receipt of a valid frame with an error condition not recoverable by retransmission of the identical frame (4.3.9, 5.5);
- j) responding to receipt of a FRMR response in the information transfer phase either by initiating link reset, or by transmitting a DM response and entering the disconnected phase (5.5);
- k) timer T1 (5.7.1.1), and parameter N2 (5.7.2);
- l) interframe time fill by contiguous flags (3.10).

#### 7.1.2 Options

A DTE that claims conformance to this International Standard may implement:

- a) multilink operation (clause 6);
- b) operation with DTE address B for DTE/DTE applications;
- c) link set-up as initiator (5.3.1);
- d) link disconnection as initiator (5.3.3);
- e) link reset as initiator (5.6.1);
- f) DTE busy condition (5.4.8);
- g) timers T3 (5.7.1.3) and T4 (5.7.1.4);
- h) transmission of unsolicited DM response frames in disconnected phase (5.3.4);
- j) transmission of DISC frames prior to link set-up (5.3.1).

### 7.2. Dynamic conformance

For each function that the PICS states to be supported, the implementation shall exhibit external behaviour consistent with the implementation of

- a) the corresponding data link layer procedures and
- b) the encoding specified in clause 3, 4.1, 4.3, 4.3.9 and 5.1 for all relevant fields of any transmitted frames.

as specified in the clauses to which the PICS proforma entry for the function refers.

### 7.3 Protocol Implementation Conformance Statement

The supplier of a protocol implementation that is claimed to conform to this International Standard shall complete a copy of the PICS proforma in annex A, including the information necessary to identify fully both the supplier and the implementation.

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Rename the present annex as annex B and insert a new annex A as follows:

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**ANNEX A \***  
**(normative)**

**PICS Proforma**

**A.1 Introduction**

The supplier of a protocol implementation which is claimed to conform to ISO 7776 shall complete the following Protocol Implementation Conformance Statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented. The PICS can have a number of uses, including use:

- by the protocol implementor, as a check-list to reduce the risk of failure to conform to the standard through oversight;
- by the supplier and acquirer — or potential acquirer — of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma;
- by the user — or potential user — of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICS's);
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

**A.2 Abbreviations and special symbols**

**A.2.1 Status symbols**

- M mandatory  
 O optional  
 O.*n* optional, but support of at least one of the group of options labelled by the same numeral *n* is required  
 X prohibited  
 <item>: conditional symbol, status is dependent on the support marked for <item> (see A.3.4)

**A.2.2 General abbreviations**

- N/A not applicable  
 PICS Protocol Implementation Conformance Statement

**A.2.3 Item references**

The following is a list of the item references used in the PICS proforma

- Major capabilities, A.5: Ls, Lm, Lc, Lt, Lta
- Basic / extended operation, A.6.1: M8, M128
- Link setup, A.6.2: LSI1, LSI2, LSI3, LSA, LSD, LSR
- Link disconnection and disconnected phase: LD1, LD2, LDP
- Link reset, A.6.2: LRI1, LRIb, LRIc, LRIId, LRRa, LRRb, LRRc, LRRd, LRA, LRD
- Collision resolution for U frames, A.6.2: LCRa, LCRb, LCRc, LCRd, LCRe
- I-frame transmission, A.6.3: IT, ITs, ITCi, ITCs, ITRJ, ITB
- I-frame reception, A.6.3: IR, IRs, IRRJ, IRB
- Frame rejection, A.6.3: FR1, FR2
- Frame formats, A.6.4: F1a, F1b, F1c, F2, F2a, F2b, F2c, F2d, F2e, F3, F4, FD, FA, FF
- Timers, etc., A.6.5: T1a, T1b, T1c, T1d, T1e, T1f, T1g, N2a, N2b, T3, T4
- System parameters, A.6.6: SPT1, SPT2, SPT3, SPT4, SPN2, SPN1, SPk

**\*) Copyright release for PICS proformas**

Users of this International Standard may freely reproduce the PICS proforma in this annex so that it can be used for the intended purpose and may further publish the completed PICS.

