TECHNICAL REPORT

ISO/IEC TR 9577

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Information technology — Telecommunications and information exchange between systems — Protocol identification in the network layer

Technologies de l'information — Télécommunications et échange d'informations entre systèmes — Identification de protocoles dans la Couche Réseau

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Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for world wide standardization as a whole. 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.

The main task of a technical committee is to prepare International Standards but in exceptional circumstances, the publication of a technical report of one of the following types may be proposed:

- type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;

- type 2, when the subject is still under technical development requiring wider exposure;

- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ('state of the art', for example).

Technical reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 9577, which is a technical report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

Introduction

Identifying protocols by information in a uniform part of the protocol control information fulfils two requirements:

i. It enables an entity to verify that the protocol received is of the type and kind expected; and

ii. It permits an entity to discriminate among a number of different protocols (both OSI and non-OSI) that might co-exist in a common environment.

This Technical Report contains a description of the means used to identify protocols and where that information is located in a protocol, together with a record of those values of protocol identifiers which have been used by ISO and by other authorities. This document does not attempt to provide any general architectural principles for the functions of the protocol identification, nor does it attempt to provide judgements as to whether a protocol might have more than one value of protocol identifier.

By reference to this Technical Report, future protocols can be developed to include a protocol identifier and the value(s) of the protocol identifier can be chosen on a knowledgeable basis.

This Technical Report notes that CCITT Recommendation X.244 provides the basis for clause 6.2.

Information technology - Telecommunications and information exchange between systems - Protocol identification in the network layer

1 Scope

This Technical Report provides

a) the description of a means to permit a protocol to be identified;

b) a record of the structure and allowable ranges of protocol identifier(s) which can be assigned by ISO and other authorities;

c) a record of the values of protocol identifiers used by OSI Network Layer protocols and non-OSI protocols occupying a similar position, in particular, only protocols with protocol control information commencing in octet 1 of the protocol data unit are covered; and

d) a record of the values that are in use as protocol control information in non-Network Layer protocols where they impact on Network Layer protocol identification.

The application of this Technical Report is:

a) in the identification of internationally standardized Network Layer protocols operating directly above the Data Link Service;

b) in the identification of protocols used in conjunction with internationally standardized Network Layer protocols that operate directly above the Data Link Service; and

c) to distinguish between Internationally standardized Network Layer protocols, and other internationally standardized protocols used in conjunction with internationally standardized Network Layer protocols.

This Technical Report is for use by ISO/IEC Technical Committees and other authorities in applying the principles contained in clause 4, and in selecting an unused value or values from the range of values permitted in clause 5 or clause 6, as appropriate. When a new value is selected, that value and its usage should be brought to the attention of ISO/IEC JTC 1 SC6 so that this Technical Report can be amended.

2 References

ISO/IEC 8073 : 1988, *Information Processing Systems - Open Systems Interconnection - Connection oriented transport protocol specification.*

NOTE - See also CCITT Recommendation X.224.

ISO/IEC 8073/Add.1 : 1988, *Information Processing Systems - Open Systems Interconnection - Connection oriented transport protocol specification - Addendum 1: Network connection management subprotocol.*

ISO 8208 : 1987, *Information processing systems - Data communications - X.25 Packet Level Protocol for Data Terminal Equipment.*

NOTE - See also CCITT Recommendation X.25

ISO/IEC 8473 : 1988, *Information Processing Systems - Data Communications - Protocol for providing the connectionless mode network service.*

ISO 8878 : 1987, *Information processing systems - Data communications - Use of X.25 to provide the OSI connection-mode network service.*

NOTE - See also CCITT Recommendation X.223

ISO/IEC 8880-2:-[1], *Information Processing Systems - Telecommunications and information exchange between systems - Protocol combinations to provide and support the OSI Network Service - Part 2: Provision and support of the connection-mode Network Service.*

ISO/IEC 8880-3:-[1], *Information Processing Systems - Telecommunications and information exchange between systems - Protocol combinations to provide and support the OSI Network Service - Part 3: Provision and support of the connectionless-mode Network Service.*

ISO/IEC 9542 : 1988, *Information Processing Systems - Telecommunications and information exchange between systems - End system to Intermediate system routeing protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473).*

1) To be published.

