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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Call Priority Interruption and Call Priority Interruption Protection supplementary services

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Protocole de signalisation d'échange — Services supplémentaires d'interruption de priorité d'appel et de protection d'interruption de priorité d'appel

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15992 was prepared by ECMA (as ECMA-264) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This second edition cancels and replaces the first edition (ISO/IEC 15992:1998), which has been technically revised.

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Introduction

This International Standard is one of a series of Standards defining services and signalling protocols applicable to Private Integrated Services Networks (PISNs). The series uses ISDN concepts as developed by ITU-T and conforms to the framework of International Standards for Open Systems Interconnection as defined by ISO/IEC.

This International Standard specifies the signalling protocol for use at the Q reference point in support of the Call Priority Interruption (CPI) and Call Priority Interruption Protection (CPIP) supplementary services. The protocol defined in this International Standard forms part of the PSS1 protocol (informally known as QSIG).

This International 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/IEC JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Call Priority Interruption and Call Priority Interruption Protection supplementary services

1 Scope

This International Standard specifies the signalling protocol for the support of the Call Priority Interruption (SS-CPI) and Call Priority Interruption Protection (SS-CPIP) supplementary services at the Q reference point between Private Integrated services Network eXchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

NOTE 1 - This edition of this International Standard does not apply to calls using the circuit-mode multiple rate bearer service.

SS-CPI allows a call request for a priority call to proceed successfully in the case that there is no user information channel available. This is accomplished by force releasing an established call of lower priority.

SS-CPIP allows for the protection of calls against interruption from priority calls.

The Q reference point is defined in ISO/IEC 11579-1.

Service specifications are produced in three stages and according to the method specified in ETS 300 387. This International Standard contains the stage 3 specification for the Q reference point and satisfies the requirements identified by the stage 1 and stage 2 specifications in ISO/IEC 15991.

The signalling protocol for SS-CPI(P) operates on top of the signalling protocol for basic circuit switched call control, as specified in ISO/IEC 11572, and uses certain aspects of the generic procedures for the control of supplementary services specified in ISO/IEC 11582.

This International Standard also specifies additional signalling protocol requirements for the support of interactions at the Q reference point between SS-CPI(P) and other supplementary services and ANFs.

NOTE 2 - Additional interactions that have no impact on the signalling protocol at the Q reference point can be found in the relevant stage 1 specifications.

This International Standard is applicable to PINXs that can interconnect to form a PISN.

2 Conformance

In order to conform to this International Standard, a PINX shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) proforma in annex A.

Conformance to this International Standard includes conforming to those clauses that specify protocol interactions between SS-CPI(P) and other supplementary services and ANFs for which signalling protocols at the Q reference point are supported in accordance with the stage 3 standards concerned.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 11572:2000, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol*

ISO/IEC 11574:2000, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services - Service description, functional capabilities and information flows*

ISO/IEC 11579-1:1994, *Information technology - Telecommunications and information exchange between systems - Private integrated services network - Part 1: Reference configuration for PISN Exchanges (PINX)*

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ISO/IEC 11582:2002, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol*

ISO/IEC 13869:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call Transfer supplementary service*

ISO/IEC 13873:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call Diversion supplementary services*

ISO/IEC 13874:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Path Replacement additional network feature*

ISO/IEC 15054:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call Interception additional network feature*

ISO/IEC 15431:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless terminal call handling additional network features*

ISO/IEC 15991:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Call Priority Interruption and Call Priority Interruption Protection supplementary services*

ETS 300 387:1994, *Private Telecommunication Network (PTN); Method for the specification of basic and supplementary services*

ITU-T Rec. I.112:1993, *Vocabulary of terms for ISDNs*

ITU-T Rec. I.210:1993, *Principles of telecommunication services supported by an ISDN and the means to describe them*

ITU-T Rec. Q.950:2000, *Supplementary services protocols, structure and general principles*

ITU-T Rec. Z.100:1999, *Specification and description language (SDL)*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1 External definitions

This International Standard uses the following terms defined in other documents:

- Adjacent PINX (ISO/IEC 11582)
- Application Protocol Data Unit (APDU) (ISO/IEC 11582)
- Basic Service (ITU-T Rec. I.210)
- Call, Basic Call (ISO/IEC 11582)
- Coordination Function (ISO/IEC 11582)
- Notification (ISO/IEC 11582)
- Originating PINX (ISO/IEC 11572)
- Preceding PINX (ISO/IEC 11572)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated services Network Exchange (PINX) (ISO/IEC 11579-1)
- Signalling (ITU-T Rec. I.112)
- Subsequent PINX (ISO/IEC 11572)
- Supplementary Service (ITU-T Rec. I.210)
- Terminating PINX (ISO/IEC 11572)
- Transit PINX (ISO/IEC 11572)
- User (ISO/IEC 11574)

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4.2 Called user

The user that receives a request to accept an incoming call and who may request SS-CPIP.

4.3 Calling user

The user that originates a call attempt and who may request SS-CPI and/or SS-CPIP.

4.4 Call interruption

An invocation procedure of SS-CPI whereby the calling user indicates that a "priority call" is to be made.

4.5 Call Priority Interruption Capability Level (CPICL)

A parameter indicating the priority of a call.

4.6 Call Priority Interruption Protection Level (CPIPL)

A parameter indicating a level of protection of a call against interruption from other calls.

4.7 Call protection

An invocation procedure of SS-CPIP whereby the calling user or the called user indicates that a call is to be protected.

4.8 Established call

The active call that is selected for interruption.

4.9 Established call user

A user in the established call.

4.10 Established call user's PINX

The PINX serving one of the users in the established call.

4.11 Forced release

The release of the established call during interruption.

4.12 Inter-PINX link

The totality of a signalling channel and a number of user information channels at the Q reference point.

4.13 Interrupting PINX

The PINX that selects an established call for interruption.

NOTE 3 - The Originating PINX or any Transit PINX involved in a call may also be an Interrupting PINX.

4.14 Non-priority call

A call that has not been assigned a CPICL value.

4.15 Priority call

A call that has a CPICL value greater than zero.

NOTE 4 - A priority call may also be a protected call.

4.16 Protected call

A call that has a CPIPL value greater than zero.

NOTE 5 - A protected call may also be a priority call.

5 List of acronyms

ANF	Additional Network Feature
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation no. 1
CPICL	Call Priority Interruption Capability Level
CPIPL	Call Priority Interruption Protection Level
ISDN	Integrated Services Digital Network
NFE	Network Facility Extension
PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated services Network eXchange

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PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS-CPI	Call Priority Interruption Supplementary Service
SS-CPIP	Call Priority Interruption Protection Supplementary Service

6 Signalling protocol for the support of SS-CPI(P)

6.1 SS-CPI(P) description

SS-CPI is a supplementary service that allows a call request for a priority call to proceed successfully in the case that there is no user information channel available. SS-CPI may be invoked by the calling user.

SS-CPIP is a supplementary service that allows for the protection of calls against interruption. SS-CPIP may be invoked by either the calling user or the called user.

A priority interruption only occurs if the call originating from the calling user has a higher Call Priority Interruption Capability Level (CPICL) than the Call Priority Interruption Protection Level (CPIPL) of at least one of the established calls on the selected inter-PINX link.

SS-CPI(P) is applicable to all circuit mode basic services defined in ISO/IEC 11574.

6.2 SS-CPI(P) operational requirements

6.2.1 Requirements on the Originating PINX

Call establishment procedures for the outgoing side of an inter-PINX link and call release procedures, as specified in ISO/IEC 11572, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for an End PINX, shall apply.

6.2.2 Requirements on the Terminating PINX

Call establishment procedures for the incoming side of an inter-PINX link and call release procedures, as specified in ISO/IEC 11572, shall apply.

For the support of SS-CPIP, generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for an End PINX, shall apply.

6.2.3 Requirements on a Transit PINX

Basic call procedures, as specified in ISO/IEC 11572 for a Transit PINX, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply. In addition, for the support of SS-CPI, the generic procedures for notification, as specified in ISO/IEC 11582 shall apply.

6.2.4 Requirements on the Interrupting PINX

Call establishment procedures for the outgoing side of an inter-PINX link and call release procedures, as specified in ISO/IEC 11572, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ISO/IEC 11582 for both an End PINX and a Transit PINX, shall apply. In addition, the generic procedures for notification, as specified in ISO/IEC 11582 shall apply.

6.2.5 Requirements on the Established call user's PINX

Generic procedures for notification, as specified in ISO/IEC 11582 for a Receiving End PINX, shall apply.

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6.3 SS-CPI(P) coding requirements

6.3.1 Operations

The operations defined in Abstract Syntax Notation number 1 (ASN.1) in table 1 shall apply. The notation is in accordance with ITU-T Rec. X.680 and X.690. The ITU-T Rec. X.208 and X.209 superseded version is in annex D.

Table 1 - Operations in support of SS-CPI(P)

```
Call-Interruption-Operations-asn1-97
{iso (1) standard (0) pss1-call-interruption (15992) call-interruption-operations-asn1-97 (2) }


DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS                 OPERATION FROM Remote-Operations-Information-Objects
                              {joint-iso-itu-t (2) remote-operations (4) informationObjects (5) version1 (0)}

                        EXTENSION, Extension{} FROM Manufacturer-specific-service-extension-class-asn1-97
                              {iso (1) standard (0) pss1-generic-procedures (11582) msi-class-asn1-97 (11)};

                        -- The following operations are defined:

Call-Interruption-Operations OPERATION ::= { callInterruptionRequest | callProtectionRequest      }

callInterruptionRequest         OPERATION ::= {
                                ARGUMENT                CPIRequestArg
                                RETURN RESULT           FALSE
                                ALWAYS RESPONDS         FALSE
                                CODE                    local: 87}

callProtectionRequest           OPERATION ::= {
                                ARGUMENT                CPIPRequestArg
                                RETURN RESULT           FALSE
                                ALWAYS RESPONDS         FALSE
                                CODE                    local: 88}

                        -- The following arguments are defined:

CPIRequestArg           ::=     SEQUENCE{
                                cpiCapabilityLevel      CPICapabilityLevel,
                                argumentExtension       CHOICE{
                                      extension         [1] IMPLICIT Extension{{CPIPExtSet}},
                                      sequenceOfExtn    [2] IMPLICIT SEQUENCE OF
                                                        Extension{{CPIPExtSet}}} OPTIONAL}

CPIPRequestArg          ::=     SEQUENCE{
                                cpiProtectionLevel      CPIProtectionLevel,
                                argumentExtension       CHOICE{
                                      extension         [1] IMPLICIT Extension{{CPIPExtSet}},
                                      sequenceOfExtn    [2] IMPLICIT SEQUENCE OF
                                                        Extension{{CPIPExtSet}}} OPTIONAL}
```

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Table 1 - Operations in support of SS-CPI(P) (concluded)

```
CPICapabilityLevel        ::=     ENUMERATED{
                                          interruptionLowPriority (1),
                                          interruptionMediumPriority (2),
                                          interruptionHighPriority (3)}

CPIProtectionLevel        ::=     ENUMERATED{
                                          noProtection (0),
                                          lowProtection (1),
                                          mediumProtection (2),
                                          totalProtection (3)}

CPIPExtSet EXTENSION ::= {...}

END                       -- of Call-Interruption-Operations-asn1-97
```

6.3.2 Notifications

The following notifications, defined in Abstract Syntax Notation number 1 (ASN.1) in table 2 shall apply.

Table 2 - Notifications in support of SS-CPI(P)

```
Call-Interruption-Notifications-asn1-97
{iso (1) standard (0) pss1-call-interruption (15992) call-interruption-notifications-asn1 (3) }

DEFINITIONS                       ::=
BEGIN

IMPORTS        NOTIFICATION FROM Notification-Data-Structure-asn1-97
               {iso (1) standard (0) pss1-generic-procedures (11582) notification-data-structure-asn1-97 (18)};

        -- The following notifications are defined:

Call-Interruption-Notifications     NOTIFICATION ::= {interruptionIsImpending | interruptionTerminated |
                                                     interruptionForcedRelease}

interruptionIsImpending                 NOTIFICATION::= {
                                        ARGUMENT    NULL
                                        CODE        local: 2008}

interruptionTerminated                  NOTIFICATION::= {
                                        ARGUMENT    NULL
                                        CODE        local: 2009}

interruptionForcedRelease               NOTIFICATION ::= {
                                        ARGUMENT    NULL
                                        CODE        local: 2010}

END                                     --of Call-Interruption-Notifications-asn1-97
```

6.3.3 Information elements

6.3.3.1 Facility information element

The operations defined above shall be coded in the Facility information element in accordance with ISO/IEC 11582.

