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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Networks — Addressing

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux privés à intégration de services — Adressage

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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. 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.

International Standard ISO/IEC 11571 was prepared by ECMA (as ECMA-155) 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 11571:1994), which has been technically revised.

Annexes C and F form an integral part of this International Standard. Annexes A, B, D and E are for information only.

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Introduction

This International Standard is one of a series of International Standards which are applicable to Private Integrated Services Networks (PISNs). Its purpose is to serve as a general and common reference for all addressing-related statements in other standards on PISNs.

This International Standard is based on the ISDN concept as developed by ITU-T and refined by ETSI for European applications, but modified to cover the particularities of PISNs. It conforms to the framework of International Standards for Open Systems Interconnection as defined by ISO/IEC.

This International Standard enables the Administrator of a PISN to choose whether

- the ISDN Numbering Plan according to ITU-T Rec. E.164, or
- a Private Numbering Plan, or
- an Implicit Numbering Plan, or
- an OSI NSAP addressing plan, or
- any combination of these numbering plans

shall be employed as native numbering plan(s) in its PISN (PISN NP).

In addition, the Administrator can employ PISN subaddressing in order to expand the addressing capacity beyond the capacity of the PISN NP.

The impact of this on terminal interchangeability between accesses of public and private ISDNs is indicated in annex D.

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 JTC1, 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 Networks - Addressing

1 Scope

This International Standard defines the requirements for the handling of network addresses for the identification of entities which use or provide telecommunication services offered by Private Integrated Services Networks (PISNs). This International Standard covers numbering, including the requirements for the support of a Private Numbering Plan, the addressing of network service access points for open systems interconnection (OSI NSAP addressing), and the support of subaddressing.

This International Standard is applicable to Private Integrated Services Network Exchanges with broad-band and narrow-band capabilities (PINX) and to terminals to be attached to the access of PINXs. Any use by a PINX of the Support of Private Numbering Plans supplementary service provided by a public ISDN is outside the scope of this International Standard.

Although this International Standard does not explicitly describe its application to location-independent (mobile) addressable entities, this application is not precluded.

2 Conformance

In order to conform to this International Standard, a PINX shall meet the mandatory requirements of clauses 6 to 8 and 10.

In order to conform to this International Standard, a terminal for attachment to an access of a PINX shall meet the mandatory requirements of clauses 9 and 11.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 8348:1996, *Information technology - Open Systems Interconnection - Network Service Definition.*

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).*

ITU-T Rec. E.160:1993, *Definitions relating to national and international numbering plans.*

ITU-T Rec. E.164:1991, *Numbering plan for the ISDN era.*

ITU-T Rec. I.334:1988, *Principles relating ISDN numbers/sub-addresses to the OSI reference model network layer addresses (Blue Book).*

ETS 300 059:1991, *Integrated Services Digital Network (ISDN); Subaddressing (SUB) supplementary service; Service description.*

ETS 300 062:1991, *Integrated Services Digital Network (ISDN); Direct Dialling In (DDI) supplementary service; Service description.*

ETS 300 089:1992, *Integrated Services Digital Network (ISDN); Calling Line Identification Presentation (CLIP) supplementary service; Service description.*

ETS 300 094:1992, *Integrated Services Digital Network (ISDN); Connected Line Identification Presentation (COLP) supplementary service; Service description.*

ETS 300 102-1:1990, *Integrated Services Digital Network (ISDN); User-network interface layer 3 specifications for basic call control.*

In addition to these normative references, informative references are listed in annex A.

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4 Definitions

The definitions in the following publications shall apply in ascending order (i.e., in the case of conflict the definition in the publication nearest the end of the list shall apply).

- ITU-T Rec. E.160,
- ISO/IEC 8348,
- the definitions given hereafter.

4.1 Address : Formalized information used to indicate unambiguously an identifiable entity. Within the context of this International Standard, identifiable entities are those which use or provide telecommunication services.

4.1.1 Number : An address restricted to containing numerical values, as defined by a numbering plan.

4.1.1.1 PISN Number : A number of the domain covered by a PISN Numbering Plan.

4.1.1.2 Partial Number : The subset of a number which is at least significant at a particular access of the network concerned for distinguishing addressable entities beyond that access.

4.1.2 Subaddress : A pat of an address beyond the addressing capability of a numbering plan.

4.2 Domain : The range of responsibility of a PISN Administrator for setting up numbering and/or addressing plans.

Note - The boundaries of a domain need not coincide with the physical boundaries of a given network.

4.2.1 Sub-Domain : A part of a domain where the responsibility for administering numbering and/or addressing plans is delegated to a subordinate PISN Administrator.

4.3 Explicit Numbering Plan : A numbering plan in which each number is accompanied by an indication as to which numbering plan it applies.

4.4 Implicit Numbering Plan : A numbering plan in which the numbers are not accompanied by an indication to which numbering plan they apply.

Note 1 - The numbering plan is either inferred by default or indicated by an escape code.

Note 2 - The relationship between a Dialling Plan and an Implicit Numbering Plan is explained in annex E.

4.4.1 Prefix : A (set of) defined leading digit(s) indicating within the context of an numbering plan the numbering plan or (sub)-domain in which the subsequent digits form a significant number.

4.4.2 Service Code : A string of digits and other characters that indicate the invocation of a service.

Note - Service codes are distinguished from numbers or addresses by

- the use of characters e.g. * or #, and/or;
- the call state in which the string of digits is provided.

4.5 Numbering Plan : A plan of numerical addresses defined for a specific numbering domain.

4.5.1 Native Numbering Plan : A numbering plan employed by a PISN Administrator in a given domain in a way that it unambiguously identifies the addressable entities of that domain.

4.5.2 Foreign Numbering Plan : A numbering plan not native to a given PISN, however, supported by it in so far as that it is known to the given PISN.

