E C M A

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-161

PRIVATE TELECOMMUNICATION NETWORKS

-

SIGNALLING AT THE S REFERENCE POINT

-

GENERIC FEATURE KEY MANAGEMENT PROTOCOL FOR THE CONTROL OF SUPPLEMENTARY SERVICES

(SSIG-FK)

December 1991

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Brief History

This Standard is one of a series of ECMA Standards defining services and signalling protocols applicable to Private Telecommunication Networks (PTNs). The series uses the ISDN concepts as developed by CCITT and is also within the framework of standards for open systems interconnection as defined by ISO. It has been produced under ITSTC work item M-IT-05 (Issue 1, Nov. 1989) no. 4.3, and is intended for submission to ETSI as a proposed ETS.

This particular Standard defines the Feature Key Management stimulus protocol for use at the S reference point in support of the basic circuit mode services.

The Feature Key Management protocol for PTNs selects options from and complements the CCITT Recommendation Q.932. It is therefore also compatible with equivalent protocols for public ISDNs.

The Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO, CCITT, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

Accepted as an ECMA Standard by the General Assembly of December 1991.

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1 Scope

This Standard defines the Feature Key Management signalling protocol for the purpose of supplementary service control at an interface at the S reference point between a Terminal Equipment (TE) and a Private Telecommunication Network (PTN). A PTN consists of one or more interconnected Private Telecommunication Network Exchanges (PTNXs), and therefore an interface at the S reference point is actually between a TE and a PTNX. The S reference point is defined in Standard ECMA-133.

The Feature Key Management protocol operates in conjunction with the signalling protocol specified in Standard ECMA-106 for circuit-switched call control. It is based on the use of the two information elements Feature activation and Feature indication. While the generic procedures associated with feature key invocation and indication are specified in this Standard, the allocation of actual codes used to designate individual supplementary services is not standardized.

This Standard is applicable to the user accesses of PTNs and to TEs which are intended for connection to PTNs.

2 Conformance

In order to conform to this Standard, a PTNX shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) Proforma in sub-clause D.3 of Annex D.

In order to conform to this Standard, a TE shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) Proforma in sub-clause D.4 of Annex D.

3 References

ECMA-105:	Data Link Layer Protocol for the D-Channel of the Interfaces at the Reference Point between Terminal Equipment and Private Telecommunication Networks (1990)
ECMA-106:	Layer 3 Protocol for Signalling over the D-channel of Interfaces at the S Reference Point between Terminal Equipment and Private Telecommunication Networks for the Control of Circuit-switched Calls (1991)
ECMA-133:	Reference Configurations for Calls through Exchanges of Private Telecommunication Networks (1989)
ECMA-155:	Addressing in Private Telecommunication Networks (1991)
CCITT Rec. I.112:	Vocabulary of terms for ISDNs (1988)
CCITT Rec. Q.932:	Generic procedures for the control of ISDN supplementary services (1988)
ENV 41007:	Definition of Terms in Private Telecommunication Networks (1989)
ETS 300102-1:	ISDN User-Network Interface Layer 3 Specification for Basic Call Control (1990)

4 Definitions

For the purpose of this Standard the following definitions apply.

4.1 Access

The definition of CCITT Rec. I.112 for "user-network access" shall apply, with "telecommunication network" being interpreted as "PTN".

4.2 Endpoint Identifier (EID)

Information used for terminal identification. The endpoint identifier parameters contain a USID and TID and additional information used to interpret them.

4.3 Feature

A supplementary service or a user-initiated PTN action which constitutes one specific part of a supplementary service.

4.4 Feature indication

An indication of the status of a feature from the PTN to the user.

4.5 Feature request

The initiation of a feature by the user.

4.6 Private Telecommunciation Network (PTN)

The definition in ENV 41007 shall apply.

4.7 Private Telecommunciation Network Exchange (PTNX)

The definition in ENV 41007 shall apply.

4.8 Service profile

The information that the PTN maintains for a given user to characterize the service offered by the PTN to that user. As an example, this may contain the association of feature identifiers with specific supplementary services. A service profile may for example be allocated to a PTN access interface or to a particular TE or a group of TEs.

4.9 Service Profile Identifier (SPID)

Identifies a specific service profile in the case that a TE asks for automatic assignment of a USID and TID by the PTN. The SPID allows the PTN to distinguish between different terminals that would otherwise be indistinguishable (e.g. same PTN number). The SPID value is provided to the user when installing a service profile and should uniquely identify that service profile.

4.10 Supplementary service

A capability provided by a PTN to a PTN user over and above that of a basic call.

4.11 Terminal Equipment (TE)

The definition in ENV 41007 shall apply.

4.12 Terminal Identifier (TID)

Identifies a terminal uniquely within a given USID. If two TEs on an interface have the same service profile the two TEs will be assigned the same USID. However, two different TIDs are required to uniquely identify each of the two TEs.

4.13 User

The definition in ENV 41007 shall apply.

4.14 User Service Identifier (USID)

Uniquely identifies a service profile on a PTN access interface.

5 Acronyms and Abbreviations

CEI	Connection Endpoint Identifier
CES	Connection Endpoint Suffix
EID	Endpoint Identifier
ISDN	Integrated Services Digital Network
PICS	Protocol Implementation Conformance Statement
PTN	Private Telecommunication Network
PTNX	Private Telecommunication Network Exchange
SAPI	Service Access Point Identifier
SPID	Service Profile Identifier
TE	Terminal Equipment
TEI	Terminal Endpoint Identifier
TID	Terminal Identifier
USID	User Service Identifier

6 Feature Key Management Protocol

Note 1:

The text in this clause is based on section 5 of CCITT Rec. Q.932. Differences are indicated by emboldening.

The Feature Key management protocol is a mechanism allowing users to invoke supplementary services. As these are stimulus procedures, the protocol elements do not directly identify the service invoked. To determine the service invoked requires knowledge of the user's service profile maintained in the **PTN**. No call state changes directly occur by these procedures.

The Feature Key management protocol is based on two information elements: Feature activation and Feature indication. The Feature activation information element is the means by which a user requests a supplementary service. The Feature activation information element contains a feature identifier number which the **PTN** maps to the corresponding service as indicated by that user's service profile. The **TE** need not have any knowledge of what service is being indicated by the feature identifier number and the user may send a feature request at any time.