When conveying an APDU of operation callInterruptionRequest or operation callProtectionRequest the NFE shall be included and shall contain value anyTypeOfPINX.

When conveying the invoke APDU of operation callInterruptionRequest or operation callProtectionRequest the Interpretation APDU shall be included and shall contain value discardAnyUnrecognisedInvokePdu.

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6.3.3.2 Notification indicator information element

The notifications defined above shall be coded in the Notification indicator information element in accordance with ISO/IEC 11582.

6.3.3.3 Other information elements

Any other information elements (e.g., Progress indicator) shall be coded in accordance with the rules of ISO/IEC 11572.

6.3.4 Messages

Messages used for call establishment and release shall be as specified in ISO/IEC 11572.

The Facility information element and the Notification indicator information element shall be conveyed in the messages as specified in clause 10 of ISO/IEC 11582.

6.4 SS-CPI state definitions

6.4.1 States at the Originating PINX

The procedures for the Originating PINX are written in terms of the following conceptual states existing within the SS-CPI Supplementary Service Control entity in that PINX in association with a particular call.

6.4.1.1 State CPI-Idle

SS-CPI is not operating.

6.4.2 States at the Transit PINX

The procedures for the Transit PINX are written in terms of the following conceptual states existing within the SS-CPI Supplementary Service Control functional entity in that PINX in association with a particular call.

6.4.2.1 State CPI-Idle

SS-CPI is not operating.

6.4.3 States at the Interrupting PINX

The procedures for the Interrupting PINX are written in terms of the following conceptual states existing within the SS-CPI Supplementary Service Control functional entity in that PINX in association with a particular call.

6.4.3.1 State CPI-Idle

SS-CPI is not operating.

6.4.3.2 State CPI-Impending

Following invocation of call interruption, the Interrupting PINX has notified an impending interruption to the users in the established call and is waiting for the end of the impending phase before starting interruption.

6.4.3.3 State CPI-Releasing

The Interrupting PINX has forced released the established call and is waiting for completion of the clearing process.

6.5 SS-CPIP state definitions

6.5.1 States at the Originating PINX

The procedures for the Originating PINX are written in terms of the following conceptual states existing within the SS-CPIP Supplementary Service Control entity in that PINX in association with a particular call.

6.5.1.1 State CPIP-Idle

SS-CPIP is not operating.

6.5.2 States at the Transit PINX

The procedures for the Transit PINX are written in terms of the following conceptual states existing within the SS-CPIP Supplementary Service Control functional entity in that PINX in association with a particular call.

6.5.2.1 State CPIP-Idle

SS-CPIP is not operating.

6.5.3 States at the Terminating PINX

The procedures for the Terminating PINX are written in terms of the following conceptual states existing within the SS-CPIP Supplementary Service Control functional entity in that PINX in association with a particular call.

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6.5.3.1 State CPIP-Idle

SS-CPIP is not operating.

6.6 SS-CPI signalling procedures for activation, deactivation and registration

Not applicable.

6.7 SS-CPIP signalling procedures for activation, deactivation and registration

Not applicable.

6.8 SS-CPI signalling procedures for invocation and operation

Annex B contains some examples of message sequences.

NOTE 6 - SS-CPI may be invoked by the calling user to identify a call attempt as being a "priority call", and to give it the capability to interrupt other calls as a means of obtaining the resources needed for successful call establishment.

Calls with an associated Call Priority Interruption Capability Level (CPICL) in which the CPICL value is greater than 0 are known as "priority calls". Priority calls have the capability to interrupt other calls, both protected and non-protected; with the exception of calls having "total protection" (CPIPL=3).

Priority calls may also be protected calls if SS-CPIP was invoked at the same time as SS-CPI.

6.8.1 Actions at the Originating PINX

6.8.1.1 Procedure for invocation of SS-CPI

For a given call, the Originating PINX may invoke SS-CPI using the procedures specified below.

The SDL representation of procedures at the Originating PINX is shown in C.1 of annex C.

6.8.1.1.1 Normal procedures

To invoke SS-CPI, the Originating PINX shall send a callInterruptionRequest invoke APDU, and re-enter state CPI-Idle. The APDU shall be sent in the SETUP message that establishes the call. The argument of the invoke operation shall convey the CPICL of the calling user.

NOTE 7 - The method by which the value of the CPICL is assigned is outside the scope of this International Standard.

6.8.1.1.2 Exceptional procedures

If the basic call fails for reasons other than those covered in 6.8.1.2 below (e.g., on calling user release, call failure, etc.), SS-CPI shall terminate, and state CPI-Idle shall be entered.

6.8.1.2 Procedure for operation of SS-CPI

While attempting to establish a new call in accordance with the procedures of ISO/IEC 11572, the inter-PINX link to the Subsequent PINX may be found to be congested (i.e., no B-channel available).

6.8.1.2.1 Normal procedures

If the calling user invoked SS-CPI, the Originating PINX shall not reject the calling user's call request, but shall check whether call interruption is possible. It shall do this by behaving as an Interrupting PINX, as specified in 6.8.3.1 below. On completion of these procedures the behaviour of the PINX shall revert to that of an Originating PINX.

6.8.1.2.2 Exceptional procedures

The exceptional procedures of an Interrupting PINX, as specified in 6.8.3.2 below, shall apply; with the modification that where "Preceding PINX" is referred to, this shall be interpreted to mean "calling user".

On completion of those procedures the behaviour of the PINX shall revert to that of an Originating PINX.

6.8.2 Actions at a Transit PINX

The SDL representation of procedures at the Transit PINX is shown in C.2 of annex C.

6.8.2.1 Normal procedures

While processing, in accordance with the procedures of ISO/IEC 11572, an incoming SETUP message containing a callInterruptionRequest invoke APDU, the Transit PINX may determine that the inter-PINX link to the Subsequent PINX is congested (i.e., no B-channels are available). In this case the Transit PINX shall not release the call in the direction of the Preceding PINX, but shall behave as an Interrupting PINX, as specified in 6.8.3.1 below. On completion of these procedures the behaviour of the PINX shall revert to that of a Transit PINX.

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6.8.2.2 Exceptional procedures

While processing, in accordance with the procedures of ISO/IEC 11572, an incoming SETUP message containing a callInterruptionRequest invoke APDU, the Transit PINX may determine that the inter-PINX link to the Subsequent PINX is not congested (i.e., B-channels are available). In this case the call shall proceed in accordance with the procedures of ISO/IEC 11572 and ISO/IEC 11582. The callInterruptionRequest invoke APDU shall be passed on to the Subsequent PINX.

6.8.3 Actions at the Interrupting PINX

The SDL representation of procedures at the Interrupting PINX is shown in C.3 of annex C.

6.8.3.1 Normal procedures

The Interrupting PINX shall check whether call interruption is possible. It shall do this by comparing the CPICL value of the priority call with the CPIPL values of established calls on the congested inter-PINX link. If an established call is found with a CPIPL value lower than the CPICL value of the priority call, and provided there are no other reasons for denying interruption (e.g., because the established call is already being interrupted), this call shall be considered interruptible. If the Interrupting PINX has no knowledge of the CPIPL for a particular established call, the call shall be treated as if it has no protection (i.e., CPIPL value equal to zero). If more than one call is interruptible, the Interrupting PINX shall select the call with the lowest CPIPL value. If more than one call has the same lowest CPIPL, the method used to select the call to be interrupted from this group of calls shall be implementation dependent.

NOTE 8 - Interruption of calls in the establishment phase (i.e., calls that have not yet reached the Active state) is outside the scope of this International Standard. It is an implementation specific matter that is part of the checking for available resources and selection of a call for interruption. Basic Call procedures allow a PINX to abort a call attempt for unspecified reasons; one such reason could be that a call of higher priority needs the resources.

Similarly, for calls in the release phase, the B-channel is about to become available, and pre-empting it for the priority call is also an implementation specific matter.

If call interruption is possible, the Interrupting PINX may provide notification of impending interruption to users in the established call. If notification of impending interruption is not to be given, interruption shall take place immediately. If notification of impending interruption is to be given, the Interrupting PINX shall send NOTIFY messages to the Adjacent PINXs of the established call. These NOTIFY messages shall use the call references of the established call, and shall contain the notification value "interruptionIsImpending". The Interrupting PINX shall start timer T1 and shall enter state CPI-Impending. Interruption shall occur on expiry of timer T1 in state CPI-Impending.

To interrupt the established call the Interrupting PINX shall send DISCONNECT messages to the Adjacent PINXs of the established call and follow basic call clearing procedures as specified in ISO/IEC 11572. These DISCONNECT messages shall use the call references of the established call and shall contain the notification value "interruptionForcedRelease". Cause no. 31 "Normal, unspecified" shall be used. The Interrupting PINX shall enter state CPI-Releasing.

When clearing of the interrupted call has been completed the Interrupting PINX shall continue with the establishment of the priority call using the newly available B-channel, according to the procedures specified in ISO/IEC 11572. At the same time the Interrupting PINX shall re-invoke SS-CPI by placing a callInterruptionRequest invoke APDU in the outgoing SETUP message. The content of this APDU shall be the same as the content of the original callInterruptionRequest invoke APDU. The Interrupting PINX shall enter state CPI-Idle.

NOTE 9 - Other supplementary service information associated with the call should also be included in the outgoing SETUP message.

6.8.3.2 Exceptional procedures

If call interruption is not possible (including the case where the protection levels of the established calls on the required inter-PINX link are too high to permit interruption) the priority call shall be released in accordance with the procedures of ISO/IEC 11572. Either cause no. 34 "no circuit/channel available" or cause no. 44 "requested circuit/channel not available" shall be used. Alternatively, the Interrupting PINX may take some other implementation dependent action. The Interrupting PINX shall enter state CPI-Idle.

Whilst in state CPI-Impending the Interrupting PINX may receive a message from the Preceding PINX to clear the priority call, according to the procedures specified in ISO/IEC 11572. The Interrupting PINX shall stop timer T1, and send NOTIFY messages to the Adjacent PINXs of the established call. These NOTIFY messages shall use the call references of the established call, and shall contain the notification value "interruptionTerminated". The Interrupting PINX shall re-enter state CPI-Idle.

Whilst in state CPI-Impending the Interrupting PINX may receive a message from one of the Adjacent PINXs of the established call to clear the established call. When clearing of the established call has been completed on the inter-PINX link required for

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the priority call to proceed, the Interrupting PINX shall stop timer T1 and continue with the establishment of the priority call using the newly available B-channel, according to the procedures specified in ISO/IEC 11572. At the same time the Interrupting PINX shall re-invoke SS-CPI by placing a callInterruptionRequest invoke APDU in the outgoing SETUP message. The content of this APDU shall be the same as the content of the original callInterruptionRequest invoke APDU. The Interrupting PINX shall re-enter state CPI-Idle.

NOTE 10 - Other supplementary service information associated with the call should also be included in the outgoing SETUP message.

Whilst in state CPI-Impending the Interrupting PINX may receive a message from the Adjacent PINX on the required inter-PINX link to clear another call than the established call. When clearing of the other call has been completed on the inter-PINX link required for the priority call to proceed, and provided timer T1 has not yet expired, the Interrupting PINX shall stop timer T1 and send NOTIFY messages to the Adjacent PINXs of the established call. These NOTIFY messages shall use the call references of the established call, and shall contain the notification value "interruptionTerminated". The Interrupting PINX shall then continue with the establishment of the priority call using the newly available B-channel, according to the procedures specified in ISO/IEC 11572. At the same time the Interrupting PINX shall re-invoke SS-CPI by placing a callInterruptionRequest invoke APDU in the outgoing SETUP message. The content of this APDU shall be the same as the content of the original callInterruptionRequest invoke APDU. The Interrupting PINX shall enter state CPI-Idle.

NOTE 11 - Other supplementary service information associated with the call should also be included in the outgoing SETUP message.

6.8.4 Actions at the Terminating PINX

No special actions are required in support of SS-CPI.

6.8.5 Actions at the Established call user's PINX

No special actions are required in support of SS-CPI.

6.9 SS-CPIP signalling procedures for invocation and operation

Annex B contains some examples of message sequences.