4.5.3 Private Integrated Services Network Numbering Plans (PISN NP) : The generic designation for the numbering plan(s) chosen as native by a PISN Administrator for its particular PISN.

4.6 ISDN Numbering Plan (ISDN NP) : The numbering plan explicitly relating to the global ISDN domain, as defined in ITU-T Recommendation E.164.

4.7 Private Numbering Plan (PNP) : The numbering plan explicitly relating to a particular private numbering domain, defined by the PISN Administrator of that domain.

4.7.1 PNP Number : A number belonging to a PNP.

4.7.2 Region : The entire domain or a sub-domain of a PNP.

Note - A region does not necessarily correspond to a geographical area of a PISN.

4.7.3 Region Code (RC) : The leading digits of a PNP Number which identify a region.

Note - The RC may be omitted to yield a shortened form of a PNP Number for use internally to that region.

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4.7.4 Regional Number (RN) : A particular form of a PNP Number which is unambiguous in the region concerned.

4.7.5 Complete Number : A number which is unambiguous in the entire PNP, i.e. which corresponds to the highest regional level employed in that PISN.

4.8 Dialling Plan : A plan according to which a user can identify addressable entities by means of numbers and, if applicable, of prefixes indicating the (sub)-domain, or of escape codes indicating the selection of another pre-defined numbering plan, to which the addressable entity belongs.

4.9 Numbering Plan Identifier (NPI) : An indication of the numbering plan to which a number belongs; it is separate from the number itself.

4.10 Type of Number (TON) : An indication which distinguishes the various complete and shortened forms of a number; it is separate from the number itself.

4.11 Escape Code : A code defined by a given numbering plan to indicate that the number following is significant only in another, defined numbering plan.

4.12 Selection Address/Number : An address or a number used to select an addressable entity to which a call is to be established.

Note - This term also applies to addresses in general, i.e. also to subaddresses.

4.13 Identification Address/Number : An address or a number when used to present an addressable entity identity to another user.

Note - This term also applies to addresses in general, i.e. also to subaddresses.

4.14 Multiple Subscriber Number (MSN) : One of multiple full or a partial numbers assigned to a user-to-network access.

4.15 PISN Administrator : The entity that has the function and responsibility of administering numbering and/or addressing plans for the PISN under their purview.

5 List of acronyms

Abbreviation	Meaning	Defined in
AFI	Addressing plan and Format Identifier	ISO/IEC 8348
CLIR	Calling Line Identification Restriction	
COLR	Connected Line Identification Restriction	
DCC	Data Country Code	ISO/IEC 8348
DDI	Direct Dialling-In supplementary service	E.160
DSP	Domain Specific Part	ISO/IEC 8348
DSS1	Digital Subscriber Signalling system No. 1	ITU-T
ESI	End System Identifier	
HO-DSP	Higher Order Domain Specific Part	
IA5	International Alphabet no. 5	Q.931
ICD	International Code Designator	ISO/IEC 8348
IDI	Initial Domain Indication	ISO/IEC 8348
IDP	Initial Domain Part	ISO/IEC 8348
ISDN	Integrated Services Digital Network	ITU-T
MSN	Multiple Subscriber Number	this document
NP	Numbering Plan	this document
NPI	Numbering Plan Identifier	this document
NSAP	Network layer Service Access Point	ISO/IEC 8348
OSI	Open Systems Interconnection	ISO/IEC 8348
PINX	Private Integrated service Network eXchange	ISO/IEC 11579-1
PISN	Private Integrated services Network	ISO/IEC 11579-1
PNP	Private Numbering Plan	this document

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PSTN	Public Switched Telephony Network	ITU-T
Q	Q reference point	ISO/IEC 11579-1
RC	Region Code	this document
RN	Regional Number	this document
S	S reference point	ISO/IEC 11579-1
SEL	Selector	
T	T reference point	ISO/IEC 11579-1
TE	Terminal Equipment	ISO/IEC 11579-1
TON	Type of Number	this document
TOS	Type of Subaddress	ITU-T Rec. I.334

6 PISN addressable entities

Depending on the numbering plan(s) employed, a PISN shall be able to assign an appropriate PISN number to each of its addressable entities.

Note 1 - An addressable entity can be associated with:

- a single access of the PISN;
- several accesses of the PISN (e.g. a line hunting group);
- an internal entity of the PISN (e.g. a service provider);
- an OSI Network layer Service Access Point (OSI NSAP).

Note 2 - A PISN number is not required to identify a particular channel of an interface that is comprised of more than one channel. Indirect identification can however, occur, e.g. when a PISN number identifies one-to-one correspondence between the interface and a particular application with a one-to-one correspondence to a particular channel.

Note 3 - A PISN number can fulfil only one of the functions.

A PISN may be able to assign more than one number to the same access of the PISN, in accordance with the Multiple Subscriber Number supplementary service.

7 Requirements on numbering plans, and on their inter-relationships

PISNs shall employ numbering plans, i.e. the addresses used within their addressing domains shall be numbers.

Depending on the choice of the PISN Administrator, the configuration management shall allow the employment of the following numbering plans as native PISN numbering plans:

- the ISDN numbering plan according to ITU-T Rec. E.164, hereafter referred to as "ISDN NP"; or
- a Private Numbering Plan, hereafter referred to as "PNP"; or
- an implicit Numbering Plan; or
- the Data Country Code numbering plan according to International Standard ISO/IEC 8348, hereafter referred to as “DCC NP”;
- the International Code Designator numbering plan according to International Standard ISO/IEC 8348, hereafter referred to as “ICD NP”; or
- any combination of these numbering plans.

In order for the PISN to employ ITU-T Rec. E.164 or the DCC NP or the ICD NP as native numbering plans, the PISN Administrator must first secure the assignment of a numbering resource from the appropriate national or international Administrator of those resources.

Note - For further information on the use of these numbering plans see informative annex B.