Feature indication is the means by which a response to a feature request is indicated by the **PTN**. The feature identifier number correlates the **PTN's** response with a user's request and/or an indicator associated with a **TE**. The Feature indication information element also contains a status indicator. The status indicator indicates the status of the requested service and may be used by the **TE** as appropriate with its man-machine interface.

6.1 Messages

6.1.1 Messages used in association with a Call Reference

The Feature activation and Feature indication information elements may be present in several of the messages defined in **ECMA-106**. The Feature activation information element may appear in the following messages in the direction **TE** to **PTN**:

a) SETUP
b) INFORMATION
c) **ALERTING**
d) **CONNECT**
e) **DISCONNECT**
f) **RELEASE**
g) **RELEASE COMPLETE**

The Feature activation information element may be repeated in a single message.

Note 2:

"Activation" as part of the name "Feature activation" should not be confused with the term "activation" used elsewhere, e.g. in stage 1 descriptions. Depending on the context, "Feature activation" can mean invocation, activation, deactivation, interrogation etc. of a supplementary service.

The Feature indication information element may be sent in the direction **PTN** to **TE** in the following messages:

a) SETUP
b) SETUP ACKNOWLEDGE
c) CONNECT
d) CALL PROCEEDING
e) ALERTING
f) INFORMATION
g) DISCONNECT
h) RELEASE
i) RELEASE COMPLETE
j) **CONNECT ACKNOWLEDGE**

The Feature indication information element may be repeated in a single message.

6.1.2 Messages used in association with the Dummy Call Reference

One or more Feature activation information elements may appear in an INFORMATION message in the direction TE to PTN.

One or more Feature indication information elements may appear in an INFORMATION message in the direction PTN to TE.

6.1.3 Additional information elements

Several messages may contain further information elements, in addition to those specified in ECMA-106, according to the following list:

Calling party number: **May be included in an INFORMATION message with the dummy call reference in the direction TE to PTN for multiple subscriber number arrangements (see ECMA-155).**

Cause: **May be included in an INFORMATION message in the direction PTN to TE (as response to a feature request).**

Display: **May be included in every message in the direction PTN to TE.**

Endpoint identifier: **May be included in INFORMATION and in SETUP messages (used for the optional terminal identification procedures described in Annex A).**

Information request: **May be included in an INFORMATION message in the direction PTN to TE (used for the optional information request procedures described in Annex B).**

Keypad facility: **May be included in INFORMATION and SETUP messages in the direction TE to PTN to provide additional information, e.g. in conjunction with the information request procedures according to Annex B.**

Signal: **May be included in the direction PTN to TE in the messages:**

ALERTING
CONNECT
CONNECT ACKNOWLEDGE
DISCONNECT
INFORMATION
RELEASE
RELEASE COMPLETE
SETUP
SETUP ACKNOWLEDGE

Service profile identification: **May be included in an INFORMATION message in the direction TE to PTN (used for the optional automatic assignment procedure described in sub-clause A.4 of Annex A).**

Switchhook: **May be included in the direction TE to PTN in the messages:**

CONNECT
DISCONNECT
INFORMATION
RELEASE
SETUP

The coding of these information elements is specified in clause 7.

6.2 Procedures

6.2.1 TE Requests

6.2.1.1 Feature requests in association with a Call Reference

The **TE** may request a feature by including a Feature activation information element in any of the messages defined in 6.1. The **TE shall** indicate the desired feature by specifying the appropriate value in the feature identifier number field.

An INFORMATION message may be sent at any time after sending or receiving the first response to the SETUP message and before sending or receiving a RELEASE or RELEASE COMPLETE message.

6.2.1.2 **Feature requests in association with the Dummy Call Reference**

The Feature activation information element may be sent in an INFORMATION message using the dummy call reference in situations where it is inappropriate to use an existing call reference or to establish a new call reference for the purpose.

Before sending an INFORMATION message with the dummy call reference the TE must first ensure that a Data Link connection exists between the TE and the PTN. If a Data Link connection does not exist the TE shall establish a Data Link connection according to the procedures described in sub-clause 6.1.1 of ECMA-106.

6.2.1.3 **Switchhook indication**

The Switchhook information element may be used to indicate "on-hook" or "off-hook" to the PTN.

6.2.2 **PTN responses**

The **PTN** may respond to a feature request in several ways. The action chosen is supplementary service and **implementation** specific.

6.2.2.1 **Return of a Feature indication**

The **PTN** may return a Feature indication information element in an INFORMATION message or any other appropriate call control message as defined in 6.1. The Feature indication may or may not have the same feature identifier number as was present in the original feature request. The status indicator shall be provided as appropriate to the specific supplementary service requested.

6.2.2.2 **Prompting for further information**

The **PTN** may prompt the user for more information (e.g. additional information related to a given **feature** request). **The procedures employed are implementation specific, possibilities including the use of tones / announcements, displays, etc.; the TE may send the required information in Keypad facility or other suitable information elements. Optionally** the information request procedures defined in Annex B may be used.

6.2.2.3 **Implicit response**

The **PTN**, under certain situations, may not return any explicit indication to the **TE** after a feature request. In this case the response is implicit, such as the acknowledgement inherent in providing the service.

6.2.2.4 **Return of Signal, Cause or Dispiay information elements**

The **PTN** may return any combination of Signal, Cause or Display information elements, **also** in conjunction with **other** responses specified in 6.2.2. The use of these information elements is supplementary service and **implementation** specific.

6.2.2.5 **Responses during error conditions**

When an error condition exists (as defined in 6.2.4) the **PTN** may:

- **React with one or more responses according to 6.2.2.1 - 6.2.2.4; or**
- Ignore the feature request and not respond at all.

The PTN may also clear appropriate existing calls in conjunction with the above actions.

6.2.3 **General aspects**

6.2.3.1 **Use of Feature indication information elements independent of a feature request**

The **PTN** may choose to send Feature indication information at any time, independent of the status of any call(s), either in an INFORMATION message or in an appropriate call control message **as specified in 6.1.1 and 6.1.2.** Multiple Feature indication information elements may be **included in a single message if** more than one indicator is to be updated.