NOTE 12 - SS-CPIP may be invoked to "protect" a call against possible interruption by priority calls.

Calls with an associated Call Priority Interruption Protection Level (CPIPL) in which the CPIPL value is greater than 0 are known as "protected calls".

Protected calls may also be priority calls if SS-CPI was invoked at the same time as SS-CPIP.

6.9.1 Actions at the Originating PINX

The SDL representation of procedures at the Originating PINX is shown in C.4 of annex C.

6.9.1.1 Normal procedures

To invoke SS-CPIP, the Originating PINX shall send a callProtectionRequest invoke APDU, and re-enter state CPIP-Idle. The APDU shall be sent in the SETUP message that establishes the call. The argument to the invoke operation shall convey the CPIPL of the calling user. The Originating PINX shall save the protection level of the call for the duration of the call.

NOTE 13 - The method by which the value of the CPIPL is assigned is outside the scope of this International Standard.

NOTE 14 - If SS-CPIP is not invoked in the forward direction, the "saved" protection level will be zero.

On receipt of a CONNECT message containing a callProtectionRequest invoke APDU in which the value of the CPIPL contained therein is higher than that already saved for the call, an Originating Transit PINX shall save the CPIPL value for the duration of the call.

6.9.1.2 Exceptional procedures

Not applicable.

6.9.2 Actions at a Transit PINX

The SDL representation of procedures at the Transit PINX is shown in C.5 of annex C.

6.9.2.1 Normal procedures

The CPIPL value contained in the callProtectionRequest invoke APDU shall be stored by the Transit PINX for the duration of the call. The callProtectionRequest invoke APDU shall be passed on to the Subsequent PINX.

NOTE 15 - If SS-CPIP is not invoked in the forward direction, the "saved" protection level will be zero.

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On receipt of a CONNECT message containing a callProtectionRequest invoke APDU in which the value of the CPIPL contained therein is higher than that already saved for the call, a Transit PINX shall save the CPIPL value for the duration of the call.

6.9.2.2 Exceptional procedures

Not applicable.

6.9.3 Actions at the Terminating PINX

The SDL representation of procedures at the Terminating PINX is shown in C.6 of annex C.

6.9.3.1 Normal procedures

On receipt of a SETUP message containing a callProtectionRequest invoke APDU, the Terminating PINX shall save the CPIPL value contained in the callProtectionRequest invoke APDU as the protection level of the call for the duration of the call. The Terminating PINX shall re-enter state CPIP-Idle.

NOTE 16 - If SS-CPIP is not invoked in the forward direction, the "saved" protection level will be zero.

To invoke SS-CPIP in the backward direction, the Terminating PINX shall first check the CPIPL associated with the called user.

NOTE 17 - The method by which the value of the CPIPL is assigned is outside the scope of this International Standard.

If the CPIPL indicates a higher protection level than that already saved for the call, the Terminating PINX shall save the CPIPL value for the duration of the call. The Terminating PINX shall send a callProtectionRequest invoke APDU, and re-enter state CPIP-Idle. The APDU shall be sent in the CONNECT message. The argument to the invoke operation shall convey the CPIPL of the called user.

6.9.3.2 Exceptional procedures

If the CPIPL associated with the called user contains a lower protection level than that already saved for the call, the request shall be ignored. The Terminating PINX shall re-enter state CPIP-Idle.

6.10 SS-CPI impact of interworking with public ISDNs

NOTE 18 - At the time of publication of this International Standard, no equivalent service has been specified for public ISDNs.

On a call to a PISN from a public ISDN that does not support an equivalent service, the Incoming Gateway PINX may behave as specified in 6.8.1 for an Originating PINX.

On a call from a PISN to a public ISDN that does not support an equivalent service, no special actions are required at the Outgoing Gateway PINX.

If one of the users in the established call is in a public ISDN that does not support an equivalent service, the Gateway PINX shall discard any SS-CPI notification.

NOTE 19 - In the case of the "interruptionIsImpending" notification, the Outgoing Gateway PINX may choose to apply an in-band tone or announcement towards the user in the established call.

6.11 SS-CPIP impact of interworking with public ISDNs

NOTE 20 - At the time of publication of this International Standard, no equivalent service has been specified for public ISDNs.

On a call to a PISN from a public ISDN that does not support an equivalent service, the Incoming Gateway PINX may behave as specified in 6.9.1 for an Originating PINX.

On a call from a PISN to a public ISDN that does not support an equivalent service, the Outgoing Gateway PINX shall behave as specified in 6.9.3 for a Terminating PINX.

6.12 SS-CPI impact of interworking with non-ISDNs

When interworking with a non-ISDN that does not support an equivalent service, the procedures defined in 6.10 for interworking with a public ISDN that does not support an equivalent service shall apply.

When interworking with a non-ISDN that supports an equivalent service, the two networks may cooperate in the operation of SS-CPI. In this case, either the Originating PINX functionality or the Terminating PINX functionality will be provided in the non-ISDN. Established Call User's PINX functionality may also be provided in the non-ISDN. The Incoming or Outgoing Gateway PINX shall provide conversion between the signalling protocol specified in this International Standard and the signalling protocol of the other network. An Incoming Gateway PINX can also behave as an Interrupting PINX.

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6.13 SS-CPIP impact of interworking with non-ISDNs

When interworking with a non-ISDN that does not support an equivalent service, the procedures defined in 6.11 for interworking with a public ISDN that does not support an equivalent service shall apply.

When interworking with a non-ISDN that supports an equivalent service, the two networks may cooperate in the operation of SS-CPIP. In this case, either the Originating PINX functionality or the Terminating PINX functionality will be provided in the non-ISDN. The Incoming or Outgoing Gateway PINX shall provide conversion between the signalling protocol specified in this International Standard and the signalling protocol of the other network.

6.14 Protocol interactions between SS-CPI(P) and other supplementary services and ANFs

This clause specifies protocol interactions with other supplementary services and ANFs for which stage 3 standards had been published at the time of publication of this International Standard. For interactions with supplementary services and ANFs for which stage 3 standards are published subsequent to the publication of this International Standard, see those other stage 3 standards.

NOTE 21 - Additional interactions that have no impact on the signalling protocol at the Q reference point can be found in the relevant stage 1 specifications.

NOTE 22 - Simultaneous conveyance of APDUs for SS-CPI(P) and another supplementary service or ANF in the same message, each in accordance with the requirements of its respective stage 3 standard, does not, on its own, constitute a protocol interaction.

6.14.1 Interaction with Calling Name Identification Presentation (SS-CNIP)

No interaction.

6.14.2 Interaction with Connected Name Identification Presentation (SS-CONP)

No interaction.

6.14.3 Interaction with Completion of Call to Busy Subscriber (SS-CCBS)

No interaction.

6.14.4 Interaction with Completion of Call on No Reply (SS-CCNR)

No interaction.

6.14.5 Interaction with Call Transfer (SS-CT)

The following interaction shall apply if SS-CT is supported in accordance with ISO/IEC 13869.

6.14.5.1 Actions at the Transferring PINX for transfer by rerouteing

If the call to be transferred was established as a protected call, the Transferring PINX shall include a callProtectionRequest invoke APDU with the callTransferInitiate invoke APDU in the FACILITY message sent to the Primary PINX. The argument to the callProtectionRequest invoke operation shall convey the higher of the CPIPL values of the established calls.

6.14.5.2 Actions at the Primary PINX for transfer by rerouteing

If a callProtectionRequest invoke APDU is received together with the callTransferInitiate invoke APDU from the Transferring PINX, SS-CPIP shall also be invoked for the establishment of the new connection using the CPIPL value contained in the received callProtectionRequest invoke APDU.

6.14.5.3 Actions at the Transferring PINX for transfer by join

At the Transferring PINX the call resulting from transfer by join (the transferred call) shall assume the highest of the protection levels of the two calls being joined. This value shall be sent to both ends of the call in a callProtectionRequest invoke APDU.

6.14.5.4 Actions at the Primary and Secondary PINXs for transfer by join

If a callProtectionRequest invoke APDU containing a CPIPL value higher than that already saved for the call is received together with the callTransferComplete invoke APDU from the Transferring PINX, a Primary / Secondary PINX shall save the CPIPL value for the duration of the call.

6.14.6 Interaction with Call Forwarding Unconditional (SS-CFU)

The following interaction shall apply if SS-CFU is supported in accordance with ISO/IEC 13873.

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6.14.6.1 Actions at the Rerouteing PINX

On receiving a callRerouting invoke APDU, the Rerouteing PINX shall include in the SETUP message to the Diverted-to PINX any callInterruptionRequest invoke APDU or callProtectionRequest invoke APDU that has been sent in the original SETUP message.

6.14.7 Interaction with Call Forwarding Busy (SS-CFB)

The interaction specified in 6.14.6 above shall apply if SS-CFB is supported in accordance with ISO/IEC 13873.

6.14.8 Interaction with Call Forwarding No Reply (SS-CFNR)

The interaction specified in 6.14.6 above shall apply if SS-CFNR is supported in accordance with ISO/IEC 13873.

6.14.9 Interaction with Call Deflection (SS-CD)

The interaction specified in 6.14.6 above shall apply if SS-CD is supported in accordance with ISO/IEC 13873.

6.14.10 Interaction with Path Replacement (ANF-PR)

The following interaction shall apply if ANF-PR is supported in accordance with ISO/IEC 13874.

6.14.10.1 Actions at the Requesting PINX

If the call to be rerouted was established as a protected call, the Requesting PINX shall include a callProtectionRequest invoke APDU with the pathReplacePropose invoke APDU in the FACILITY message sent to the Cooperating PINX. The argument to the callProtectionRequest invoke operation shall convey the CPIPL of the established call.

6.14.10.2 Actions at the Cooperating PINX

If a callProtectionRequest invoke APDU is received together with the pathReplacePropose invoke APDU from the Requesting PINX, SS-CPIP shall also be invoked for the establishment of the new connection.

6.14.11 Interaction with Call Offer (SS-CO)

No interaction.

6.14.12 Interaction with Call Intrusion (SS-CI)

No interaction.

NOTE 23 - SS-CI may be used in conjunction with SS-CPI to provide for intrusion if a called user busy condition is determined.

6.14.13 Interaction with Do not Disturb (SS-DND)

No interaction.

6.14.14 Interaction with Do not Disturb Override (SS-DNDO)

No interaction.

6.14.15 Interaction with Advice of Charge (SS-AOC)

No interaction.

6.14.16 Interaction with Recall (SS-RE)

No interaction.

6.14.17 Interaction with Call Interception (ANF-CINT)

The following interaction shall apply if ANF-CINT is supported in accordance with ISO/IEC 15054.

6.14.17.1 Actions at the Intercepting PINX

If it has been invoked, SS-CPI shall take precedence over ANF-CINT when a network congestion condition is encountered i.e., neither interception immediate nor interception delayed shall be invoked.

If ANF-CINT is invoked (i.e., for a reason other than network congestion) the Intercepting PINX shall include any callInterrruptionRequest invoke and / or callProtectionRequest invoke APDU contained in the original call in the call to the Intercepted-To PINX.

6.14.18 Interaction with Transit Counter (ANF-TC)

No interaction.

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6.14.19 Interaction with Wireless Terminal Location Registration (SS-WTLR)

No interaction.

6.14.20 Interaction with Wireless Terminal Incoming Call (ANF-WTMI)

The following interaction shall apply if ANF-WTMI is supported in accordance with ISO/IEC 15431.

6.14.20.1 Actions at the Rerouteing PINX

On receiving a wtmiDivert invoke APDU, the Rerouteing PINX shall include in the SETUP message sent to the Visitor PINX any callInterruptionRequest invoke APDU or callProtectionRequest invoke APDU accompanying the wtmiDivert invoke APDU.

6.14.20.2 Actions at the WTMI-detect PINX

If the incoming call for which ANF-WTMI is to be invoked contains a callInterruptionRequest invoke APDU or a callProtectionRequest invoke APDU, the WTMI-detect PINX shall include these APDUs with the wtmiDivert invoke APDU in the FACILITY message sent to the Rerouteing PINX.

6.14.21 Interaction with Wireless Terminal Outgoing Call (ANF-WTMO)

No interaction.

6.14.22 Interaction with Wireless Terminal Authentication of a WTM user (SS-WTAT)

No interaction.

6.14.23 Interaction with Wireless Terminal Authentication of a PISN (SS-WTAN)

No interaction.