For the purpose of this International Standard

- the addressing domain of a PISN shall be assumed to be the whole PISN. If a PISN is divided into two or more addressing domains, each with its own PISN NP, each addressing domain shall be considered to be a separate PISN;

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- communication between one addressing domain and another addressing domain shall be treated as interworking between two PISNs;
- a single addressing domain spanning more than one PISN shall be considered as a single PISN.

7.1 Coding of PISN numbering plans

Whereas in the DCC NP and the ICD NP the number digits are always binary coded (see ISO/IEC 8348), the ISDN NP and the PNP can alternatively be IA5-character-coded, see annex F. The IA5 character coding scheme employs a Type Of Number (TON) value which enables users to indicate the hierarchical level a dialled number belongs to.

7.2 Content of PISN numbers

7.2.1 PISN numbers using the IA5 character coding scheme

IA5 character coding can be employed by the ISDN NP, the PNP and the implicit numbering plan. See table 1.

Note - For further information on the use of these numbering plans, see annex B.

Table 1 - TON values for the E.164, PNP and Unknown NP indications

Explicit Format		Implicit Format
NPI = E.164	**NPI = PNP**	**NPI = UNKNOWN**
international number	level 2 regional number	
national number	level 1 regional number	
subscriber number	local number	
partial (Note 1)	partial (Note 1)	
unknown (Note 1)	unknown (Note 1)	unknown (Note 2)
network specific number	reserved	
abbreviated number	reserved	

Note 1 - In the Layer 3 signalling protocol standards on DSS1 applicable at the T and at the coincident S/T reference points, the TON values “UNKNOWN” and “Partial” share the same codepoints. Distinction is made by the direction of number information flow:

At the boundary between the public ISDN and a PISN the meanings for Selection Numbers is “UNKNOWN” if the information flow is to the public ISDN, and the meaning is “Partial” if the information flow is from the public ISDN (i.e. in the context of DDI). For Identification Numbers the meanings are reversed.

At the boundary between the PISN and its terminals the meanings for Selection Numbers is “Partial” if the information flow is from the PISN to the terminal (i.e. in the context of MSN), and the meaning is “UNKNOWN” if the information flow is from the terminal to the PINX. For Identification Numbers the meanings are reversed.

Note 2 - The number digits follow an implicit numbering plan and can include prefixes.

In the explicit format the numbering plan indicator (NPI) shall have a value other than "UNKNOWN". The TON shall be set to either "UNKNOWN" or to any of the other values specified for the NPI concerned. Except where the TON is set to "UNKNOWN", the number digits shall not include prefixes.

In the implicit format the NPI shall have the value "UNKNOWN". The TON shall only take the value "UNKNOWN". If applicable, the number digits shall include prefixes, according to the implicit numbering plan employed.

7.2.2 DCC and ICD numbering plans

The numbering plans use the OSI NSAP format. The allocation of numbers is under the control of the numbering authority, as specified in ISO/IEC 8348.

Note - The PISN Administrator usually administrates its own sub-domain.

7.3 Content of the number digits in a PISN Numbering Plan

7.3.1 ISDN NP

The content of digits of the ISDN NP is outside the scope of this International Standard. Information can be found in ITU-T Rec. E.164.

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7.3.2 PNP

A PNP Number shall comprise a sequence of x decimal digits (0,1,2,3,4,5,6,7,8,9) with the possibility that different PNP Numbers within the same PNP can have different values of x. The maximum value of x shall be the same as for the public ISDN numbering plan, see ITU-T Rec. E.164.

Note 1 - Within this range, the minimum/maximum value of x in a particular PISN will be determined by the PISN Administrator.

Note 2 - It is the PISN Administrator's responsibility to choose the appropriate numbering capabilities of the PINXs and terminals for that PISN.

With the value of TON = UNKNOWN any prefixes are additional to the value of x.

Note 3 - The definition of prefixes and service codes (consisting of e.g. decimal digits and/or special or alpha characters like *, #, A, B, C...) is the responsibility of the PISN Administrator and is outside the scope of this International Standard.

7.3.3 Unknown NP

For a number of an Unknown NP the same value x for the number of digits shall apply as specified for the PNP, see 6.2.2. Any prefixes shall be additional to the value of x.

Note - The definition of prefixes and service codes (consisting of e.g. decimal digits and/or special or alpha characters like *, #, A, B, C...) is the responsibility of the PISN Administrator and is outside the scope of this International Standard.

7.3.4 DCC NP

The numbers of a DCC NP are conceived to be globally unique. i.e. the hierarchical level of the numbers in the DCC NP will correspond to "international" in the ISDN NP. Parts of the number are under the control of the numbering authority, as specified in ISO/IEC 8348.

Note - The PISN Administrator usually administrates its own sub-domain.

7.3.5 ICD NP

The numbers of an ICD NP are conceived to be globally unique. i.e. the hierarchical level of the numbers in the ICD NP will correspond to "international" in the ISDN NP. Parts of the number are under the control of the numbering authority, as specified in ISO/IEC 8348.

Note - The PISN Administrator usually administrates its own sub-domain.

7.4 Structure of Private Numbering Plans

7.4.1 PNP in the IA5 character coding format

A PNP can be hierarchically organized by means of regions. Shortened forms of PNP Numbers can then be used in certain parts of a PISN.

Note 1 - A region (i.e., level 0, 1, or 2) will typically comprise one or more PINXs; but in principle there is nothing to prevent a numbering boundary from occurring inside a PINX.

Different levels of region are made possible by using regions in a recursive manner. Therefore, within a region of level n, one or more regions of level n-1 may exist. The highest level of regioning encompasses the entire PNP. A PNP Number which has significance within level n shall be called a level n regional number. The lowest level of a region shall be called level 0. The maximum level number in a PISN shall be two, corresponding to three levels in total. See annex F for an example.