6.2.3.2 **Deactivation procedures**

When explicitly deactivating a supplementary service, two methods may be used:

a) sending of a feature request with the same feature identifier may deactivate the supplementary service; some supplementary services may be "toggled" on and off;

b) sending a feature request with a different feature identifier which is explicitly defined (between the **TE** and the **PTN**) as the deactivator for that particular supplementary service.

6.2.3.3 **Clearing of a call**

If a Feature activation information element is sent using the call reference of an active call, and that call is cleared for some reason, then there exists no call reference with which to correlate the feature indication. If a Feature indication information element is to be returned, one of the following options may be used:

a) The **PTN** may send a Feature indication information element in one of the call clearing messages (i.e., DISCONNECT, RELEASE, or RELEASE COMPLETE).

b) The **PTN** may send a Feature indication information element in an INFORMATION message after clearing has occurred, using the dummy call reference.

6.2.3.4 **Sending of multiple feature requests / indications**

If a sequence of feature requests is received, **either in one message or** in separate messages, so rapidly that the **PTN** cannot respond to the first feature request prior to receiving a subsequent feature request, the **PTN** shall act upon all feature requests **in the order received** by returning multiple Feature indication information elements or other responses as detailed in 6.2.2. These may be sent in a single message or in multiple messages.

If a TE receives a sequence of feature indications, either in one message or in separate messages, it shall act upon each feature indication individually in the order received.

6.2.4 **Error conditions**

The error procedures specified in sub-clause 6.3 of ECMA-106 shall also apply for the messages and information elements specified in this Standard. Additionally, the following procedures shall apply.

6.2.4.1 **Invalid feature request**

If a **TE** requests a feature using an invalid feature identifier number, the **PTN** shall take any **of the** actions specified in 6.2.2.5, as appropriate. An invalid feature identifier number is one for which the user **is not provided** a corresponding service, or the value is not understood by the service provider (e.g. out of range).

6.2.4.2 **Invalid call reference**

If a TE uses the dummy call reference in a message other than INFORMATION, or if it sends an INFORMATION message with the dummy call reference when the PTN expects

an existing call reference for a particular feature request, the PTN shall not provide the service and shall respond as indicated in 6.2.2.5.

6.2.4.3 Invalid feature indication or PTN response

A TE may ignore an invalid Feature indication (e.g. an unknown feature identifier number) or any PTN response which it did not expect or cannot handle correctly. Other actions of the TE are implementation dependent.

7 Coding of Information Elements

Note 3:

This clause is based on section 8 of CCITT Rec. Q.932, with differences indicated by emboldening, and also contains references to ECMA-106 and ETS 300102-1.

7.1 Dummy call reference

Sub-clause 4.3 of ETS 300102-1 shall apply.

7.2 Calling party number

ECMA-106, 11.5.10, shall apply.

7.3 Cause

ETS 300102-1, 4.5.12, shall apply.

7.4 Display

ETS 300102-1, 4.5.15, shall apply.

7.5 Endpoint identifier

The purpose of the Endpoint identifier information element is:

- to indicate the user service identifier and terminal identifier for the purpose of terminal identification; and
- to indicate a specific terminal for the purpose of terminal selection.

See annex A for the associated procedures.

The Endpoint identifier information element is coded as shown in figure 1 and table 1. The default maximum length of the Endpoint identifier information element is four octets.

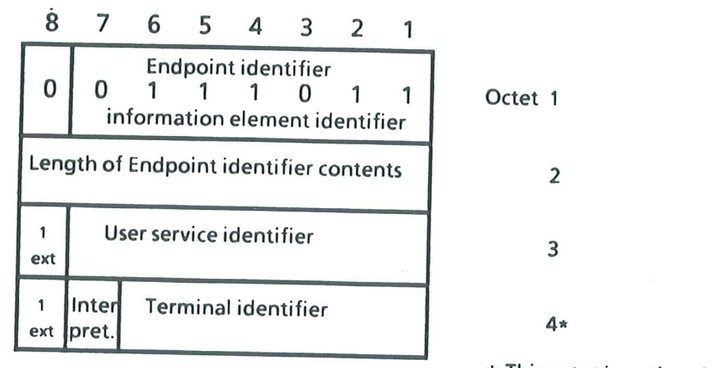

Figure 1 - Endpoint identifier information element

Table 1 - Endpoint identifier information element

User service identifier (USID) (octet 3) The USID is a selection parameter which identifies a group of terminals on an interface which share a common service profile and which may be addressed together. Upon receipt of this parameter a terminal will consider itself as being addressed if the value received matches its stored value or if the value received is coded as all ONEs (127). When USID is coded 127, octet 4 shall not be used.
Interpreter (octet 4, bit 7) Bit 7 of octet 4 indicates how a terminal is to interpret the TID field received (see TID definition below) if the value of this field is not 63. When set to '0' the terminal is being addressed only if the TID value matches. When set to ONE, the terminal is being addressed only if the TID received does not match. In the direction TE to PTN this bit shall be set to ZERO.
Terminal identifier (TID) (octet 4, bits 1 to 6) The TID is a selection parameter which identifies a single terminal within a group designated by a USID value. For USID=127 the TID does not apply. Upon receipt of this field, a terminal will consider itself addressed if one of the following is true: - the interpreter bit is set to ZERO and the TID value received matches the terminal's stored value; - the interpreter bit is set to ONE and the TID value received does not match the terminal's stored value; - the TID value received is set to all ONEs (63).

7.6 Feature activation

The purpose of the Feature activation information element is to invoke a supplementary service as identified by the feature identifier number. The service associated with the feature identifier number is dependent on that particular user's service profile.

The **default** maximum length of this information element is four octets.

The Feature activation information element is coded as shown in figure 2 and table 2.

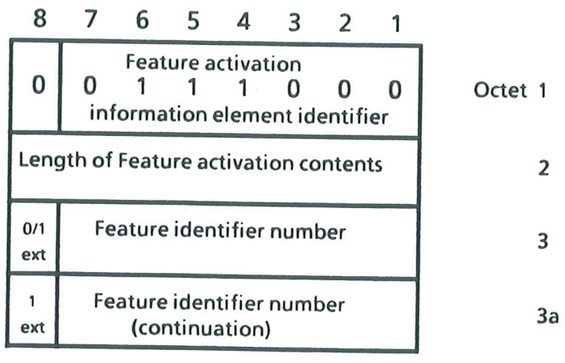

Figure 2 - Feature activation information element

Table 2 - Feature activation information element

Feature identifier number (octets 3 and 3a)

The feature identifier number is a unique number assigned to a feature in a service profile. The feature identifier number is part of both the Feature activation and Feature indication information elements. This number identifies the feature that is being requested or updated. The association of a particular number to a particular feature may be different for each user.