ISO/IEC 10030:-[1], *Information Processing Systems - Telecommunications and information exchange between systems - End system routeing information exchange protocol for use in conjunction with ISO 8878.*

CCITT Recommendation Q.931 (I.451), *ISDN User-Network Interface Layer 3 Specification.*

CCITT Recommendation T.70, *Network-independent basic transport service for the telematic services.*

CCITT Recommendation X.29, *Procedures for the exchange of control information and user data between a packet assembly/disassembly facility (PAD) and a packet mode DTE or another PAD.*

CCITT Recommendation X.244, *Exchange of protocol identification during virtual call establishment on Packet Switched Public Data Networks.*

NOTE - All references to CCITT Recommendations refer to the text of these Recommendations as approved by the CCITT Plenary Assembly in 1988

3 Abbreviations

CCITT	International Telegraph and Telephone Consultative Committee
GFI	General Format Identifier
IPI	Initial Protocol Identifier
NCMS	Network Connection Management Subprotocol
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
SPI	Subsequent Protocol Identifier
TPDU	Transport Protocol Data Unit
TR	Technical Report

4 Protocol identifiers

The protocol operating directly over the Data Link Layer is termed the initial protocol and is identified by the Initial Protocol Identifier (IPI).

The protocol carried by the initial protocol is termed the subsequent protocol and is identified by a Subsequent Protocol Identifier (SPI).

The subsequent protocol can carry further subsequent protocols, identified by further SPIs, iteratively.

For the purpose of this Technical Report, the octets referred to as IPI and SPI are viewed as protocol identifiers. In some cases the protocol itself gives other names to these octets, and might also view the function of the octets as being distinct from protocol identification. ISO 8208 is an example of such a protocol (see annex A of this Technical Report). It is possible to identify such protocols by the means described in this Technical Report.

NOTE - Guidelines for the processing of protocol identifiers are given in Annex B.

5 Initial protocol identifier

5.1 General

The location of the IPI is the first octet of the protocol control information; this is depicted in figure 1. The value of the IPI unambiguously identifies the initial protocol.

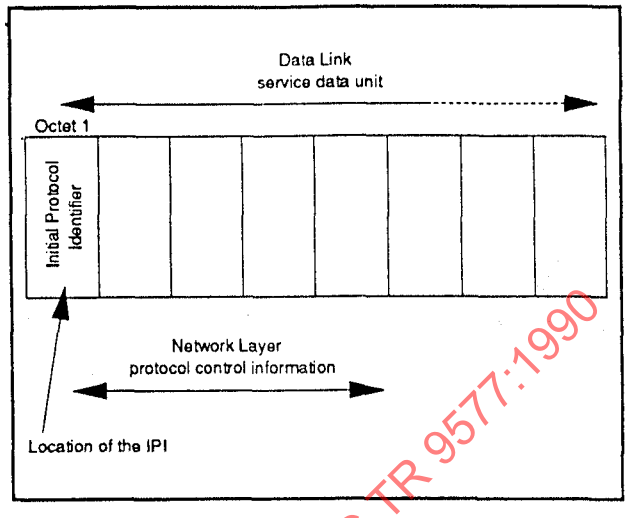


Figure 1: Location of the IPI

5.2 Assignment structure

The structure applied to the values of the IPI is depicted in table 1.

With the exception of protocol identifiers used by ISO 8208 (and by the corresponding CCITT Recommendation X.25), bits 8, 7, 6, and 5 of the IPI indicate the administrative authority which is responsible for assigning a combination of the associated bits 4, 3, 2, and 1 to an initial protocol.

5.3 Values assigned to the IPI

Table 2 records the values that have been assigned to specific protocols. Values not recorded are reserved and available for allocation by the administrative authorities specified by the structure depicted in clause 5.2.

A specific value is reserved to indicate the null Network Layer. One value is reserved for future extension to this Technical Report.

6 Subsequent protocol identifier

6.1 General

The SPI is the first octet of protocol control information in each instance of communication of the subsequent protocol. This is depicted in figure 2 where a subsequent protocol is operating directly over the initial protocol.

The value of the SPI:

- identifies another OSI Network Layer protocol;
- identifies some other non-OSI protocol; or
- is that which is in use by an OSI Transport Layer protocol.

1) To be published.

It should be noted that in some cases an SPI might not be present, for example see A.3.