Note 2 - The parsing (i.e., the analysis and interpretation of digits) within a given level is outside the scope of this International Standard.

Note 3 - In a PNP without hierarchical structure, level 0 is the level that exists if the only region is 0.

The TON indicator shall indicate the level of region to which a PNP Number belongs. Where the TON indicator has the value "UNKNOWN", the level to which a PNP Number belongs shall be clear from the digits of the number, e.g. by the use of prefixes or implied by the leading digits.

A level 0 regional number shall be called a local number (LN). An RN for the highest level which exists within a PNP shall be called a Complete Number.

A level n RN with n greater than 0 shall include a level n-1 RN and a level n-1 region code (RC) identifying the level n-1 region to which the level n-1 RN belongs. The level n-1 RC shall occupy the leading digits of the level n RN, and the level n-1 RN shall occupy the trailing digits. This is illustrated in figure 1.

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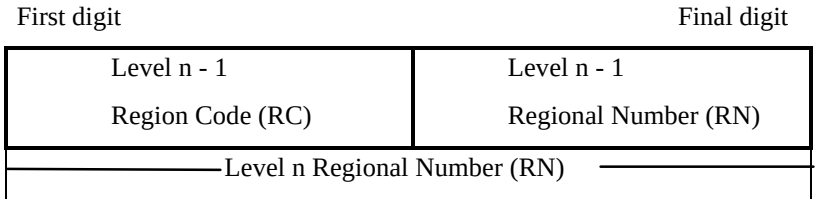

Figure 1 - Structure of a Level n Regional Number

A full 3 level structure is shown in figure 2.

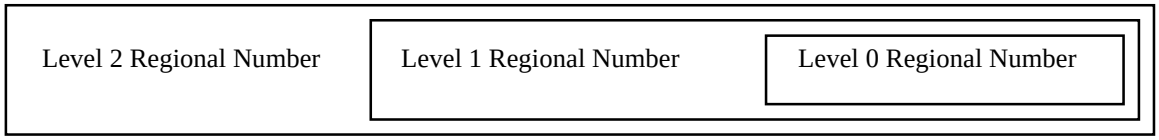

Figure 2 - Structure of a PNP Number with three levels of regions

A level n RN shall have significance only within the level n region to which it applies. When that number is used outside that level n region, it shall be in the form of an RN of level greater than n. Only a Complete Number shall have significance throughout the entire PNP.

It shall not be necessary for all level n-1 RCs in a level n region to have the same number of digits. It shall be possible for the number of digits in a level n-1 RC to be 0.

It shall not be necessary for all level n-1 RNs within a level n region to have the same number of digits.

7.4.2 PNP in the binary coding format

Since the binary coding format does not allow the indication of hierarchical levels, the contents of a PNP number shall always be a complete number.

7.5 Relationship between the Private and the ISDN Numbering Plan

If a PNP is employed in a given PISN, any addressable PISN entity shall be able to be identified by more than one number, viz. a number of the PNP and a number of the ISDN Numbering Plan. If applicable, the PISN shall be responsible for converting between the PNP and the ISDN Numbering Plan.

Note 1 - A simple relationship between PNP Numbers and ISDN Numbers, e.g. conformity of the significant (e.g. the last few) digits of the PNP Number and a partial ISDN Number, will

- facilitate interworking of the two numbering plans,
- provide better visibility to users, and
- simplify directories.

Note 2 - The case where a PISN user has a PNP Number but no ISDN Number does not prevent him from communicating with users of public ISDNs. Outgoing calls from the user to a public ISDN are possible, although no identification of the originating user (other than a possible subaddress) can be given to the public ISDN. Incoming calls can only be established indirectly via another PISN user (e.g. a PISN directory service or attendant).

7.6 Relationship between other members of the PISN NP and the ISDN NP

For any type of PISN NP other than PNP employed in a given PISN, any addressable PISN entity shall be able to be identified by more than one number, viz. a number of that other PISN NP and a number of the ISDN Numbering Plan. If applicable, the PISN shall be responsible for converting between the other PISN NP and the ISDN Numbering Plan.

There can be public networks which, in addition to employing the ISDN NP in the IA5 coding format, also support the ISDN NP in the binary coding format. However, as a default the PISN shall be capable of converting ISDN numbers between the two coding formats, if so applicable.

7.7 Relationship between PNP numbers in different PISNs

When two PISNs are directly connected in a way that communication can be established between a user of one PISN and a user of the other PISN without involving a public network, any user in one PISN who needs to receive calls directly from the other PISN shall have a PNP Number from the other PISN's PNP, in addition to a PNP Number of his own PISN's PNP.

Note 1 - A PNP Number of one PISN's PNP has no significance in the other Network's PNP.

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When using Selection Numbers, each PISN shall be responsible for ensuring that the only PNP Numbers sent to the other PISN are numbers of the other PISN's PNP.

Note 2 - Similar responsibility should apply to Identification Numbers. If this is not possible, they should preferably be suppressed. Otherwise, if they were sent unchanged to the other PISN, they might not be adequate for identification purposes.