Bit 8 in octet 3 is used to extend the feature identifier field. If bit 8 is set to ZERO then another octet follows; if bit 8 is set to ONE then octet 3 is the last octet. The identifier numbers for a one-octet field range from 1 to 127. For a multi-octet field the order of bit values progressively decreases as the octet number increases.

7.7 Feature indication

The purpose of the Feature indication information element is to allow the PTN to convey feature indications to the user regarding the status of a supplementary service.

The default maximum length of this information element is 5 octets.

The coding of the Feature indication information element is shown in Figure 3 and Table 3.

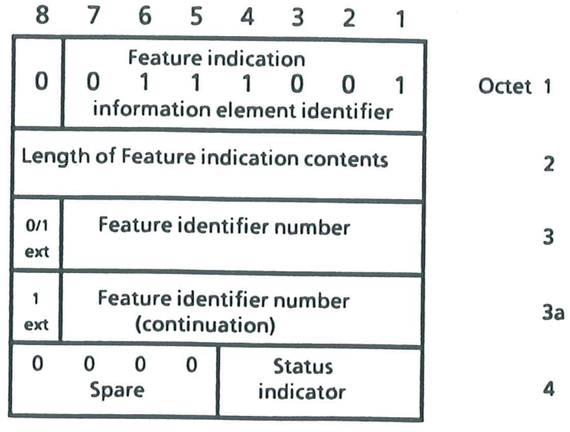

Figure 3 - Feature indication information element

Table 3 - Feature indication information element

Feature identifier number (octets 3 and 3a)

See table 2

Status indicator (octet 4)

The status indicator field identifies the current status of a supplementary service.

Bits 4 3 2 1	Status	Meaning	Example of possible TE implementation
0 0 0 0	Deactivated	Feature is in the deactivated state	Lamp off
0 0 0 1	Activated	Feature is in the active state	Lamp steady on
0 0 1 0	Prompt	Feature promt (waiting for user input)	Lamp steady flash
0 0 1 1	Pending	Feature is pending	Lamp steady wink

All other values are reserved.

7.8 Information request

The purpose of the Information request information element is to provide the capability for requesting additional information and signalling completion of the information request (see annex B).

The information request information element is coded as shown in figure 4 and table 4.

The default maximum length of the Information request information element is three octets.

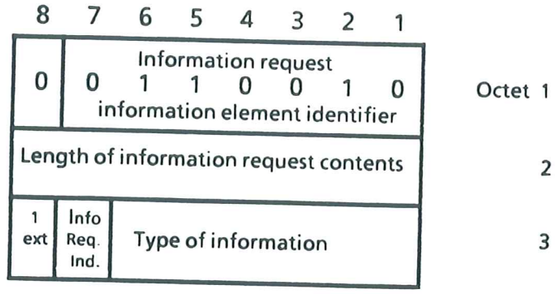

Figure 4 - Information request information element

Table 4 - Information request information element

Information request indicator (octet 3, bit 7)						
Bit 7 = 0	Information request completed					
Bit 7 = 1	Prompt for additional information					
Type of information (octet 3, bits 1 to 6)						
Bits	6	5	4	3	2	1
	0	0	0	0	0	0 undefined
	0	0	0	0	0	1 authorization code
	0	0	0	0	1	0 address digits
	0	0	0	0	1	1 terminal identification
All other values are reserved.						

7.9 Keypad facility

ETS 300102-1, 4.5.17, shall apply.

7.10 Signal

ETS 300102-1, 4.5.27, shall apply.

7.11 Service profile identification

The purpose of the Service profile identification information element is to allow the user to initiate automatic assignment of the user service identifier and terminal identifier (see annex A).

The Service profile identification information element is defined in figure 5 and table 5.

The default maximum length of the Service profile identification information element is 32 octets.

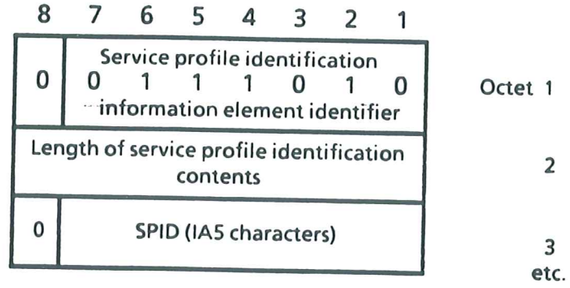

Figure 5 - Service profile identification information element

Table 5 - Service profile identification information element

SPID (octet 3 and following)
The service profile identifier parameter is coded in IA5 characters, according to the format specified by the PTN.

7.12 Switchhook

The purpose of the Switchhook information element is to indicate the status of the terminal switchhook to the PTN.

The Switchhook information element is coded as shown in Figure 6 and Table 6. The length of this information element is three octets.

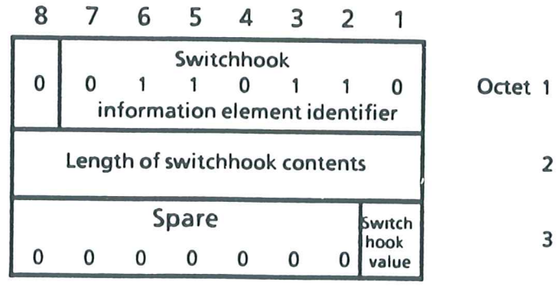

Figure 6 - Switchhook information element

Table 6 - Switchhook information element

Switchhook value (octet 3)	
Bit 1	meaning
0	on hook
1	off hook

Annex A

(normative)

User Service Profiles and Terminal Identification

Note A.1:

This annex is based on annex A of CCITT Rec. Q.932, with differences indicated by emboldening.

A.1 Introduction

These optional procedures allow a **PTN** to support identification and selection of specific terminals on a multi-point **TE - PTN** interface, and also to support multiple user service profiles, in those cases in which **ECMA-106** information elements are not sufficient for such purposes.

A TE or PTN supporting such multiple profiles for terminals which could not otherwise be distinguished **should** support this additional identification procedure. Otherwise, it is completely optional.