Multilink procedure, initialization, A.7.1:	ML1
Multilink resetting, A.7.1:	MLRi, MLRr, MLRCi, MLRCr, MLLNrs
Multilink procedure for taking an SLP out of service:	MLSOS
Multilink frame transmission, A.7.1:	MLFT, MLFTrf, MLFTrb
Multilink frame reception, A.7.1:	MLFR, MLFRbs, MLFRfc, MLLNt1, MLMT2
Multilink frames, A.7.1:	MLFS, MLFF, MLFVS, MLFSC
Multilink system parameters, A.7.2:	SPMT1, SPMT2, SPMT3, SPMWT, SPMWR, SPMX

### A.3 Instructions for completing the PICS proforma

#### A.3.1 General structure of the PICS proforma

The first part of the PICS proforma — Implementation Identification and Protocol Summary — is to be completed as indicated with the information necessary to identify fully both the supplier and the implementation.

The main part of the PICS proforma is a fixed-format questionnaire, divided into several subclauses each containing a number of individual items. Answers to the questionnaire items are to be provided in the rightmost column, either by simply marking an answer to indicate a restricted choice (usually Yes or No), or by entering a value or a set or range of values. (Note that there are some items where two or more choices from a set of possible answers can apply: all relevant choices are to be marked.)

Each item is identified by an item reference in the first column; the second column contains the question to be answered; the third column contains the reference or references to the material that specifies the item in the main body of ISO 7776. The remaining columns record the status of the item — whether support is mandatory, optional or conditional — and provide the space for the answers: see also A.3.4 below.

A supplier may also provide — or be required to provide — further information, categorized as either Additional Information or Exception Information. When present, each kind of further information is to be provided in a further subclause of items labelled  $A_i$  or  $X_i$  respectively for cross-referencing purposes, where  $i$  is any unambiguous identification for the item (eg, simply a numeral): there are no other restrictions on its format and presentation.

A completed PICS proforma, including any Additional Information and Exception Information, is the Protocol Implementation Conformation Statement for the implementation in question.

NOTE — Where an implementation is capable of being configured in more than one way, a single PICS may be able to describe all such configurations. However, the supplier has the choice of providing more than one PICS, each covering some subset of the implementation's configuration capabilities, in case that makes for easier and clearer presentation of the information.

#### A.3.2 Additional Information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended or expected that a large quantity will be supplied, and a PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations; or a brief rationale — based perhaps upon specific application needs — for the exclusion of features which, although optional, are commonly present in implementations of the ISO 7776 protocol.

References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

#### A.3.3 Exception Information

It may occasionally happen that a supplier will wish to answer an item with mandatory status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the Support column for this: instead, the supplier shall write the missing answer into the Support column, together with an  $X_i$  reference to an item of Exception Information, and shall provide the appropriate rationale in the Exception item itself.

An implementation for which an Exception item is required in this way does not conform to ISO 7776.

NOTE — A possible reason for the situation described above is that a defect in ISO 7776 has been reported, a correction for which is expected to change the requirement not met by the implementation.

#### A.3.4 Conditional items

The PICS proforma contains a number of conditional items. These are items for which both the applicability of the item itself, and its status if it does apply — mandatory or optional — are dependent upon whether or not certain other items are supported.

Where a group of items is subject to the same condition for applicability, a separate preliminary question about the condition appears at the head of the group, with an instruction to skip to a later point in the questionnaire if the "Not Applicable" answer is selected. Otherwise, individual conditional items are indicated by a conditional symbol of the form "<item>: S" in the Status column, where <item> is an item

reference that appears in the first column of the table for some other item, and *S* is a status symbol, M or O.

If the item referred to by the conditional symbol is marked as supported, the conditional item is applicable, and its status is given by *S*: the support column is to be completed in the usual way. Otherwise, the conditional item is not relevant and the Not Applicable (N/A) answer is to be marked.

Each item whose reference is used in a conditional symbol, or in a preliminary question for grouped conditional items, is indicated by an asterisk in the Item column.

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**A.4 PICS Proforma — ISO 7776 : Identification**

**A.4.1 Implementation identification**

Supplier	
Contact point for queries about the PICS	
Implementation Name(s) and Version(s)	
Other information necessary for full identification — eg, name(s) and version(s) of machines and/or operating systems; system names	

**NOTES**

- 1 Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.
- 2 The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (eg, Type, Series, Model).