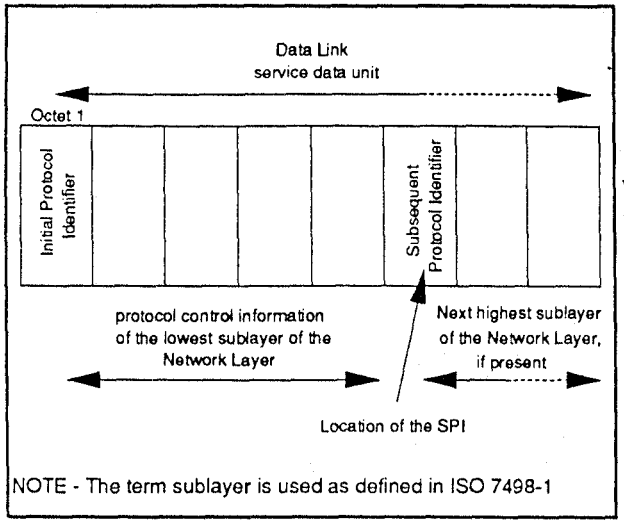


Figure 2: Location of the SPI

6.2 Assignment structure

The structure applied to the SPI is depicted in Table 3.

Bits 8 and 7 of the SPI indicate the administrative authority (if any) which is responsible for assigning the associated bits 6, 5, 4, 3, 2, and 1 to a subsequent protocol.

6.3 Values assigned to the SPI

Table 4 records the values that have been assigned to specific protocols which operate over the initial protocol. Values not recorded are reserved and available for allocation by the administrative authorities specified by the structure depicted in clause 6.2.

Table 1: Structure of the IPI octet

Bit Pattern 8	7	6	5	4	3	2	1	Allocation Category
0	0	0	0	0	0	0	0	Allocated by ISO
0	0	0	0	0	0	0	1	Allocation by CCITT
through to and including								
0	0	0	0	1	1	1	1	
x	x	0	1	x	x	x	x	ISO 8208, CCITT X.25
x	x	1	0	x	x	x	x	ISO 8208, CCITT X.25
0	0	1	1	x	x	x	x	ISO 8208, CCITT X.25
0	1	0	0	x	x	x	x	Allocation by ISO
0	1	1	1	x	x	x	x	Joint Allocation by CCITT and ISO
1	0	0	0	x	x	x	x	Allocation by ISO
1	0	1	1	x	x	x	x	Allocation by CCITT
1	1	0	0	x	x	x	x	Not categorized by this Technical Report (see Note)
1	1	1	1	0	0	0	0	Joint Allocation by CCITT and ISO
through to and including								
1	1	1	1	1	1	1	0	
1	1	1	1	1	1	1	1	Reserved for extension. See table 2.

NOTE - Although not categorized by this Technical Report, the codepoint "11001100" is in widespread use (see table 2 and Annex C).

Table 2: Values assigned to the IPI octet

Bit Pattern 8	7	6	5	4	3	2	1	Protocol
0	0	0	0	0	0	0	0	Null Network Layer (see Note 1)
0	0	0	0	0	0	0	1	CCITT T.70 (minimum network layer functionality)
0	0	0	0	1	0	0	0	CCITT I.451/Q.931
x	x	0	1	x	x	x	x	ISO 8208/CCITT X.25 - modulo 8
x	x	1	0	x	x	x	x	ISO 8208/CCITT X.25 - modulo 128
0	0	1	1	x	x	x	x	ISO 8208/CCITT X.25 - GFI Extension
1	0	0	0	0	0	0	1	ISO 8473 (excluding the inactive subset)
1	0	0	0	0	0	1	0	ISO 9542
1	0	0	0	1	0	1	0	ISO 10030
1	1	0	0	1	1	0	0	See Annex C
1	1	1	1	1	1	1	1	Reserved for extension by this Technical Report (see Note 2).