A TE or PTN that does not recognize the information elements used by this annex shall apply the error procedures defined in **6.3 of ECMA-106** if these elements are received.

Figure A.1 shows examples of the relationships of TEs, SPIDs, USIDs and TIDs and their dynamic relationship to TEIs. In this example, TEs 1, 3, 4 and 5 support the automatic endpoint identifier parameter assignment procedure **while** TE 2 does not, but has the endpoint identifier parameters locally entered. TE 6 does not support terminal identification, therefore it utilizes the specified default service profile.

Note A.2:

TEIs are explained in Standard ECMA-105, 3rd edition.

Note A.3:

Items in parentheses indicate values or relationships which are dynamically established by initialization procedures (see A.4). Others are established via administrative actions and stored as a result of manual entry.

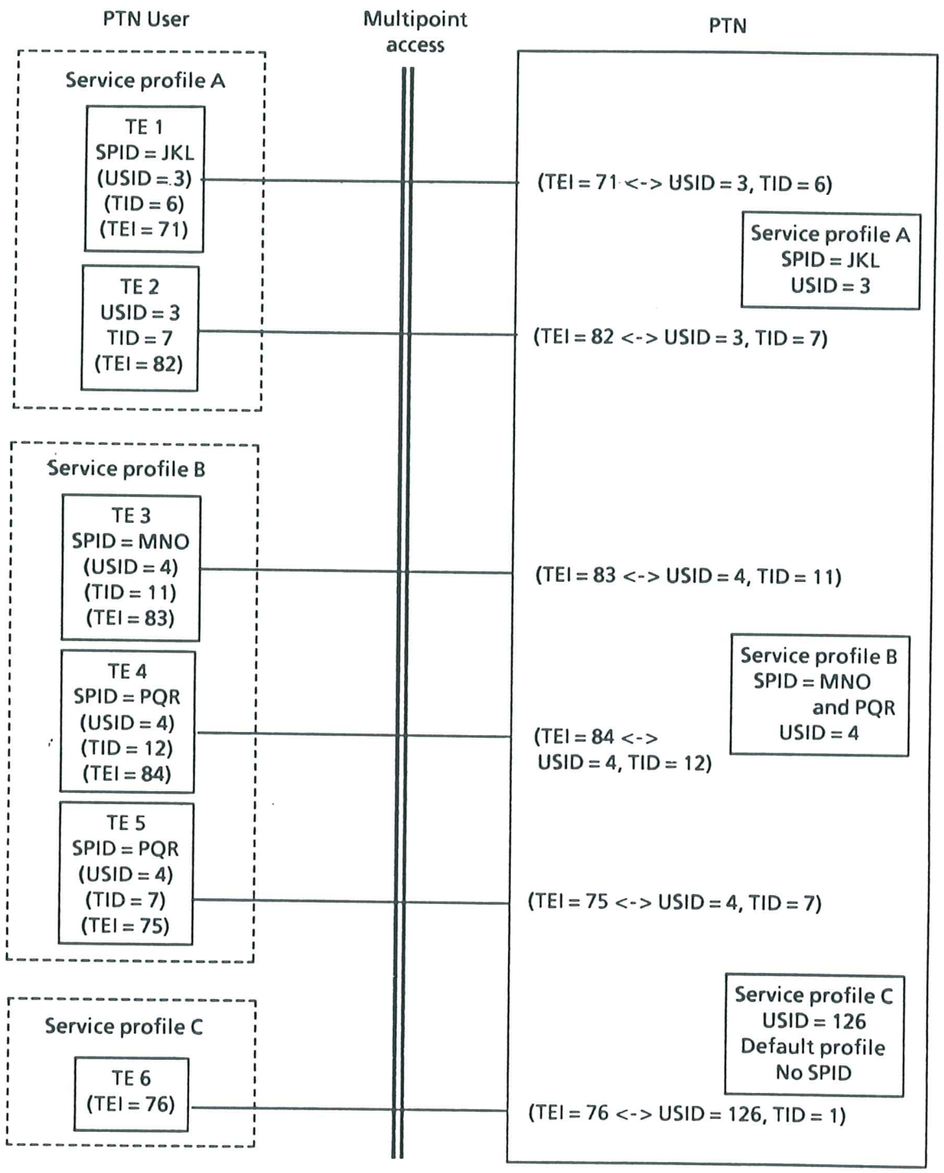

Figure A.1 - Relationship of service profile, SPID, USID, TID and TEI

A.2 User service profiles

The support of user service profiles requires that the **supplementary** service requests from a TE are associated by the **PTN** with a specific profile. A USID is used to identify the profile on a **PTN** access. The service profile is assigned to a Data Link connection so that the **PTN** can associate all of the service requests from the corresponding Connection Endpoint Suffix (CES) with the required profile (see Note A.4). The assignment of a service profile to a Data Link connection minimizes the per-service request overhead of profile identification.

The procedures for assigning a service profile to a Data Link connection are incorporated into the initialization procedures described in A.4.

Note A.4:

CES along with SAPI constitute the CEI (Connection Endpoint Identifier) that is used to identify message units passed between the Data Link Layer (as represented by the TEI) and Layer 3.

A.3 Terminal identification

The support of terminal identification requires that a call sent by the **PTN** can be addressed to:

- all of the TEs of a user service profile;
- one TE of a user service profile; or
- all but one TE of a user service profile.

A USID is used to identify the user service profile with a (set of) TE(s) on a **PTN** access interface, and a TID is used to identify individual TEs within a user service profile on a **PTN** access.

The USID and TID may be entered into the TE by the user as arranged **with the service provider**, or dynamically downloaded to the TE from the **PTN** with an automatic assignment procedure.

The USID and TID parameters are used by the TE to check the compatibility of a call offered by the **PTN**. The inclusion of a USID and TID with only access uniqueness minimizes the per-call overhead of supporting terminal addressing.

The procedures for downloading the USID and TID to a TE are incorporated into the automatic endpoint identifier allocation and initialization procedures described in A.4. The procedures for using a USID and TID for terminal identification in an offered call sent by the **PTN** are described in A.5.

A.4 Initialization

The initialization procedure provides for the association by the **PTN** of the **supplementary** service requests from a TE on a particular Data Link connection (as represented by the TEI) with a user service profile. An **additional** automatic assignment procedure, **which may optionally be used by a TE, provides for** automatic assignment of USID and TID parameters and their downloading by the **PTN** to the TE.