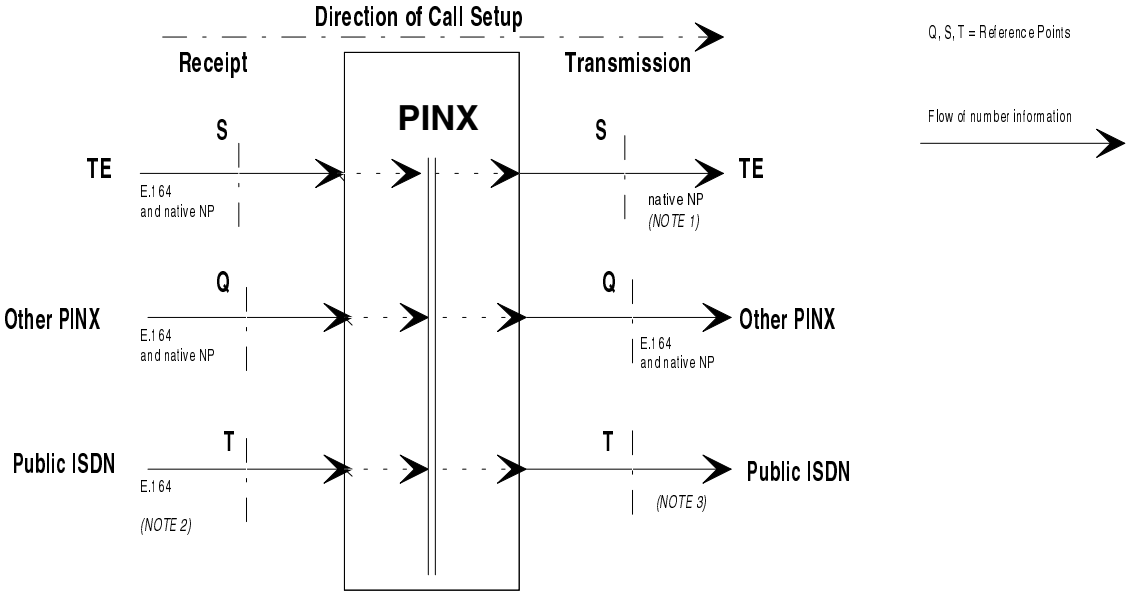
8 Number handling requirements of private integrated services network exchanges

This clause specifies the numbering formats of Selection and Identification Numbers which a *PINX* shall be able to accept and to provide at the following interfaces:

- PISN access interfaces at the S reference point;
- public ISDN access interfaces at the T reference point;
- inter-PINX connections at the Q reference point.

The reference points are defined in ISO/IEC 11579-1.

Figure 3 indicates the numbering plan identifications to be accepted and provided for Selection Numbers.



Note 1 - In the case of an MSN arrangement only, see normative annex C.

Note 2 - In the case of the DDI supplementary service only.

Note 3 - Specified in standards for the public ISDN.

Figure 3 - Numbering formats for Selection Numbers

Figures 4 and 5 indicate the numbering plan identifications to be accepted and provided for Origination and Destination Identification Numbers, respectively.

Note - The term "native NP" indicates that, according to the choice of the PISN Administrator, any of the NPI values can occur, see clause 7. The indication "E.164 and native NP" means that the ISDN Numbering Plan will occur in any case, irrespective of whether E.164 has been chosen as a native NP (applicable to figures 3 to 5).

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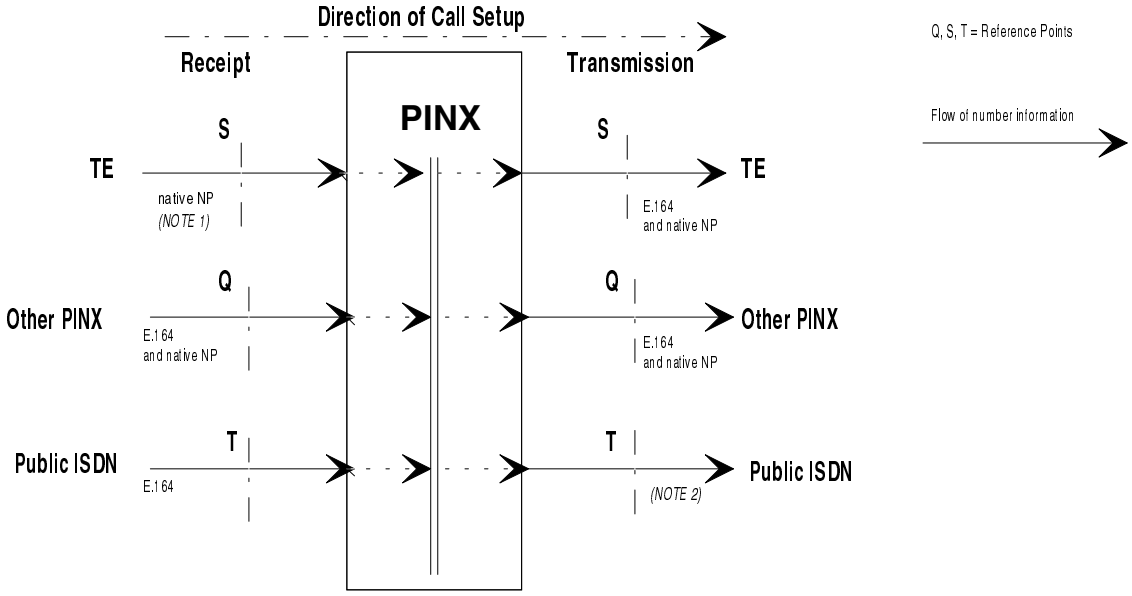
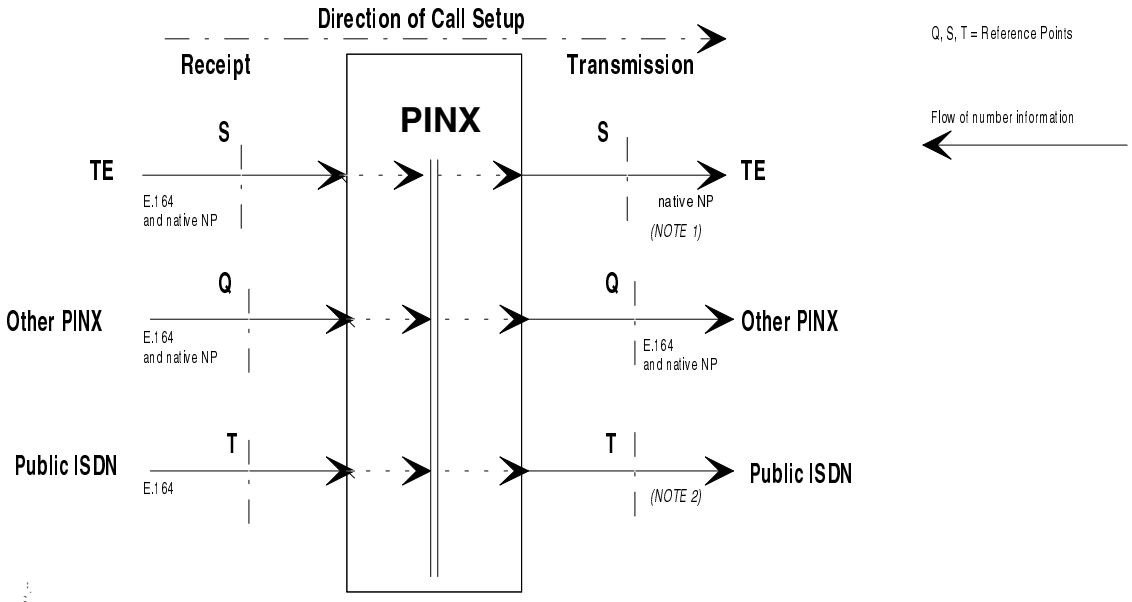