6.14.24 Interaction with Message Waiting Indication (SS-MWI)

No interaction.

6.14.25 Interaction with Common Information (ANF-CMN)

No interaction.

6.15 SS-CPI parameter values (timers)

6.15.1 Timer T1

Timer T1 shall operate at the Interrupting PINX during state CPI-Impending. Its purpose is to provide a short delay between the established call users receiving notification of impending interruption and interruption actually taking place.

Timer T1 shall have a value in the range 1-10 s.

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Annex A
(normative)

Protocol Implementation Conformance Statement (PICS) proforma

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this International Standard 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'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; while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs;
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A.2 Instructions for completing the PICS proforma

A.2.1 General structure of the PICS proforma

The PICS proforma is a fixed format questionnaire divided into sub-clauses 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) that specifies (specify) the item in the main body of this International 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 either in the Support column, by simply marking an answer to indicate a restricted choice (Yes or No), or in the Not Applicable (N/A) column.

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A.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.

A.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 this International Standard. 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.

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A.3 PICS proforma for ISO/IEC 15992

A.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)	

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

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

A.3.2 Protocol summary

Protocol version	1.0
Addenda implemented (if applicable)	
Amendments implemented	
Have any exception items been required (see A.2.3)?	No [ ] Yes [ ] (The answer Yes means that the implementation does not conform to this International Standard)

Date of Statement	

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A.3.3 General

Item	Question/feature	Reference	Status	N/A	Support
A1	Support of SS-CPI		o.1		Yes [ ] No [ ]
A2	Support of SS-CPIP		o.1		Yes [ ] No [ ]
A3	Support of SS-CPI in Originating PINX	6.8.1	A1:o.2	[ ]	Yes [ ] No [ ]
A4	Support of SS-CPI in Transit PINX	6.8.2	A1:o.2	[ ]	Yes [ ] No [ ]
A5	Support of SS-CPI in Interrupting PINX	6.8.3	A1:m	[ ]	m: Yes [ ]
A6	Support of SS-CPIP in Originating PINX	6.9.1	A2:o.3	[ ]	Yes [ ] No [ ]
A7	Support of SS-CPIP in Transit PINX	6.9.2	A2:o.3	[ ]	Yes [ ] No [ ]
A8	Support of SS-CPIP in Terminating PINX	6.9.3	A2:o.3	[ ]	Yes [ ] No [ ]
A9	SS-CPI behaviour as Incoming Gateway when interworking with public ISDN	6.10	A1:o	[ ]	Yes [ ] No [ ]
A10	SS-CPI behaviour as Incoming Gateway when interworking with non-ISDNs	6.12	A1:o	[ ]	Yes [ ] No [ ]
A11	SS-CPI behaviour as Outgoing Gateway when interworking with non-ISDNs	6.12	A1:o	[ ]	Yes [ ] No [ ]
A12	SS-CPIP behaviour as Incoming Gateway when interworking with public ISDN	6.11	A2:o	[ ]	Yes [ ] No [ ]
A13	SS-CPIP behaviour as Outgoing Gateway when interworking with public ISDN	6.11	A2:o	[ ]	Yes [ ] No [ ]
A14	SS-CPIP behaviour as Incoming Gateway when interworking with non-ISDNs	6.13	A2:o	[ ]	Yes [ ] No [ ]
A15	SS-CPIP behaviour as Outgoing Gateway when interworking with non-ISDNs	6.13	A2:o	[ ]	Yes [ ] No [ ]

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A.3.4 Procedures

Item	Question/feature	Reference	Status	N/A	Support
B1	Support of relevant ISO/IEC 11572 and ISO/IEC 11582 procedures	6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.5	m		Yes [ ]
B2	SS-CPI procedures in Originating PINX	6.8.1	A3:m	[ ]	m: Yes [ ]
B3	SS-CPI procedures in Transit PINX	6.8.2	A4:m	[ ]	m: Yes [ ]
B4	SS-CPI procedures in Interrupting PINX	6.8.3	A5:m	[ ]	m: Yes [ ]
B5	Notification of interruption impending in Interrupting PINX	6.8.3	A5:o	[ ]	Yes [ ] No [ ]
B6	SS-CPIP procedures in Originating PINX	6.9.1	A6:m	[ ]	m: Yes [ ]
B7	SS-CPIP procedures in Transit PINX	6.9.2	A7:m	[ ]	m: Yes [ ]
B8	SS-CPIP procedures in Terminating PINX - forward direction	6.9.3	A8:m	[ ]	m: Yes [ ]
B9	SS-CPIP procedures in Terminating PINX - backward direction	6.9.3	A8:o	[ ]	Yes [ ] No [ ]

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A.3.5 Coding

Item	Question/feature	Reference	Status	N/A	Support
C1	Sending of callInterruptionRequest invoke APDU in Originating PINX	6.3.1	A3:m	[ ]	m: Yes [ ]
C2	Receipt of callInterruptionRequest invoke APDU in Transit PINX	6.3.1	A4:m	[ ]	m: Yes [ ]
C3	Sending of callInterruptionRequest invoke APDU in Transit PINX	6.3.1	A4:m	[ ]	m: Yes [ ]
C4	Sending of interruptionIsImpending notification in Interrupting PINX	6.3.1	B5:m	[ ]	m: Yes [ ]
C5	Sending of interruptionTerminated notification in Interrupting PINX	6.3.1	B5:m	[ ]	m: Yes [ ]
C6	Sending of interruptionForcedRelease notification in Interrupting PINX	6.3.1	A5:m	[ ]	m: Yes [ ]
C7	Sending of callInterruptionRequest invoke APDU in Interrupting PINX	6.3.1	A5:m	[ ]	m: Yes [ ]
C8	Sending and receipt of callProtectionRequest invoke APDU in Originating PINX	6.3.1	A6:m	[ ]	m: Yes [ ]
C9	Sending and receipt of callProtectionRequest invoke APDU in Transit PINX	6.3.1	A7:m	[ ]	m: Yes [ ]
C10	Sending of callProtectionRequest invoke APDU in Terminating PINX	6.3.1	B9:m	[ ]	m: Yes [ ]
C11	Receipt of callProtectionRequest invoke APDU in Terminating PINX	6.3.1	B8:m	[ ]	m: Yes [ ]

A.3.6 Timers

Item	Question/feature	Reference	Status	N/A	Support
D1	Support of timer T1	6.15.1	B5:m	[ ]	m: Yes [ ] Value [ ]

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A.3.7 Interaction with Call Transfer (SS-CT)

Item	Question/feature	Reference	Status	N/A	Support
E1	Support of SS-CT (transfer by join)		o		Yes [ ] No [ ]
E2	Support of SS-CT (transfer by rerouteing)		o		Yes [ ] No [ ]
E3	Interactions between SS-CT by rerouteing and SS-CPIP for initiation of call transfer by Transferring PINX	6.14.5.1	c.1	[ ]	m: Yes [ ]
E4	Interactions between SS-CT by rerouteing and SS-CPIP for establishment of new connection by Primary PINX	6.14.5.2	c.1	[ ]	m: Yes [ ]
E5	Interactions between SS-CT by join and SS-CPIP	6.14.5.3	c.2	[ ]	m: Yes [ ]

c.1: if (A2 and E2) then mandatory, else N/A

c.2: if (A2 and E1) then mandatory, else N/A

A.3.8 Interactions with Call Forwarding Unconditional (SS-CFU)

Item	Question/feature	Reference	Status	N/A	Support
F1	Support of SS-CFU (Rerouteing PINX)		o		Yes [ ] No [ ]
F2	Interactions at Rerouteing PINX	6.14.6	F1:m	[ ]	m: Yes [ ]

A.3.9 Interactions with Call Forwarding Busy (SS-CFB)

Item	Question/feature	Reference	Status	N/A	Support
G1	Support of SS-CFB (Rerouteing PINX)		o		Yes [ ] No [ ]
G2	Interactions at Rerouteing PINX	6.14.7	G1:m	[ ]	m: Yes [ ]

A.3.10 Interactions with Call Forwarding No Reply (SS-CFNR)

Item	Question/feature	Reference	Status	N/A	Support
H1	Support of SS-CFNR (Rerouteing PINX)		o		Yes [ ] No [ ]
H2	Interactions at Rerouteing PINX	6.14.8	H1:m	[ ]	m: Yes [ ]

A.3.11 Interactions with Call Deflection (SS-CD)

Item	Question/feature	Reference	Status	N/A	Support
I1	Support of SS-CD (Rerouteing PINX)		o		Yes [ ] No [ ]
I2	Interactions at Rerouteing PINX	6.14.9	I1:m	[ ]	m: Yes [ ]

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A.3.12 Interactions with Path Replacement (ANF-PR)

Item	Question/feature	Reference	Status	N/A	Support
J1	Support of ANF-PR (Requesting PINX)		o		Yes [ ] No [ ]
J2	Support of ANF-PR (Cooperating PINX)		o		Yes [ ] No [ ]
J3	Interactions between ANF-PR and SS-CPIP for initiation of path replacement by Requesting PINX	6.14.10.1	c.1	[ ]	m: Yes [ ]
J4	Interactions between ANF-PR and SS-CPIP for establishment of new connection by Cooperating PINX	6.14.10.2	c.2	[ ]	m: Yes [ ]

c.1: if (A2 and J1) then mandatory, else N/A.

c.2: if (A2 and J2) then mandatory, else N/A.

A.3.13 Interaction with Call Interception (ANF-CINT)

Item	Question/feature	Reference	Status	N/A	Support
K1	Support of SS-CINT		o		Yes [ ] No [ ]
K2	Interaction between SS-CINT at the Intercepting PINX and SS-CPI(P) at an Originating PINX	6.14.17.1	K1:m	[ ]	m: Yes [ ]
K3	Interaction between SS-CINT at the Intercepting PINX and SS-CPI(P) at a Transit PINX	6.14.17.1	K1:m	[ ]	m: Yes [ ]

A.3.14 Interaction with Wireless Terminal Incoming Call (ANF-WTMI)

Item	Question/feature	Reference	Status	N/A	Support
L1	Support of ANF-WTMI		o		Yes [ ] No [ ]
L2	Interactions between ANF-WTMI and SS-CPI(P) for initiation of WTMI diversion by Rerouteing PINX	6.14.20.1	L1:m	[ ]	m: Yes [ ]
L3	Interactions between ANF-WTMI and SS-CPI(P) at WTMI-detect PINX	6.14.20.2	L1:m	[ ]	m: Yes [ ]

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Annex B
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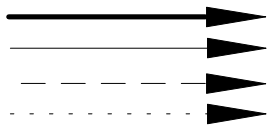
Examples of message sequences

This annex describes some typical message flows for SS-CPI and SS-CPIP. The following conventions are used in the figures of this annex.

1 The following notation is used:



Basic call message containing SS-CPI(P) information
Basic call message without SS-CPI(P) information
Symbolic primitive carrying SS-CPI(P) information
Symbolic primitive without SS-CPI(P) information

xxx.inv Invoke APDU for operation xxx

2 The figures show messages exchanged via Protocol Control between PINXs involved in SS-CPI(P). Only messages relevant to SS-CPI(P) are shown.

3 Only the relevant information content (e.g. remote operation APDUs, notification information elements) is listed below each message name. The Facility and Notification indicator information elements containing remote operation APDUs and notifications are not explicitly shown. Information with no impact on SS-CPI(P) is not shown.

4 Some interactions with users are included in the form of symbolic primitives. The actual protocol at the terminal equipment interface is outside the scope of this International Standard.

5 The examples assume en-bloc sending.

6 The following abbreviations are used:

clear.Request	Request to clear the call
cpiRequest	callInterruptionRequest
cpipRequest	callProtectionRequest
cpi.request	SS-CPI request
cpip.request	SS-CPIP request
setup.ind	Incoming call indication
interruptionIsImpending	SS-CPI is impending
interruptionForcedRelease	SS-CPI forced release has occurred
interruptionTerminated	SS-CPI has been terminated

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B.1 Example message sequence for normal operation of SS-CPI without notification

In this example users in the established call are forced release without being notified that the interruption is taking place. The interruption results in the establishment of a new call using resources made available after the interruption.