NOTES

1 ISO 8473 uses this value for the Inactive subset.

2 The extension mechanisms will be the subject of joint development between CCITT and ISO/IEC.

Table 3: Structure of the SPI octet

Bit Pattern 8	7	6	5	4	3	2	1	Allocation Category
0	0	0	0	0	0	0	0	Allocated by ISO (see Note 1)
0	0	0	0	0	0	0	1	Allocation by CCITT
through to and including								
0	0	1	1	1	1	1	1	
0	1	x	x	x	x	x	x	Allocation by National Bodies (see Note 2)
1	0	0	x	x	x	x	x	Allocation by ISO
1	0	1	x	x	x	x	x	Allocation by CCITT
1	1	0	0	0	0	0	0	Not categorized by this Technical Report (see Note 3)
through to and including								
1	1	1	1	1	1	1	0	
1	1	1	1	1	1	1	1	Reserved for extension. See table 4.

NOTES

1 The general principle of bits 8 and 7 identifying the administration authority issued by this Technical Report. Where bits 8 and 7 are "00" this identifies CCITT. However, it has been necessary for ISO/IEC to use the particular value "00 000000" as an SPI for a certain protocol. This is not expected to cause interworking problems.

2 The Allocation of SPIs by National Bodies should be done with extreme care as it is possible that different National Bodies could allocate the same Identifier to different Protocols, or different Identifiers to the same Protocols. In such cases Interworking problems may result.

3 Although not categorized by this Technical Report, the codepoint "11001100" is in widespread use (see table 4 and Annex C).

Table 4: Values assigned to the SPI octet

Bit Pattern 8	7	6	5	4	3	2	1	Protocol
0	0	0	0	0	0	0	0	ISO 8473 Inactive subset
0	0	0	0	0	0	0	1	Reserved - in use by CCITT X.29 (see Note 1).
0	0	0	0	0	0	1	0	Reserved - in use by CCITT T.70 Transport Layer procedure (see Note 2).
0	0	0	0	0	0	1	1	Reserved - in use by ISO 8073/Add.1, and CCITT X.224 Annex B (see Notes 2 and 3).
through to and including								
0	0	1	1	1	1	1	1	
1	0	0	0	0	0	0	0	IEEE SNAP (see Annex D)
1	0	0	0	0	0	0	1	ISO 8473 (excluding the inactive subset)
1	0	0	0	0	0	1	0	ISO 9542
1	0	0	0	0	1	0	0	ISO 8878 Annex A
1	0	0	0	1	0	1	0	ISO 10030
1	1	0	0	1	1	0	0	See Annex C
1	1	1	1	1	1	1	1	Reserved for extension by this Technical Report (see Note 2).

NOTES

1 This protocol defines its own protocol identifier which is greater than one octet. This technical Report is concerned only with the first octet (see clause 6.1).

2 These are not Network Layer protocol identifiers. The values shown are used by the respective higher layer protocol.

3 These values are not used for identification. However, the receipt of these values confirms the use of the Transport Layer protocol identification mechanism as defined in NCMS (known *a_priori*).

4 The extension mechanisms will be the subject of joint development between CCITT and ISO/IEC.

ANNEX A

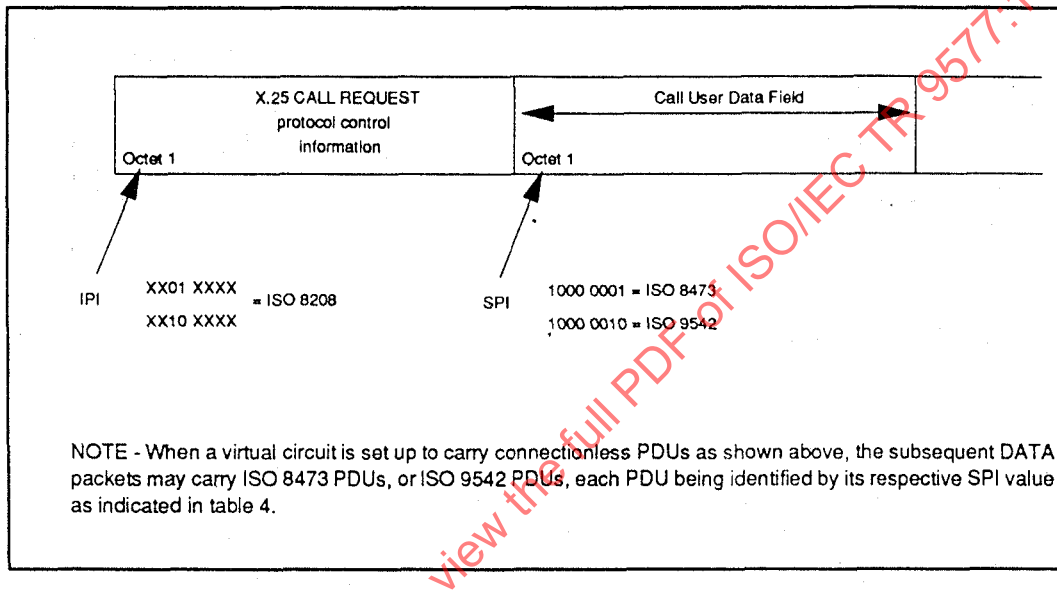
The location and use of protocol identifiers in X.25