Note 1 - In the case of an MSN arrangement only, see annex C.

Note 2 - Specified in standards for the public ISDN.

Figure 4 - Numbering formats for Originating Identification Numbers



Note 1 - In the case of an MSN arrangement only, see annex C.

Note 2 - Specified in standards for the public ISDN.

Figure 5 - Explicit numbering formats for Destination Identification Numbers

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8.1 PINX Requirements for the Acceptance of Received Numbers

This clause specifies the forms of numbers a PINX shall be able to accept as Selection Numbers during call establishment, and as Identification Numbers in connection with supplementary services.

A PINX shall interpret a received IA5-coded PNP Number with a region level less than the highest level used in that numbering plan (i.e. not a Complete Number), as relating to the region of that level to which the PINX belongs.

If a PINX receives a PNP number and the domain does not employ a PNP, the received number shall be treated as invalid.

If a PINX receives an implicit number and the domain does not employ an implicit NP, the received number shall be treated as invalid.

If a PINX receives an IA5-coded PNP number with a TON value which has no meaning within the domain concerned (e.g. region level too high), the received number shall be treated as invalid.

If a PINX receives a PISN NP number of a type which the domain does not employ, the received number shall be treated as invalid.

The action to be taken on receipt of a number which is found to be invalid is outside the scope of this International Standard.

In all cases, a PINX shall be able to accept an accompanying subaddress.

8.1.1 Numbering formats accepted with IA5-coded Selection Numbers

A PINX shall be able to accept any of the following numbering formats as a Selection Number.

8.1.1.1 S reference point

Any of the numbering formats specified in 7.2.1 shall be accepted as valid in a received Selection Address, except that for PARTIAL.

Note - This does not necessarily mean that a calling PISN user actually submits a number when requesting connection establishment. Alternatively, he can have arranged the TE for automatic provision of a pre-determined Selection Number.

8.1.1.2 Q reference point

Any of the numbering formats specified in 7.2.1 shall be accepted as valid in a received Selection Address, except that for PARTIAL.

8.1.1.3 T reference point

A PINX shall be able to accept any of the formats for DDI numbers specified in ETS 300 062, according to the DDI arrangements.

8.1.2 Numbering formats accepted with IA5-coded Identification Numbers

A PINX shall be able to accept any of the following numbering formats as an Identification Number.

8.1.2.1 S reference point

If an access is not arranged for MSN, the PINX shall provide the identity information and classify it as "PISN PROVIDED".

If a TE provides identity information to the PINX, the PINX shall ignore it.

If an access is arranged for MSN, the PINX shall apply a screening function to the identity information received from a TE on such an access.

The details for the format (explicit/implicit, NPI value, TON value, number of MSN digits in the case of a partial number) depend on the MSN arrangement. The possibilities are given in annex C of this International Standard.

The PINX shall distinguish between the following cases:

a) **TE provides no identity information**

The PINX shall provide a default identity information and classify it as "PISN PROVIDED".

b) **TE provides identity information**

If the identity information corresponds to the MSN arrangement, the PINX shall proceed accordingly (i.e. complete a partial number, if this was arranged for) and classify the identity information as "USER PROVIDED".

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If the identity information does not correspond to the MSN arrangement, the PINX shall discard the identity information received, replace it with a default identity information according to the MSN arrangement and classify it as "PISN PROVIDED".

8.1.2.2 Q reference point

Any of the numbering formats specified in 7.2 shall be treated as valid in a received Identification Number except, in the case of an IA5-coded number, that for PARTIAL.

However, a PINX can instead receive an indication "NUMBER NOT AVAILABLE DUE TO INTERWORKING" or "NUMBER RESTRICTED". This indication shall be accepted and forwarded by the PINX.

8.1.2.3 T reference point

Note - The format in which a public ISDN offers Identification numbers to a PISN is covered in ETSs 300 089 and 300 094 and is beyond the scope of this International Standard.

A PINX shall be able to accept numbers only with NPI value "E.164" as part of an Identification Address. In the case of an IA5-coded number any TON values shall be accepted by the PINX.

However, a PINX can instead receive an indication "NUMBER NOT AVAILABLE DUE TO INTERWORKING" or "NUMBER RESTRICTED". An addressing request with this indication shall be accepted and forwarded by the PINX.

A PINX can optionally convert an ISDN Number into a PNP Number prior to passing it on, if the received ISDN Number is recognized as corresponding to a PNP Number.

8.2 PINX requirements for the provision of numbers

This sub-clause specifies the numbering formats a PINX shall use when providing Selection Numbers or Identification Numbers at its various interfaces.

A PINX shall perform the conversion of a number from one format to another format where necessary in order to meet the requirements below.