Since initialization provides the basis for subsequent association of a service profile with a Data Link connection, normally, a TE that supports initialization is expected to request the initialization procedure (e.g., **with** the first Layer 3 message after dynamic assignment of a TEI). However, a request for initialization is allowed at any time. The Data Link connection is always associated with the most recently identified service profile. Under some circumstances, the **PTN** may solicit terminal initialization.

A.4.1 Terminal requested initialization

a) TEs may initialize at any time by sending an Endpoint identifier information element (containing a USID and TID) in an INFORMATION message to the **PTN**. Subsequent to this, the **PTN** shall associate the service profile with the Data Link over which the message was sent.

b) For terminals which support automatic assignment of USID and TID parameters, initialization (that is, association of a service profile with a Data Link connection) is provided as part of the automatic assignment procedure described here.

A TE may initiate automatic assignment of the endpoint identifier by sending a Service profile identification information element in an INFORMATION message with the dummy call reference. The Service profile identification information element should contain the SPID parameter allocated **by arrangement with the service provider. The PTN shall associate** the Data Link over which **the message was** received with the identified service profile and acknowledge the initialization **by sending** an INFORMATION message with the Endpoint identifier information element containing a USID and TID, the values of which are determined by the **PTN**.

When a **TE** determines that the initialization procedure has failed, it **shall** assume that the PTN cannot support the procedure and shall not repeatedly **request** initialization.

A.4.2 PTN solicited initialization

The **PTN** may solicit a request for initialization on a Data Link connection by sending an Information request information element with the codepoint "terminal identification" in an INFORMATION message with the dummy call reference. Upon receiving the request, the terminal may respond as described in A.4.1 a) or b) above.

When a **PTN** determines that the initialization procedure has failed, it **shall** assume that the terminal cannot support the procedures and **shall** not **repeatedly solicit** initialization.

A.4.3 Collision

When terminal initialization **request** and PTN solicitation procedures collide, the terminal **shall** ignore the solicitation from the PTN and the PTN **shall proceed** as normal upon receipt of the initialization request from the terminal.

A.5 Identification procedures

The **PTN may** offer a call using terminal addressing **by including** the Endpoint identifier information element in the SETUP message.

When a TE receives a SETUP message containing the Endpoint identifier information element, it shall:

- if **the Endpoint identifier information element** is not supported, handle the information element in accordance with **the error procedures defined in sub-clause 6.3 of ECMA-106** and complete normal compatibility checking procedures; or
- if **the Endpoint identifier information element** is supported, test for an address compatibility with the endpoint identifier **(EID)** in addition to completing the normal compatibility checking procedures.

Annex B

(normative)

Information Request Procedures

Note B.1:

This annex is based on annex B of CCITT Rec. Q.932, with differences indicated by emboldening.

B.1 Introduction

This annex specifies optional procedures which allow a **PTN** to request additional information from a TE. These procedures do not impact the **ECMA-106** call state. This capability shall only be allowed during the Null, Overlap Sending, Outgoing Call Proceeding, Call Delivered and Active Call states.

A **TE** or **PTNX** that does not recognize the information elements used by this annex shall apply the error procedures defined in **6.3 of ECMA-106** if these information elements are received.

B.2 Procedures

B.2.1 Normal procedures

The **PTN may** send an INFORMATION message to the **TE** to request additional information. **The INFORMATION message may be sent with an existing call reference or with the dummy call reference, as appropriate.** The INFORMATION message shall contain the Information request information element with the information request indicator set to "prompt for additional information" and type of information set to the appropriate value. After sending the INFORMATION message **while in the Overlap Sending state** the **PTN shall** start timer T302; the **PTN shall then** restart timer T302 on the receipt of every INFORMATION message **unless** the requested information **is complete. In any call state other than Overlap Sending the PTN may apply an implementation-specific timer T_i in a similar way, as appropriate.**

No **ECMA-106** call state changes shall occur when the INFORMATION message is sent or received.

The **TE** may always send the requested information in Keypad facility information elements contained in one or more INFORMATION messages. **However, the TE may include in the INFORMATION message(s) other information elements, too, if appropriate.**

When the **PTN** has determined that sufficient information has been received to proceed, it **shall stop timer T302 or any implementation-specific timer T_i. It** may **also** send an INFORMATION message to the **TE**, containing an Information request information element with the information request indicator set to "information request completed" to **indicate that** the required information has been received correctly. If the additional information **was requested** during Overlap Sending state, and no additional information is required before the **PTN** can proceed with processing the call, a CALL PROCEEDING message may suffice to signal the end of information sending.

If an existing call reference was used the **PTN** may also indicate that sufficient information has been received by initiating call clearing according to **7.3 of ECMA-106**.

B.2.2 Abnormal procedures

If no response is received from the **TE**, or if the information received is incomplete upon expiry of timer T302 **or an implementation-specific timer T_i**, or if the information provided by the user is invalid, then the PTN shall

- **either** initiate call clearing according to **7.3 of ECMA-106, if the information request related to a call in progress;**
- **or** return an INFORMATION message containing a Cause information element with an appropriate cause value, **e.g. if the dummy call reference was used.**

If the TE responds with a RELEASE COMPLETE message to an INFORMATION message containing **the dummy call reference and** an Information request information element, then the procedure shall be considered as terminated.

Annex C

(informative)

Illustration of the Feature Key Management Protocol

Note C.1:

This annex is based on section 1.3 of Appendix 1 of CCITT Rec. Q.932, with differences indicated by emboldening.

This annex is provided as an illustration of the application of the **Feature Key Management** protocol. The example shown should not be taken as definitive, since the support of the Feature Key Management protocol is **implementation** dependent.

The signalling sequence shown is not exhaustive and is only intended to illustrate one possible supplementary service control sequence.