**A.4.2 Protocol summary, ISO 7776:1986**

Identification of protocol specification	ISO 7776 : 1986
Identification of amendments and corrigenda to this PICS proforma which have been completed as part of this PICS	ISO 7776 : 1986 / Amd. : Corr. : Amd. : Corr. :
Have any Exception items been required (see A.3.3)? (The answer Yes means that the implementation does not conform to ISO 7776 : 1986)	No <input type="checkbox"/> Yes <input type="checkbox"/>

Date of Statement	
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A.5 PICS Proforma — ISO 7776: Major capabilities

Item	Protocol Feature	References	Status	Support
	Does the implementation support the following:-			
Ls	Single link procedure	1	M	Yes <input type="checkbox"/>
*Lm	Multilink procedure	6	O	Yes <input type="checkbox"/> No <input type="checkbox"/>
Lc	DTE/DCE Operation	1, 5.1	M	Yes <input type="checkbox"/>
*Lt	DTE/DTE Operation	1, 5.1	O	Yes <input type="checkbox"/> No <input type="checkbox"/>
Lta	If DTE/DTE operation is supported, assignment of A/B or C/D addresses as though for a DCE.	1, 5.1	Lt: O	N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>

A.6 PICS Proforma — ISO 7776, Single link procedure

A copy of this subclause shall be completed for each supported type of single link procedure. The different types shall be numbered consecutively; indicate the number and the total number of different types:

SLP number ____ of ____
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A.6.1 PICS Proforma — ISO 7776, Single link procedure: basic / extended operation

Item	Protocol feature	References	Status	Support
M8	Basic (modulo 8) operation	1, 3, 4.1.1	O.1	Yes <input type="checkbox"/> No <input type="checkbox"/>
M128	Extended (modulo 128) operation	1, 3, 4.1.1	O.1	Yes <input type="checkbox"/> No <input type="checkbox"/>

A.6.2 PICS Proforma — ISO 7776, Single link procedure: link setup, disconnection and resetting

Does the implementation support the following features:

Item	Protocol Feature	References	Status	Support	
*LSI1	Initiation of link setup	5.3.1	O.2	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LSI2	If initiation of link setup is supported, does the DTE initiate link disconnection before initiating link setup	5.3.1	LSI1: O	N/A <input type="checkbox"/> Yes <input type="checkbox"/>	No <input type="checkbox"/>
LSI3	Initiation of link setup on receiving an unsolicited DM response	4.3.8, 5.5	LSI1: O	N/A <input type="checkbox"/> Yes <input type="checkbox"/>	No <input type="checkbox"/>
LSA	Response to link setup attempts by acceptance, and entry into the information transfer phase	5.3.1	O.2	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LSD	Denial of link setup attempts by the DCE/remote DTE (ie, by transmission of DM response)	5.3.1	O	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
*LSR	Transmission of unsolicited DM response to request the remote DTE to initiate link setup	4.3.8, 5.3.1, 5.5	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LD1	Initiation of link disconnection	5.3.3	M	Yes <input type="checkbox"/>	
LD2	Response to link disconnection by the DCE/remote DTE	5.3.3	M	Yes <input checked="" type="checkbox"/>	
LDP	Response to DISC commands, and to other commands with P = 1, received during the disconnected phase	5.3.3	M	Yes <input type="checkbox"/>	
	Initiation of link reset:	5.6.1			
LRIa	— on receipt of FRMR	5.5, 5.6.1	O.3	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRIb	— on receipt of unsolicited UA	5.5, 5.6.1	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRIc	— on receipt of unsolicited F=1	5.5, 5.6.1	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRI d	— otherwise	5.6.1	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Request for remote link reset, by transmission of DM response during information transfer phase:				
LRRa	— on receipt of FRMR	5.5, 5.6.1	O.3	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRRb	— on receipt of unsolicited UA	5.5, 5.6.1	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRRc	— on receipt of unsolicited F=1	5.5, 5.6.1	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRRd	— otherwise	5.6.1	O	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRA	Acceptance of link reset attempts by the DCE/remote DTE	5.6.1	O.4	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LRD	Denial of link reset attempts by the DCE/remote DTE (i.e., by transmission of DM response)	5.6.1	O.4	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Resolution of collision of unnumbered commands that are the same by entering the indicated phase:	5.3.5			
LCRa	— after receiving the UA_RSP		O.5	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LCRb	— after sending the UA_RSP		O.5	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LCRc	— after timing out waiting for UA_RSP having sent UA_RSP		O.5	Yes <input type="checkbox"/>	No <input type="checkbox"/>
LCRd	Resolution of collision of different unnumbered commands	5.3.5	M	Yes <input type="checkbox"/>	
LCRe	Resolution of collision of DM responses by initiating link set-up	5.3.7	LSR: M	N/A <input type="checkbox"/> Yes <input type="checkbox"/>	

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