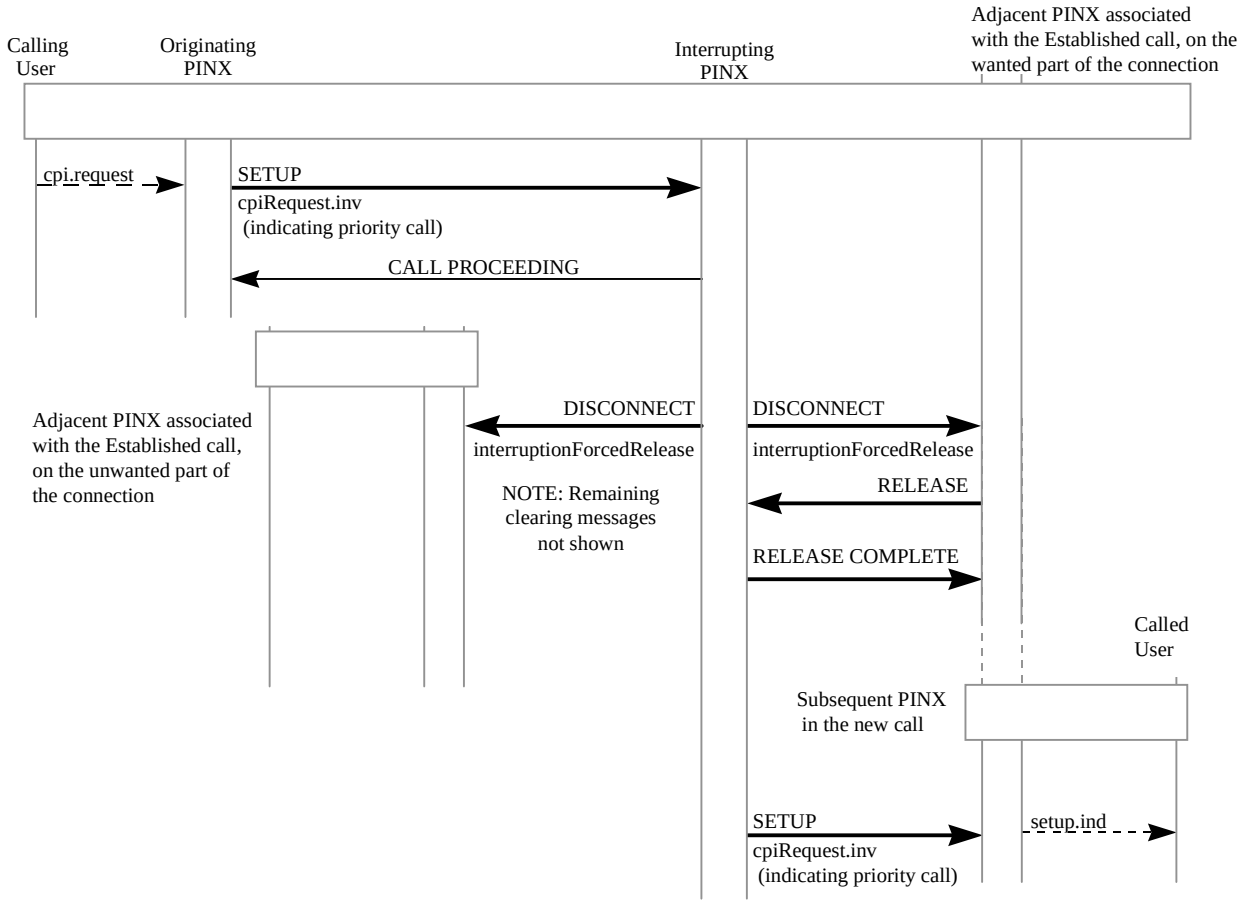

Figure B.1 - Message sequence for normal operation of SS-CPI without notification

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B.2 Example message sequence for normal operation of SS-CPI with notification

In this example users in the established call notified of the impending interruption before being forced released. The interruption results in the establishment of a new call using resources made available after the interruption.

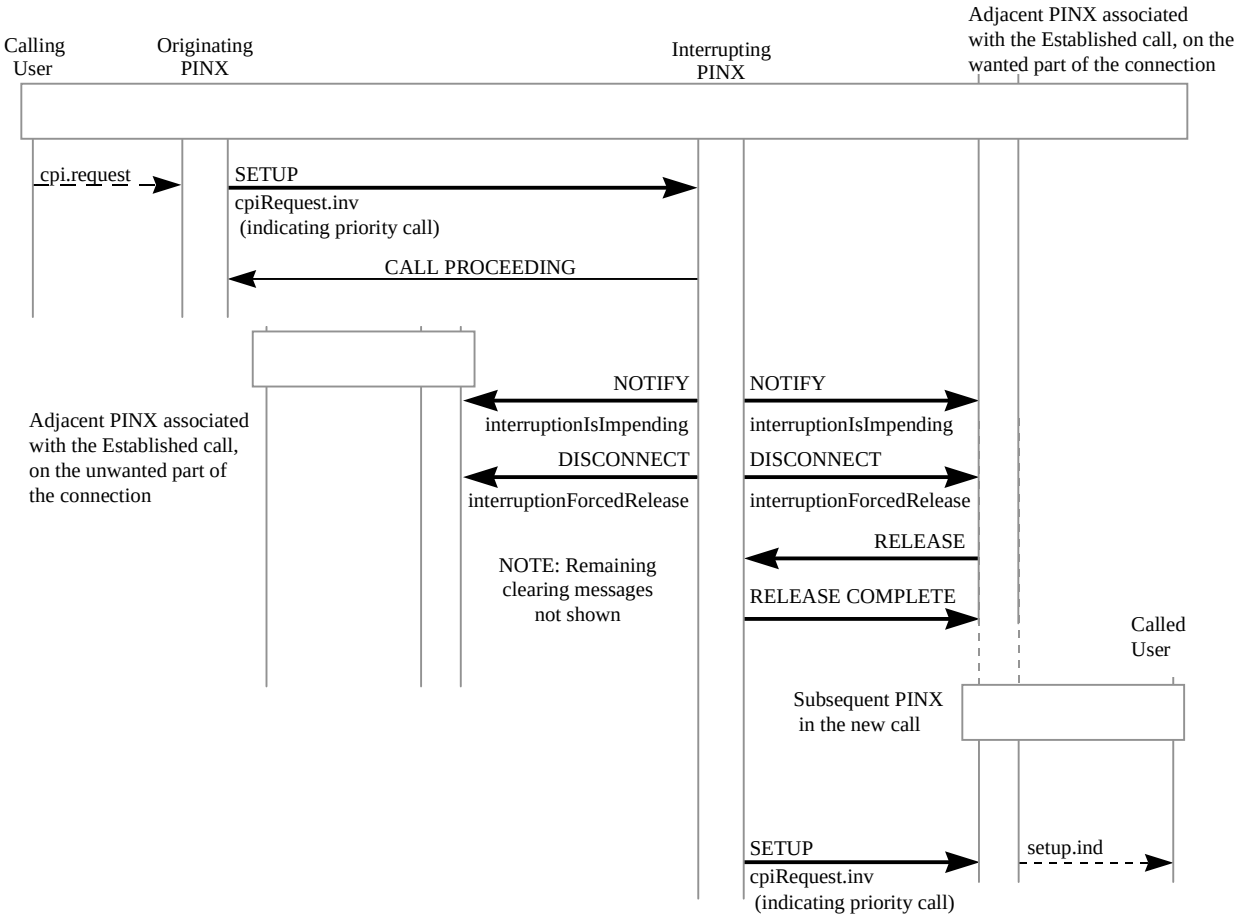

Figure B.2 - Message sequence for normal operation of SS-CPI with notification

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B.3 Example message sequence for abandoned invocation of SS-CPI

In this example the request for SS-CPI is subsequently followed by a request to clear the call. Users in the call selected for interruption, previously notified that interruption is impending, are notified that the interruption has been terminated.

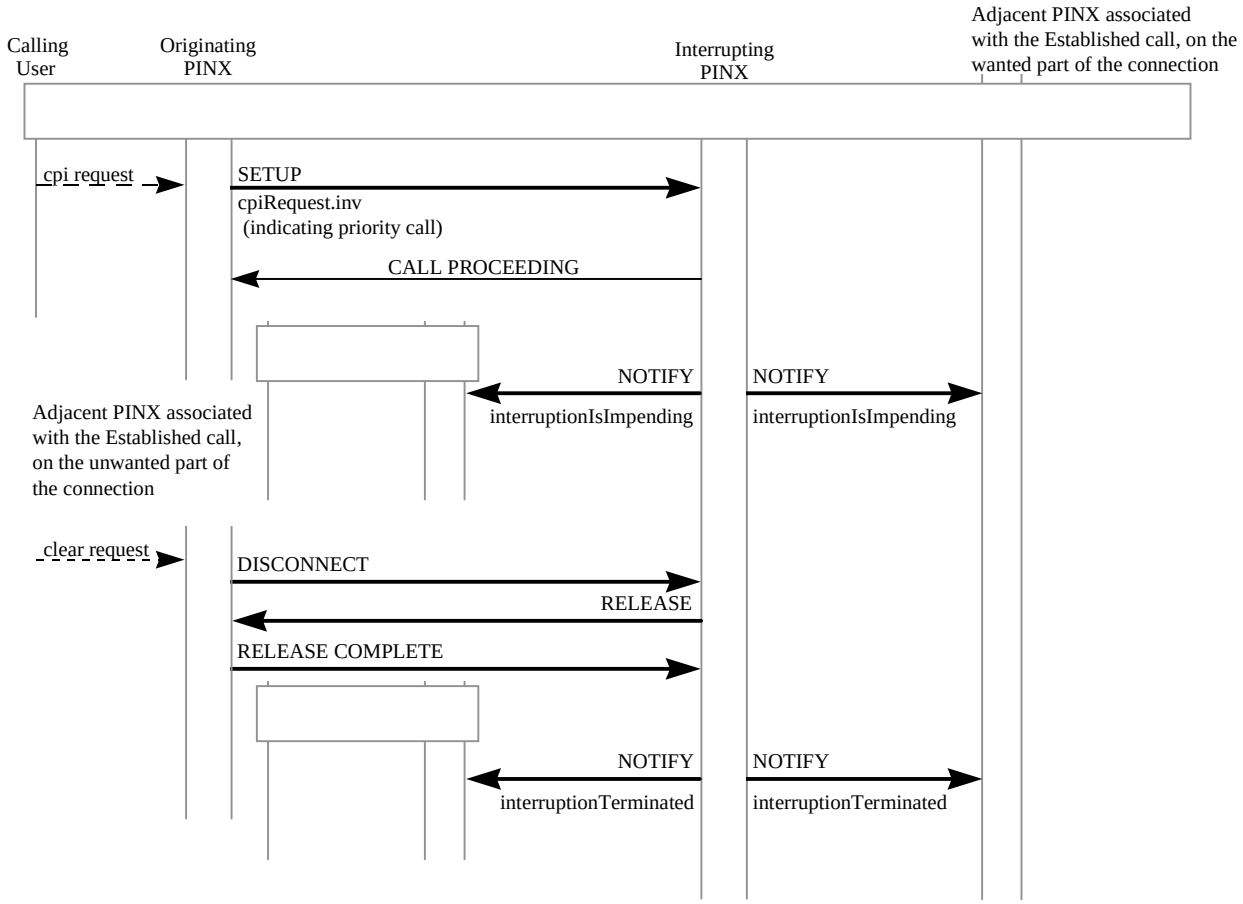

Figure B.3 - Message sequence for unsuccessful invocation of SS-CPI

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B.4 Example message sequence for successful invocation of SS-CPIP

In this example the request for SS-CPIP made by the calling user is subsequently followed by a request for SS-CPIP from the called user.