The example in Figure C.1 shows a feature request entered in the Overlap Sending state, with parameters provided in form of digits contained in Keypad facility information elements. The association of the feature identifier number (provided within the Feature activation and **Feature indication** information elements) with a given supplementary service has to be arranged between the **TE and the PTN before the service is provided for the first time.**

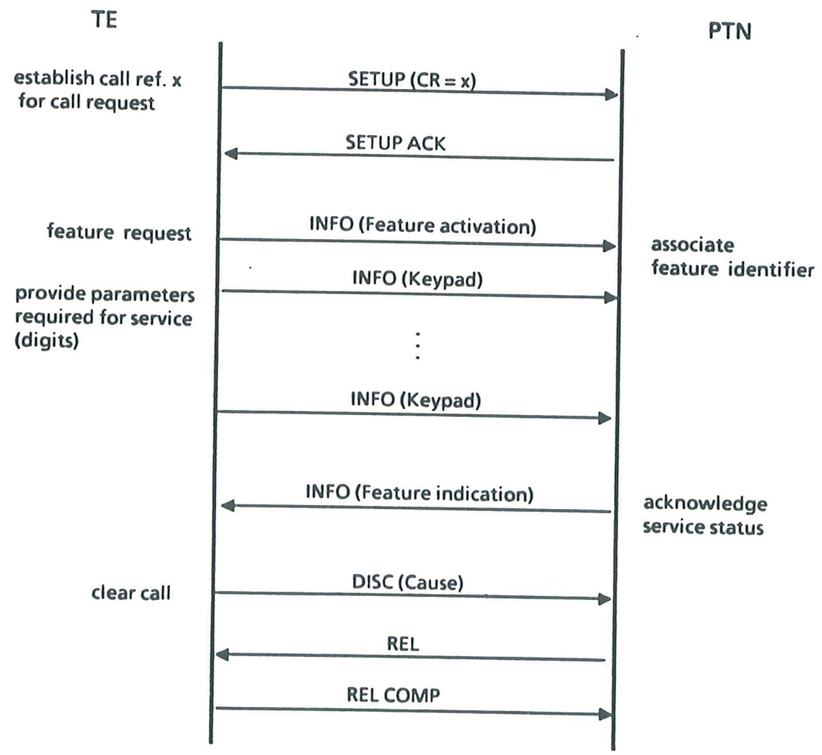

Figure C.1 - Generic example of the use of the Feature key management protocol

Annex D

(normative)

Protocol Implementation Conformance Statement (PICS) Proformas

D.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this Standard shall complete one of the following Protocol Implementation Conformance Statement (PICS) proformas. The PICS proforma in D.3 is for a PTNX. The PICS proforma in D.4 is for a TE.

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's 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 D.1:

  While interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs.

- by a protocol user, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

D.2 Instructions for Completing the PICS Proforma

D.2.1 General Structure of the PICS Proforma

The PICS proforma is a fixed-format questionnaire divided into subclauses each containing a group of individual items. Each item is identified by an item number, the name of the item (question to be answered), and the reference(s) to the clause(s) specifying the item in the main body of this Standard.

The "Status" column indicates whether an item is applicable and if so whether support is mandatory or optional. The following terms are used:

m	mandatory (the capability is required for conformance to the protocol);
o	optional (the capability is not required for conformance to the protocol, but if the capability is implemented, it is required to conform to the protocol specifications);
o.<n>	optional, but support of at least one of the group of options labelled by the same numeral <n> is required;
x	prohibited;

c.<cond> conditional requirement, depending on support for the item or items listed in condition <cond>;

<item>:m simple conditional requirement, the capability being mandatory if item number <item> is supported, otherwise not applicable;

<item>:o simple conditional requirement, the capability being optional if item number <item> is supported, otherwise not applicable.

Answers to the questionnaire items are to be provided in the "Support" column, by simply marking an answer to indicate a restricted choice (Yes or No), or in the "Not Applicable" column (N/A).

D.2.2 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.

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.

D.2.3 Exception Information

It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited 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 is required to write into the Support column an x.<i> reference to an item of Exception Information, and to 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 Standard ECMA-161.

Note D.2:

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

D.3 PICS Proforma for PTNX Implementations

D.3.1 Implementation Identification

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

Note D.3:

Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

Note D.4:

The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (e.g., Type, Series, Model).

D.3.2 Protocol Summary

Protocol Version	1.0
Addenda Implemented (if applicable)	
Amendments Implemented	
Have any exception items been required (see D.2.3)?	No [] Yes [] (The answer Yes means that the implementation does not conform to ECMA-161)

Date of Statement	

D.3.3 Procedures for the PTNX

Item	Question / feature	References	Status	N/A	Support
A1	Receipt of a feature activation request	6.2.1	m		Yes [ ]
A2	Handling of multiple feature activation requests in the order received	6.2.3.4	m		Yes [ ]
A3	Sending of a feature indication as a response to a feature activation request	6.2.2.1	o		Yes [ ] No [ ]
A4	Reactions to feature activation requests other than the sending of feature indications	6.2.2	o		Yes [ ] No [ ]
A5	Sending of feature indications independent of a feature activation request	6.2.3.1	o		Yes [ ] No [ ]
A6	Information request procedure	Annex B	o		Yes [ ] No [ ]
A7	Terminal selection by Endpoint identifier	A.5	o		Yes [ ] No [ ]
A8	Non-automatic terminal initialization	A.4	A7:o.1	[ ]	o: Yes [ ] No [ ]
A9	Automatic assignment of an endpoint identifier	A.4	A7:o.1	[ ]	o: Yes [ ] No [ ]

D.3.4 Messages and information elements - PTNX Requirements

Item	Question / feature	References	Status	N/A	Support
B1	Receipt of INFORMATION messages with the dummy Call Reference	6 1.2	m		Yes [ ]
B2	Sending of INFORMATION messages with the dummy Call Reference	6.1 2	o		Yes [ ] No [ ]
B3	Receipt of a Feature activation information element in ALERT, CONNECT, DISCONNECT, INFORMATION, RELEASE, RELEASE COMPLETE, SETUP	6.1.1 6.1.2	m		Yes [ ]
B4	Receipt of multiple Feature activation information elements in a single message	6.1.1 6.1.2	m		Yes [ ]
B5	Inclusion of Feature indication information element(s) in one or more of the specified messages	6.1.1 6.1.2	c.1		m: Yes [ ] o: Yes [ ] No [ ]
B6	Inclusion of a Signal information element in any of the specified messages	6.1.3	o		Yes [ ] No [ ]
B7	Inclusion of a Cause information element in INFORMATION	6.1.3	o		Yes [ ] No [ ]
B8	Inclusion of a Display information element in any message	6.1.3	o		Yes [ ] No [ ]
B9	Inclusion of an Information request information element in INFORMATION	6.1.3	A6:m	[ ]	m: Yes [ ]
B10	Receipt of a Keypad facility information element in INFORMATION or SETUP	6.1.3	c.2		m: Yes [ ] o: Yes [ ] No [ ]
B11	Inclusion of an Endpoint identifier information element in SETUP	6.1.3	A7:m	[ ]	m: Yes [ ]
B12	Receipt of an Endpoint identifier information element in INFORMATION	6.1.3	A8:m	[ ]	m: Yes [ ]
B13	Inclusion of an Endpoint identifier information element in INFORMATION	6.1.3	A9:m	[ ]	m: Yes [ ]
B14	Receipt of a Service profile identification information element in INFORMATION	6.1.3	A9:m	[ ]	m: Yes [ ]
B15	Receipt of a Switchhook information element in CONNECT, DISCONNECT, INFORMATION, RELEASE, SETUP	6.1.3	o		Yes [ ] No [ ]
B16	Receipt of a Calling party number information element in INFORMATION with the dummy Call Reference	6.1.3	o		Yes [ ] No [ ]