This annex shows examples of protocol identifiers when ISO 8208 is used as the initial protocol in various situations. These examples assume that the systems operate in an OSI environment.

NOTES:

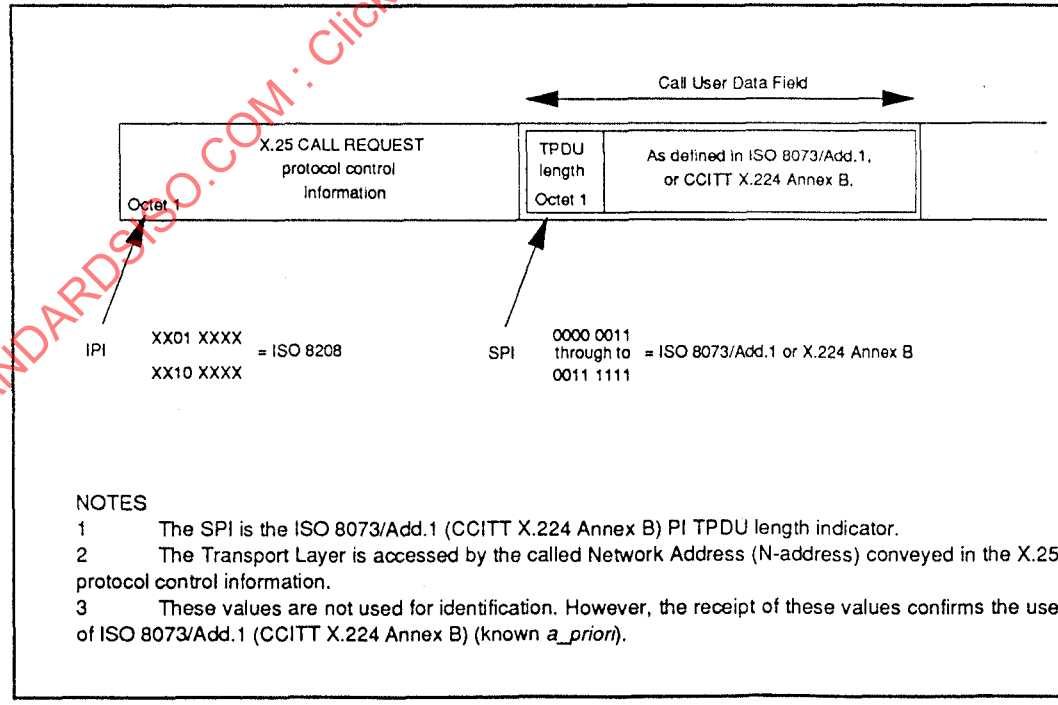
1 The first octet of ISO 8208 consists of the General Format Identifier (GFI) and the upper four bits of the logical channel identifier. This first octet is the Initial Protocol Identifier (IPI).

2 In the case of CCITT X.25 CALL REQUEST/INCOMING CALL packets, the leftmost bit (bit 8) might be set to '1' to indicate alternative address formats. In ISO 8208 this bit is set to '0'.



NOTE - When a virtual circuit is set up to carry connectionless PDUs as shown above, the subsequent DATA packets may carry ISO 8473 PDUs, or ISO 9542 PDUs, each PDU being identified by its respective SPI value as indicated in table 4.