In addition, if two adjacent PINXs are in different regions of the same regional level, a PINX shall not send an IA5-coded regional number of that level to the other PINX. Instead, it shall convert the number into a regional number of a higher level by adding the appropriate regional code(s) and changing the TON value accordingly.

8.2.1 Numbering formats provided with Selection Numbers

A PINX shall transmit Selection Numbers in the following numbering formats.

8.2.1.1 S reference point

If more than one PNP Number is associated with the access, the PINX shall transmit the Selection Number across the access. The number shall be provided in either the implicit numbering format or in one of the explicit numbering formats, see 7.2, according to the details of the MSN arrangement, see annex C.

8.2.1.2 Q reference point

A number shall be provided in either the explicit or implicit numbering formats, see 7.2. With IA5-coded numbers any TON value can apply, except that for PARTIAL.

Note - Reasons for using the E.164 NP in addition to the native NP can be:

- The calling user has provided an E.164 number for a destination in the public ISDN, and the originating PINX does not have, or does not choose to use, immediate access to the public ISDN.
- The calling user has provided an E.164 number for a destination which is in fact the PISN, and the originating PINX does not have the capability of deducing the fact that the destination is in the PISN and converting it to a PISN number.
- The destination is in the PISN, but the PINX chooses to send an E.164 number because it knows that routeing via a public ISDN is necessary.

8.2.1.3 T reference point

The format in which a PINX shall transmit Selection Numbers to the public ISDN is covered in ETS 300 102 and is beyond the scope of this International Standard.

Note - A PISN will be required to submit numbers either

- in the explicit format with NPI value "E.164" as part of a Selection Number; With IA5-coded numbers any TON value can apply, see 7.2.1, except that for PARTIAL; or

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- according to the implicit numbering format with the NPI value UNKNOWN.

8.2.2 Numbering formats provided with Identification Numbers

Identification Numbers shall be provided by a PINX in the following numbering formats.

If there is no number available to send, an indication "NUMBER NOT AVAILABLE DUE TO INTERWORKING" or "NUMBER RESTRICTED" shall be sent instead.

8.2.2.1 S reference point

Depending on supplementary services, e.g. Calling Line Identification Presentation, a PINX can transmit an Identification Number to the TE.

As a PISN management option, the Identification Number can be provided either in the implicit numbering format or in one of the explicit numbering formats, see 7.2.

With IA5-coded numbers *any* TON value can apply, see 7.2.1, except that for PARTIAL.

The actual submission of Identification Numbers to the TE is subject to identification supplementary services and is outside the scope of this International Standard.

8.2.2.2 Q reference point

Identification Numbers shall be interchanged between PINXs which can be used in the context of supplementary services, e.g. Calling Line Identification Presentation.

An Identification Number can be provided in either the implicit or one of the explicit numbering formats.

Any TON value can apply, see 7.2.1, except that for PARTIAL.

8.2.2.3 T reference point

The format in which a PINX shall transmit Identification Numbers to the public ISDN is covered by ETSs 300 089 and 300 094 and is beyond the scope of this International Standard.

Note - The Administrator of a PISN can agree on a special non-screening arrangement with the operator of the public ISDN, which prevents the public ISDN from screening Identification Numbers submitted by the PISN.

A PISN will be required to submit Identification Numbers either

- in the explicit format only, with NPI value "E.164". With IA5-coded numbers any TON value can apply, see 7.2.1, or
- according to the implicit numbering format with the NPI value UNKNOWN.

If a non-screening arrangement has been established with the public ISDN operator, the PINX can use the TON values NATIONAL or INTERNATIONAL. In the first case, the public ISDN will still be allowed to manipulate the TON value before presenting it to the remote user, e.g. to INTERNATIONAL, depending on whether the receiving user resides outside the country concerned. In the second case, the public ISDN will not manipulate the TON value. The number digits need not be part of the ISDN number set which might have been assigned to the PISN-to-public ISDN access in the context of DDI.

If a non-screening arrangement does not exist, the PISN shall present an identification Number according to the arrangement for DDI.

The public ISDN will screen the Identification Number for plausibility, and alter it to SUBSCRIBER, NATIONAL or INTERNATIONAL number as appropriate to the party receiving the Identification Number.

If the number concerned is a PNP Number with no corresponding ISDN Number, no number shall be transmitted.

9 Address handling requirements of terminals attached to private integrated services network exchanges

This clause specifies the address handling requirements of terminals for attachment to a PINX via an interface at the S reference point.

Except for the case of sending a Selection Number and receiving an Identification Number, the requirements apply only when the terminal is to be used on an access which has been arranged for the support of the MSN arrangement, see annex C.

9.1 Selection Number handling

9.1.1 Outgoing calls

A terminal shall transmit a Selection Number either in one of the explicit formats or in the implicit format. If IA5 number coding is employed, the appropriate values of NPI and TON shall be chosen, as specified in 7.2.1.

In the case of the explicit formats and IA5-coding, any TON value can apply except PARTIAL.

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Within the scope of this International Standard any of the NPI values indicated in 7.2 can be used, depending on which numbering domain the addressed entity belongs to.

Note - The format can vary on a per call basis.

9.1.2 Incoming calls

A terminal arranged for MSN, shall be able to accept a Selection Number. Its behaviour is specified in clause 11.

The Selection Number received shall be screened against (one of) the Multiple Subscriber Number(s) which the terminal, in the context of the MSN arrangement, has been arranged for.

If the outcome of the screening process is negative, the terminal shall either explicitly reject or ignore the incoming call request. If the outcome of the screening process is positive, the terminal shall offer the call request to its user.

Note - Care should be taken when connecting terminals which are arranged for the MSN arrangement and terminals which are not arranged for the MSN arrangement in parallel to the same multi-point interface, e.g. a basic rate interface. In such a case, it cannot be guaranteed that the MSN arrangement works correctly. It can happen that a terminal not arranged for the MSN arrangement reacts faster to an incoming call request than a terminal arranged for the MSN arrangement, i.e. that the MSN arrangement is overridden by the basic service.