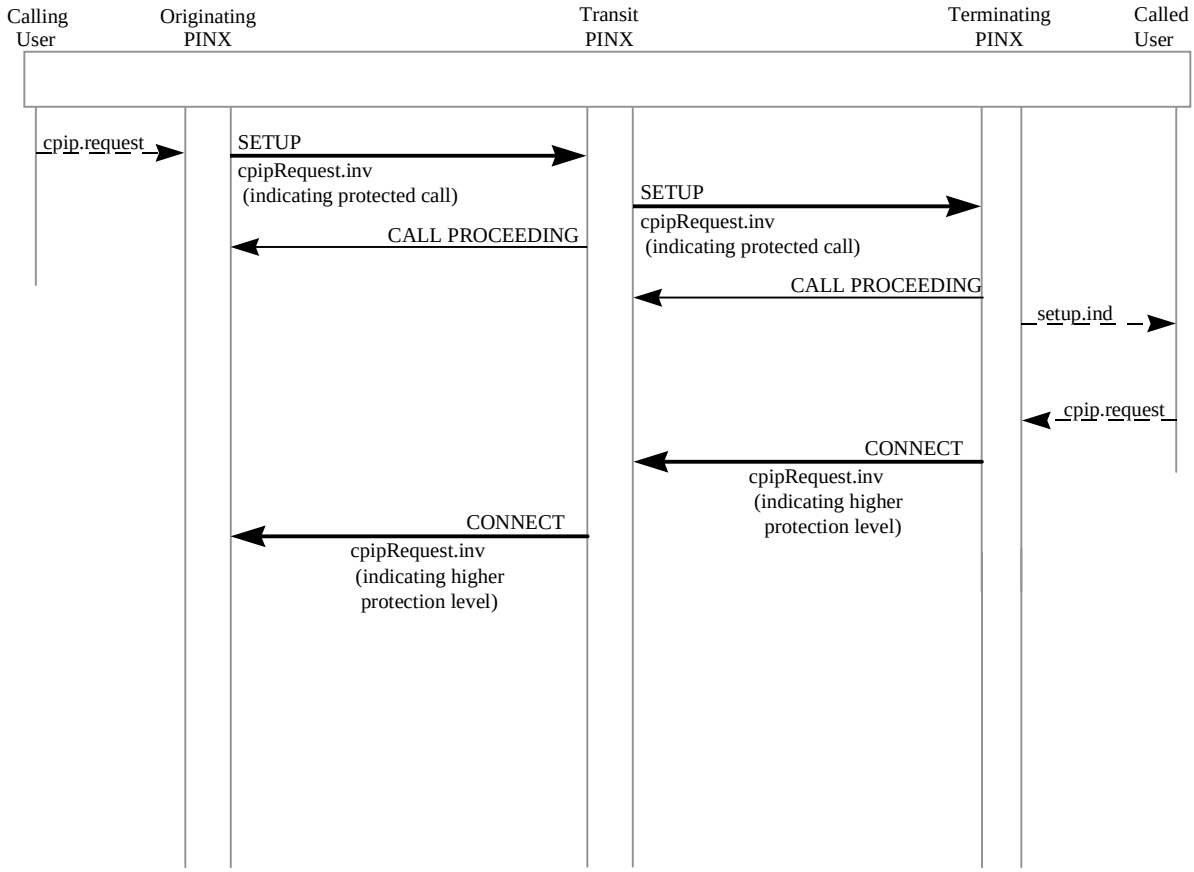

Figure B.4 - Message sequence for successful invocation of SS-CPIP

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Annex C
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Specification and Description Language (SDL) representation of procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Rec. Z.100 (1999).

Each diagram represents the behaviour of an SS-CPI or SS-CPIP Supplementary Service Control entity at a particular type of PINX. In accordance with the protocol model described in ISO/IEC 11582, the Supplementary Service Control entity uses, via Coordination Functions, the services of Generic Functional Procedures Control and Basic Call Control.

Where an output symbol represents a primitive to the Coordination Functions, and that primitive results in a message being sent, the output symbol bears the name of the message and any remote APDU(s) or notification(s) contained in that message. In the case of a message specified in ISO/IEC 11572, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the Coordination Functions, and that primitive is the result of a message being received, the input symbol bears the name of the message and any remote operations APDU(s) or notification(s) contained in that message. In the case of a message specified in ISO/IEC 11572, basic call actions associated with the receipt of that message are deemed to have occurred.

The following abbreviations are used:

.inv	Request invoke APDU
callInt.Req	callInterruptionRequest
callProt.Req	callInterruptionRequest
cpiPL	cpiProtectionLevel
cpiCL	cpiCapabilityLevel

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C.1 SDL representation of SS-CPI at the Originating PINX

Figure C.1 shows the behaviour of an SS-CPI entity within the Originating PINX.

Input signals from the left represent primitives from the user, or an entity acting on behalf of the user.

Output signals to the right represent primitives from the coordination functions in respect of messages sent.

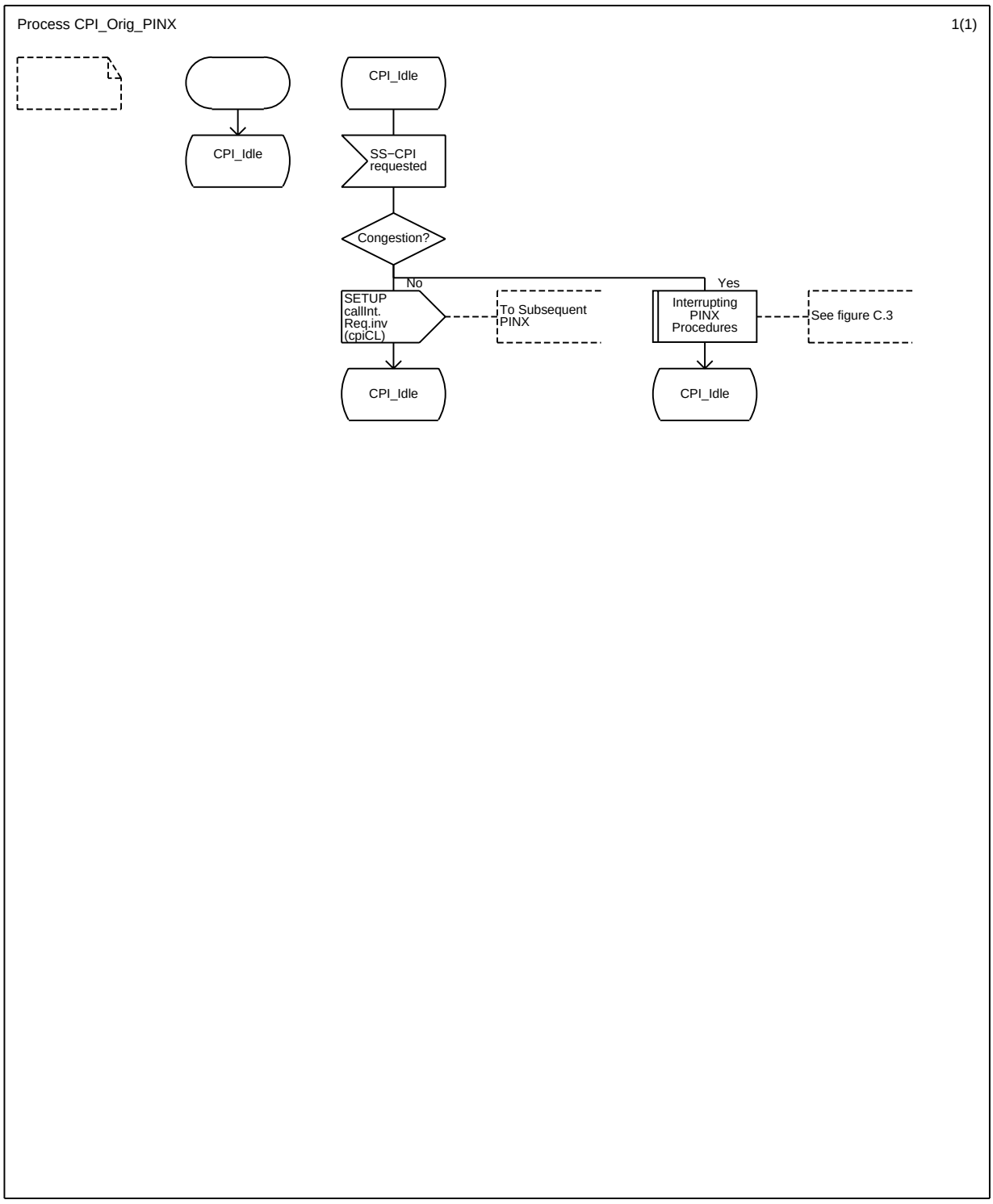

Figure C.1 (sheet 1 of 1) - Originating PINX SDL (SS-CPI)

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C.2 SDL representation of SS-CPI at the Transit PINX

Figure C.2 shows the behaviour of an SS-CPI entity within the Transit PINX.

Input signals from the left represent primitives from the coordination functions in respect of messages received from the Preceding PINX.

Output signals to the right represent primitives to the coordination functions in respect of messages sent to the Subsequent PINX.

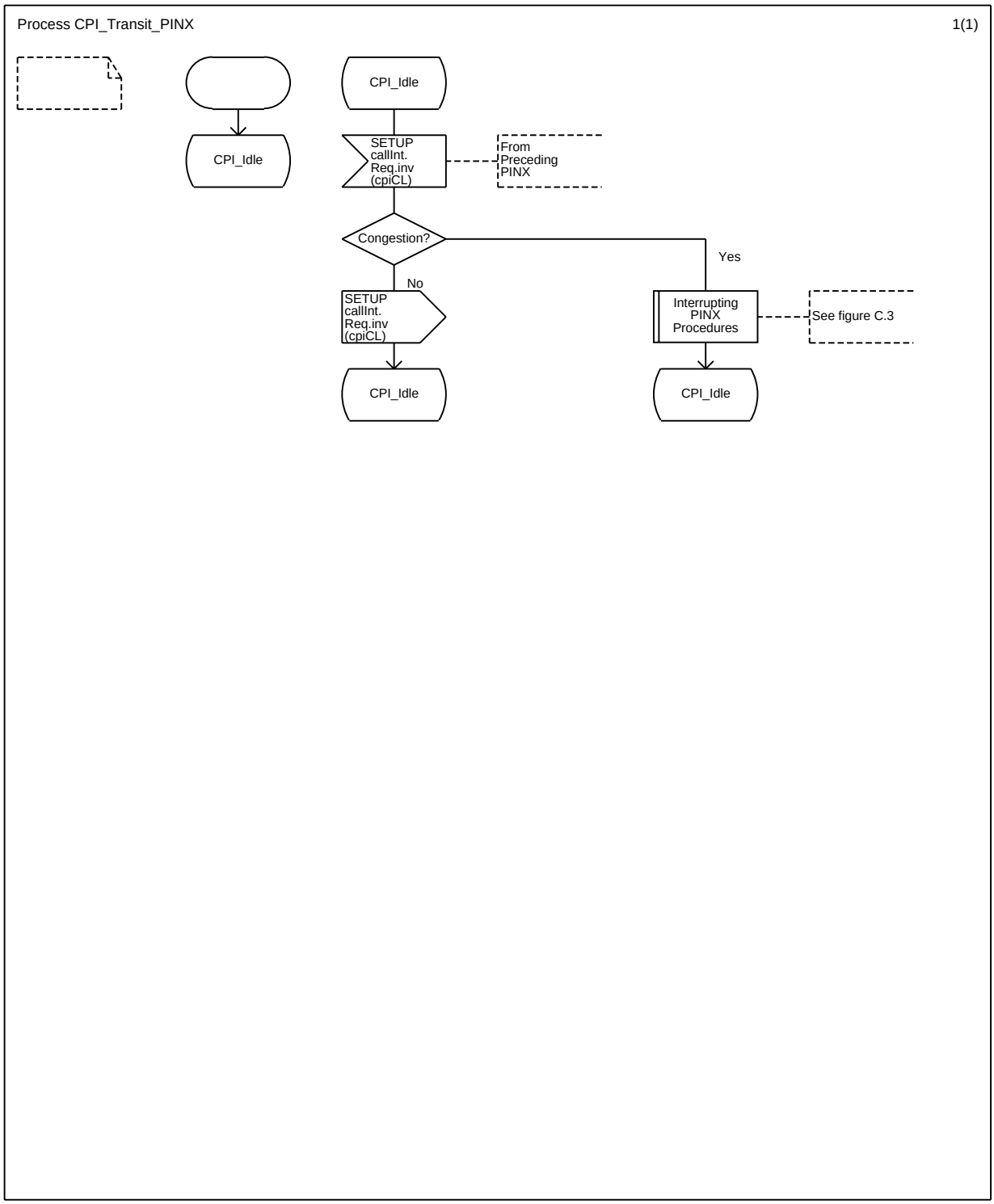

Figure C.2 (sheet 1 of 1) - Transit PINX SDL (SS-CPI)

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C.3 SDL representation of SS-CPI at the Interrupting PINX

Figure C.3 shows the behaviour of an SS-CPI entity within the Interrupting PINX.