Figure A.1 - IPI and SPI when ISO 8473 or ISO 9542 is operated over ISO 8208



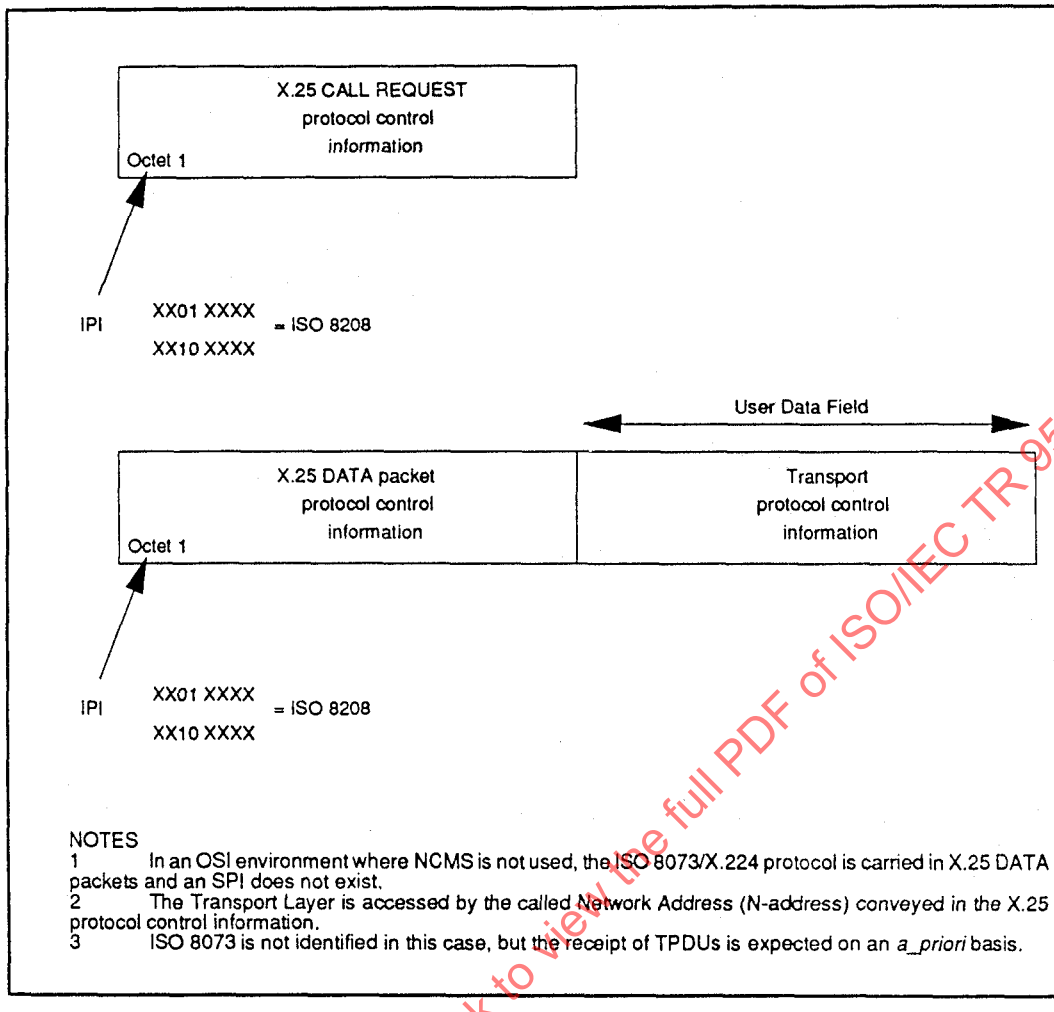
NOTES

1 The SPI is the ISO 8073/Add.1 (CCITT X.224 Annex B) PI TPDU length indicator.

2 The Transport Layer is accessed by the called Network Address (N-address) conveyed in the X.25 protocol control information.

3 These values are not used for identification. However, the receipt of these values confirms the use of ISO 8073/Add.1 (CCITT X.224 Annex B) (known *a_priori*).

Figure A.2 - IPI and SPI when ISO 8073/Add.1 (CCITT X.224 Annex B) is operated over ISO 8208



NOTES
1 In an OSI environment where NCMS is not used, the ISO 8073/X.224 protocol is carried in X.25 DATA packets and an SPI does not exist.
2 The Transport Layer is accessed by the called Network Address (N-address) conveyed in the X.25 protocol control information.
3 ISO 8073 is not identified in this case, but the receipt of TPDUs is expected on an *a_priori* basis.

Figure A.3 - Location of IPI and SPI when ISO 8073 is used over ISO 8208