c.1: if A3 or A5 then mandatory else optional

c.2: if A6 then mandatory else optional

D.4 PICS Proforma for TE Implementations

D.4.1 Implementation Identification

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

Note D.5:

Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

Note D.6:

The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (e.g., Type, Series, Model).

D.4.2 Protocol Summary

Protocol Version	1.0
Addenda Implemented (if applicable)	
Amendments Implemented	
Have any exception items been required (see D.2.3) ?	No [ ] Yes [ ] (The answer Yes means that the implementation does not conform to ECMA-161)

Date of Statement	

D.4.3 Procedures for the TE

Item	Question / feature	References	Status	N/A	Support
C1	Sending of a feature activation request in association with a Call Reference	6.2.1.1	o		Yes [ ] No [ ]
C2	Sending of a feature activation request in association with the dummy Call Reference	6.2.1.2	o		Yes [ ] No [ ]
C3	Receipt of feature indications; processing in the order received	6.2.2.1 6.2.3.1	m		Yes [ ]
C4	Information request procedure	Annex B	o		Yes [ ] No [ ]
C5	Terminal selection by Endpoint identifier	A.5	o		Yes [ ] No [ ]
C6	Non-automatic terminal initialization	A.4	C5:o.2	[ ]	o: Yes [ ] No [ ]
C7	Request for automatic assignment of an endpoint identifier	A.4	C5:o.2	[ ]	o: Yes [ ] No [ ]

D.4.4 Messages and information elements - TE Requirements

Item	Question / feature	References	Status	N/A	Support
D1	Receipt of INFORMATION messages with the dummy Call Reference	6.1.2	m		Yes [ ]
D2	Sending of INFORMATION messages with the dummy Call Reference	6.1.2	o		Yes [ ] No [ ]
D3	Inclusion of a Feature activation information element in one or more of the specified messages	6.1.1 6.1.2	c.3	[ ]	m: Yes [ ]
D4	Inclusion of multiple Feature activation information elements in a single message	6.1.1 6.1.2	D3: o	[ ]	o: Yes [ ] No [ ]
D5	Receipt of one or more Feature indication information elements in ALERT, CALL PROCEEDING, CONNECT, CONNECT ACKNOWLEDGE, DISCONNECT, INFORMATION, RELEASE, RELEASE COMPLETE, SETUP, SETUP ACKNOWLEDGE	6.1.1 6.1.2	m		Yes [ ]
D6	Receipt of a Signal information element in any of the specified messages	6.1.3	m		Yes [ ]
D7	Receipt of a Cause information element in INFORMATION	6.1.3	m		Yes [ ]
D8	Receipt of a Display information element in any message	6.1.3	m		Yes [ ]
D9	Receipt of an Information request information element in INFORMATION	6.1.3	C4: m	[ ]	m: Yes [ ]
D10	Inclusion of a Keypad facility information element in INFORMATION or SETUP	6.1.3	c.4		m: Yes [ ] o: Yes [ ] No [ ]
D11	Receipt of an Endpoint identifier information element in SETUP	6.1.3	C5: m	[ ]	m: Yes [ ]
D12	Inclusion of an Endpoint identifier information element in INFORMATION	6.1.3	C6: m	[ ]	m: Yes [ ]
D13	Receipt of an Endpoint identifier information element in INFORMATION	6.1.3	C7: m	[ ]	m: Yes [ ]
D14	Inclusion of a Service profile identification information elemt. in INFORMATION	6.1.3	C7: m	[ ]	m: Yes [ ]
D15	Inclusion of a Switchhook information element in CONNECT, DISCONNECT, INFORMATION, RELEASE, SETUP	6.1.3	o		Yes [ ] No [ ]
D16	Inclusion of a Calling party number information element in INFORMATION with the dummy Call Reference	6.1.3	D2: o	[ ]	o: Yes [ ] No [ ]

c.3: if C1 or C2 then mandatory else N/A

c.4: if C4 then mandatory else optional

Annex E

(informative)

Relationship to Corresponding Standards for Public ISDNs

The Feature Key Management protocol for PTNs specified in this Standard complements and is compatible with the corresponding services for public ISDNs as specified by CCITT. There are no differences which will prevent terminal interchangeability between PTNs and public ISDNs.

Note E.1:

ETSI has not specified the Feature Key Management protocol.

The differences between this Standard and CCITT Rec. Q.932 (Feature key management protocol) are mainly editorial and can be summarized as follows (differences with a technical impact are indicated by emboldening):

- **This Standard allows the inclusion of Feature activation and Feature indication information elements in more messages than Q.932.**
- This Standard allows multiple feature requests and indications; **the Feature activation information element may be repeated in a single message, too; multiple requests and indications shall be processed in the order received.**
- There is an explicit list of additional information elements in this Standard.
- This Standard simply differentiates between feature requests associated with an existing call reference and feature requests associated with the dummy call reference, whereas Q.932 uses the terms "call associated" and "non-call associated", with more complicated rules on the use of call references; the resulting procedures are equivalent.
- This Standard explicitly states the requirement to establish a Data Link connection if the dummy call reference is used.
- This Standard covers error handling more completely by explicitly referring to the error handling procedures of the basic call (implicit in Q.932).
- This Standard contains PICS Proformas.