Output signals to the left represent primitives to the coordination functions in respect of messages sent to the Preceding PINX. Output signals to the right represent primitives to the coordination functions in respect of messages sent to the Subsequent PINX and to the Adjacent PINXs. Timer expiry, clearing of the interrupting call, and release in respect of the established call or any other call on the required inter-PINX link are indicated by input signals from the right.

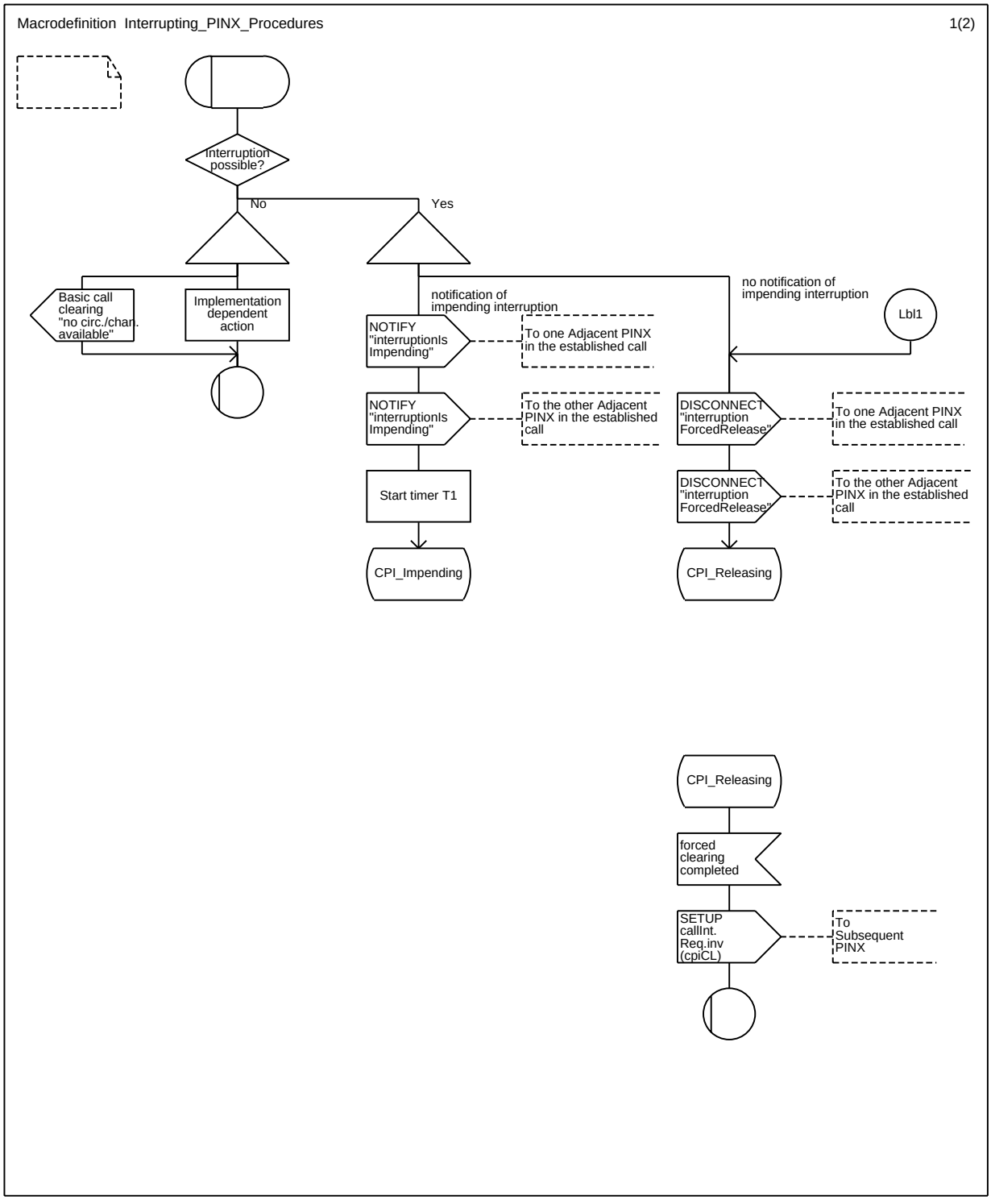

Figure C.3 (sheet 1 of 2) - Interrupting PINX SDL (SS-CPI)

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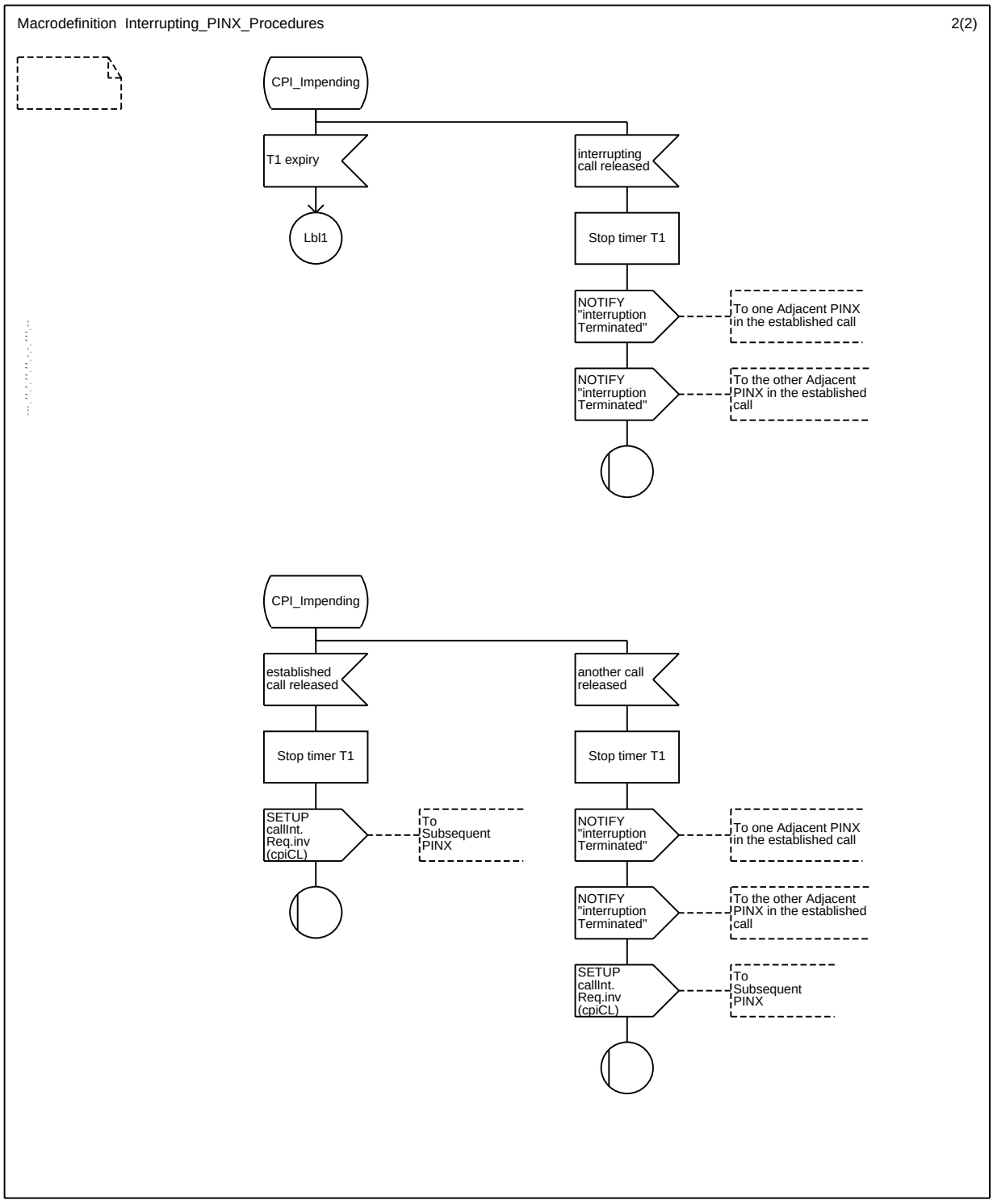

Figure C.3 (sheet 2 of 2) - Interrupting PINX SDL (SS-CPI)

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C.4 SS-CPIP at the Originating PINX

Figure C.4 shows the behaviour of an SS-CPIP entity within the Originating PINX.

Input signals from the left represent primitives from the user, or an entity acting on behalf of the user.

Input signals from the right represent primitives from the coordination functions in respect of messages received from the Subsequent PINX. Output signals to the right represent primitives to the coordination functions in respect of messages sent to the Subsequent PINX.

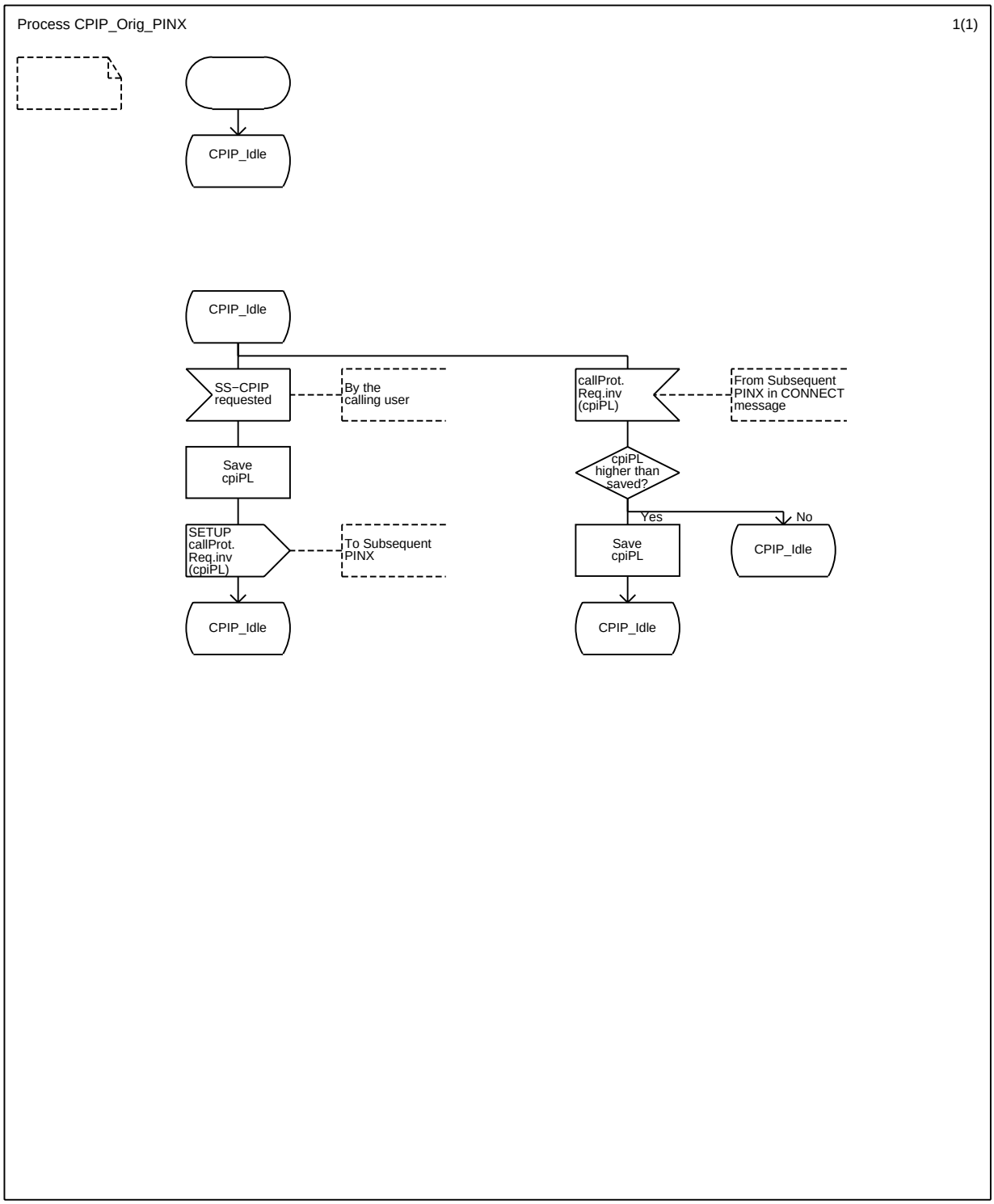

Figure C.4 (sheet 1 of 1) - Originating PINX SDL (SS-CPIP)

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C.5 SS-CPIP at the Transit PINX

Figure C.5 shows the behaviour of an SS-CPIP entity within the Transit PINX.

Input signals from the left represent primitives from the coordination functions in respect of messages received from the Preceding PINX. Output signals to the left represent primitives to the coordination functions in respect of messages sent to the Preceding PINX.

Output signals to the right represent primitives to the coordination functions in respect of messages sent to the Subsequent PINX. Input signals from the right represent primitives from the coordination functions in respect of messages received from the Subsequent PINX.

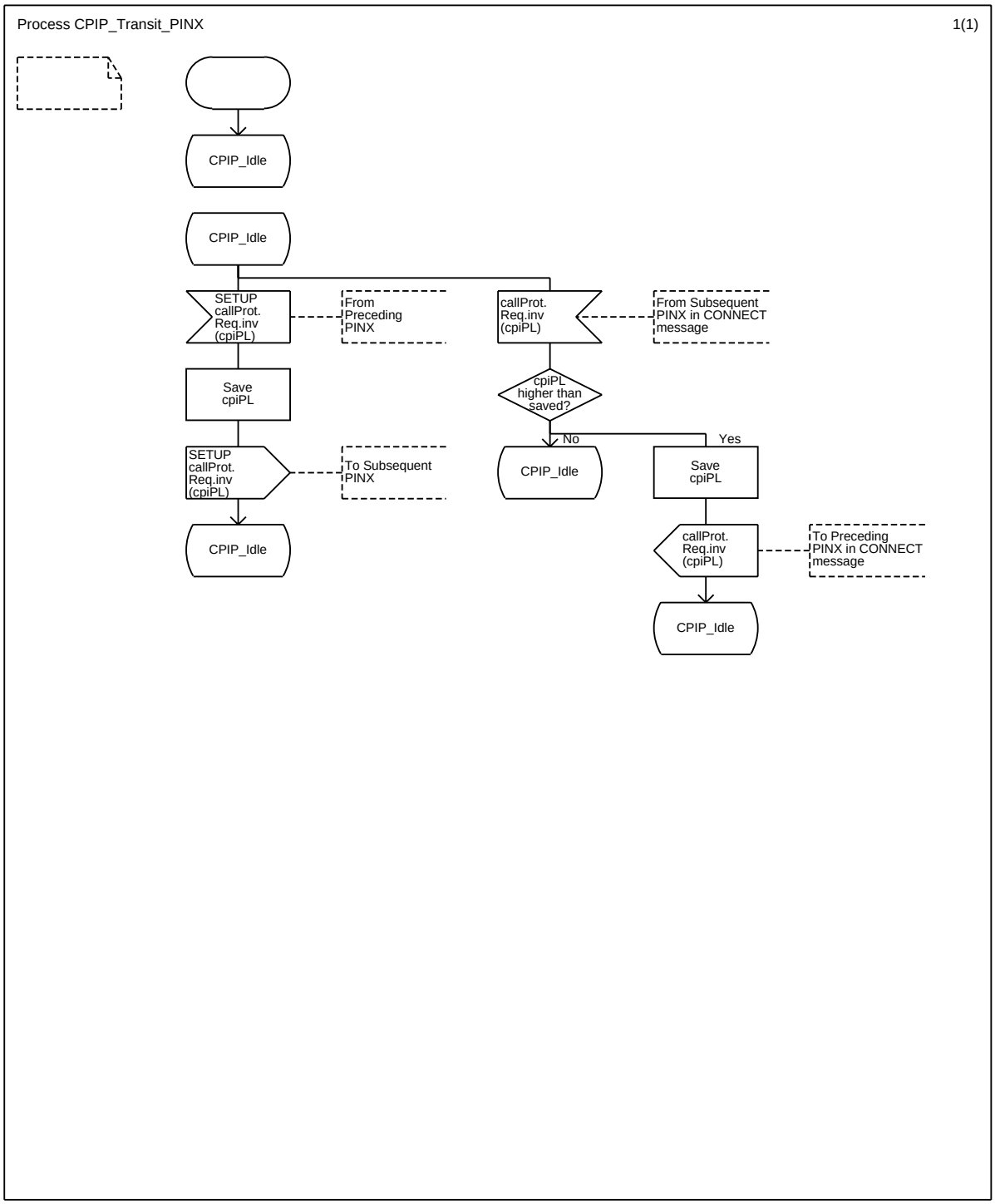

Figure C.5 (sheet 1 of 1) - Transit PINX SDL (SS-CPIP)

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C.6 SS-CPIP at the Terminating PINX

Figure C.6 shows the behaviour of an SS-CPIP entity within the Terminating PINX.

Input signals from the left represent primitives from the coordination functions in respect of messages received from the Preceding PINX. Output signals to the left represent primitives to the coordination functions in respect of messages sent to the Preceding PINX.

Input signals from the right represent primitives from the called user, or an entity acting on behalf of the called user.

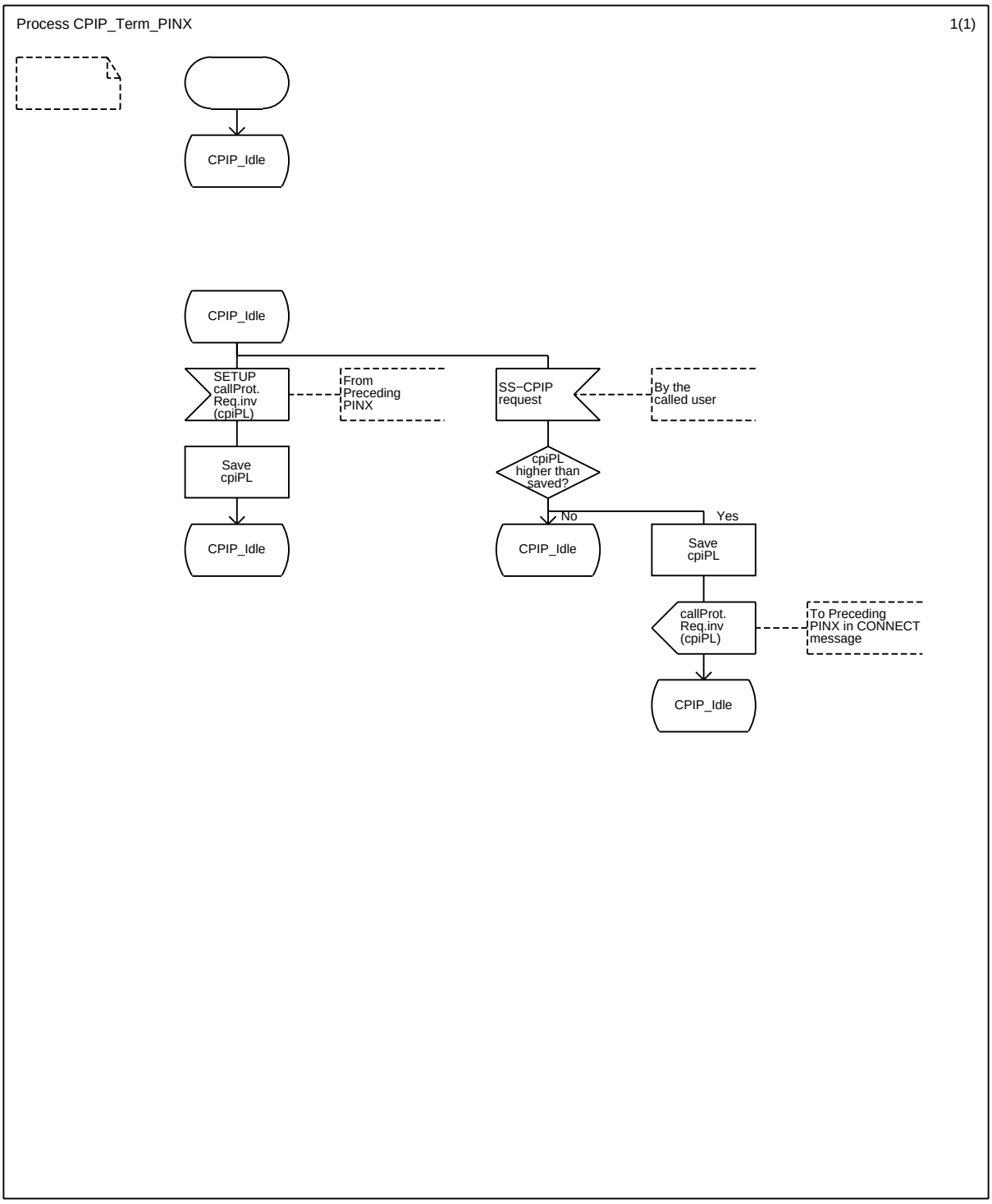

Figure C.6 (sheet 1 of 1) - Terminating PINX SDL (SS-CPIP)

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Annex D
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ASN.1 definitions according to ITU-T Recs. X.208 / X.209

This annex lists all ASN.1 modules as they were defined in the first edition of ISO/IEC 15992, i.e. based on ITU-T Recommendations X.208 / X.209. Starting with this edition the ASN.1 modules within ISO/IEC 15992 comply with ITU-T Recommendations X.680 / X.690. Please note that regardless of which version of these modules is used as a base of a QSIG implementation, the line encoding remains unchanged. Changes in future editions to modules based on X.680 / X.690 ASN.1 are not reflected in the modules in this annex.

Table D.1 - Call-Interruption-Operations - based on ITU-T Recs. X.208 / X.209

```
Call-Interruption-Operations
                    {iso (1) standard (0) pss1-call-interruption (15992) call-interruption-operations (0) }

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS             OPERATION FROM Remote-Operation-Notation
                        {joint-iso-ccitt (2) remote-operations (4) notation (0)}

                    Extension FROM Manufacturer-specific-service-extension-definition
                        {iso (1) standard (0) pss1-generic-procedures (11582) msi-definition (0)};

                    -- The following operations are defined:

CallInterruptionRequest ::= OPERATION
                        ARGUMENT            CPIRequestArg

CallProtectionRequest ::= OPERATION
                        ARGUMENT            CPIPRequestArg

                    -- The following arguments are defined:

CPIRequestArg       ::= SEQUENCE{
                        cpiCapabilityLevel  CPICapabilityLevel,
                        argumentExtension   CHOICE{
                            extension       [1] IMPLICIT Extension,
                            sequenceOfExtn  [2] IMPLICIT SEQUENCE OF
                                            Extension} OPTIONAL}

CPIPRequestArg      ::= SEQUENCE{
                        cpiProtectionLevel  CPIProtectionLevel
                        argumentExtension   CHOICE{
                            extension       [1] IMPLICIT Extension,
                            sequenceOfExtn  [2] IMPLICIT SEQUENCE OF
                                            Extension} OPTIONAL}

CPICapabilityLevel  ::= ENUMERATED{
                                interruptionLowPriority (1),
                                interruptionMediumPriority (2),
                                interruptionHighPriority (3)}
```


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Table D.1 - Call-Interruption-Operations - based on ITU-T Recs. X.208 / X.209 (concluded)

```
CPIProtectionLevel      ::=   ENUMERATED{
                                    noProtection (0),
                                    lowProtection (1),
                                    mediumProtection (2),
                                    totalProtection (3)}

callInterruptionRequest         CallInterruptionRequest         ::= 87
callProtectionRequest           CallProtectionRequest           ::= 88

END                     -- of Call-Interruption-Operations
```

Table D.2 - Call-Interruption-Notifications - based on ITU-T Recs. X.208 / X.209

```
Call-Interruption-Notifications
                        {iso (1) standard (0) pss1-call-interruption (15992) call-interruption-notifications (1) }

DEFINITIONS                     ::=
BEGIN

IMPORTS         NOTIFICATION FROM Notification-Data-Structure
                {iso (1) standard (0) pss1-generic-procedures (11582) notification-data-structure (7)};

        -- The following notifications are defined:

InterruptionIsImpending         ::=     NOTIFICATION
                                        ARGUMENT    NULL

InterruptionTerminated          ::=     NOTIFICATION
                                        ARGUMENT    NULL

InterruptionForcedRelease       ::=     NOTIFICATION
                                        ARGUMENT    NULL

interruptionIsImpending         InterruptionIsImpending         ::= 2008
interruptionTerminated          InterruptionTerminated          ::= 2009
interruptionForcedRelease       InterruptionForcedRelease       ::= 2010

END                                     --of Call-Interruption-Notifications
```

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