9.2 Identification Number handling

9.2.1 Sending of identification address

A terminal shall send its multiple subscriber number as (part of) the Identification Number whenever the user originates an outgoing call or answers an incoming call. For the details of the MSN arrangement see annex C.

9.2.2 Reception of identification address

If a terminal supports line identification presentation supplementary services, it shall accept an Identification Number identifying another user in a call, e.g. when an outgoing call has been answered or an incoming call is presented.

For the formats to be supported, see 8.2.2.1; for information on terminal interchangeability between private and public ISDNs, see annex D.

10 Subaddressing in PISNs

In order to cope with cases in which the numbering plan(s) employed by the PISN are not sufficient to unambiguously identify an addressable entity, the PISN shall provide the transfer of subaddress information within its basic services. The length and structure of a subaddress shall follow clause 1.2 of ITU-T Rec. I.334.

Note 1 - Applications of subaddressing can be:

- Selection of a specific application process at the called user's side;
- Presentation of the calling party's identity to the called party;
- Presentation of the connected party's identity to the calling party;
- Any combination of the above.

Note 2 - This allows, in particular, the support of a mobile calling party, when it identifies itself against the called party merely by its subaddress.

According to ITU-T Rec. I.334, a subaddress can comprise a sequence of up to 40 digits or up to 20 octets, and shall be accompanied by a Type Of Subaddress (TOS) indicator, which can have the values "NSAP" or "User Specified". Where the TOS indicates "NSAP", the structure of the subaddress shall conform to ISO/IEC 8348.

Note 3 - When the PISN has been arranged for the support of NSAP addresses within the PISN NP, they should be employed as native numbering plans rather then as subaddresses.

10.1 Treatment of subaddresses in a pure PISN environment

In the context of basic services a PINX shall accept and submit a calling or called party's subaddress at its S, T and Q reference points. The PINX shall not alter the contents nor the format of a subaddress.

If a subaddress is available as part of a Selection Address, it shall be passed on across the access even if no number is transmitted, i.e. when no MSN arrangement exists.

If a subaddress is available as part of an Identification Address, it shall be passed on across the access even if other identification restrictions apply, e.g. CLIR or COLR.

10.2 Treatment of subaddresses in interworking situations

In certain interworking situations, e.g. connection with a local area network, a PISN may be required to process subaddresses, i.e. to analyze them, act upon them and modify them, if applicable.

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In this case, a PINX shall accept and submit subaddresses in accordance with ITU-T Rec. I.334.

Processing of subaddresses shall be possible for selection and identification purposes and shall not be subject to other identification restrictions, e.g. CLIR or COLR.

The details for processing subaddresses are subject to the PISN's system management and are outside the scope of this International Standard.

10.3 Interworking with the public ISDN

The receipt of subaddress information as part of the Selection Address from a public ISDN is possible only by use of the public ISDN Subaddressing supplementary service, see ETS 300 059. For an interim period, some public ISDNs will convey subaddresses of restricted length only.

11 Selection address handling of terminals supporting sub-addressing

A terminal with neither an arrangement for MSN nor for subaddressing shall present an incoming call to its user regardless of whether a number or subaddress was received, subject to other requirements being satisfied, e.g. service compatibility, availability of resources.

A terminal with an arrangement for MSN but not for subaddressing shall present an incoming call to its corresponding MSN user only if the number received matches the Multiple Subscriber Number of that user, subject to other requirements being satisfied, e.g. service compatibility, availability of resources.

A terminal arranged for subaddressing but not for MSN shall present an incoming call to its user (or one of its users) only if the subaddress received matches the subaddress of that user, subject to other requirements being satisfied, e.g. service compatibility, availability of resources.

A terminal with arrangement for MSN and subaddressing shall present an incoming call to its user only if the number and subaddress received match both the MSN number and the subaddress of that user, subject to other requirements being satisfied, e.g. service compatibility, availability of resources.

Note 1 - It is the responsibility of the PISN Administrator to ensure that only TEs with compatible selection handling capabilities are operated on basic PISN accesses, see 9.1.2.

Note 2 - For information on MSN arrangements, see annex C.

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Annex A

(informative)

Bibliography

ITU-T Rec. E.165	Timetable for coordinated implementation of the full capability of the numbering plan for the ISDN Era (Rec. E.164)
ITU-T Rec. E.166	Numbering plan interworking in the ISDN Era
ITU-T Rec. I.251.1	Integrated Services Digital Network (ISDN) - Direct-dialling-in supplementary service - Service description
ITU-T Rec. I.251.2	Integrated Services Digital Network (ISDN) - Multiple subscriber number supplementary service - Service description
ITU-T Rec. I.251.3	Integrated Services Digital Network (ISDN) - Calling Line Identification Presentation (CLIP) supplementary service - Service description
ITU-T Rec. I.251.5	Integrated Services Digital Network (ISDN) - Connected Line Identification Presentation (COLP) supplementary service - Service description
ITU-T Rec. I.251.8	Integrated Services Digital Network (ISDN) - Sub-addressing supplementary service - Service description
ITU-T Rec. I.330	ISDN numbering and addressing principles
ITU-T Rec. I.331	(see ITU-T E.164 above)
ITU-T Rec. I.333	Terminal selection in ISDN
ITU-T Rec. Q.931	ISDN user-network interface layer 3 specification for basic call control
ITU-T Rec. X.121	International numbering plan for public data networks
ITU-T Rec. X.122	Numbering plan interworking between a Packet Switching Public Data Network (PSPDN) and an Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) in the short term
ETS 300 050	Integrated Services Digital Network (ISDN); Multiple Subscriber Number (MSN) supplementary service; Service description

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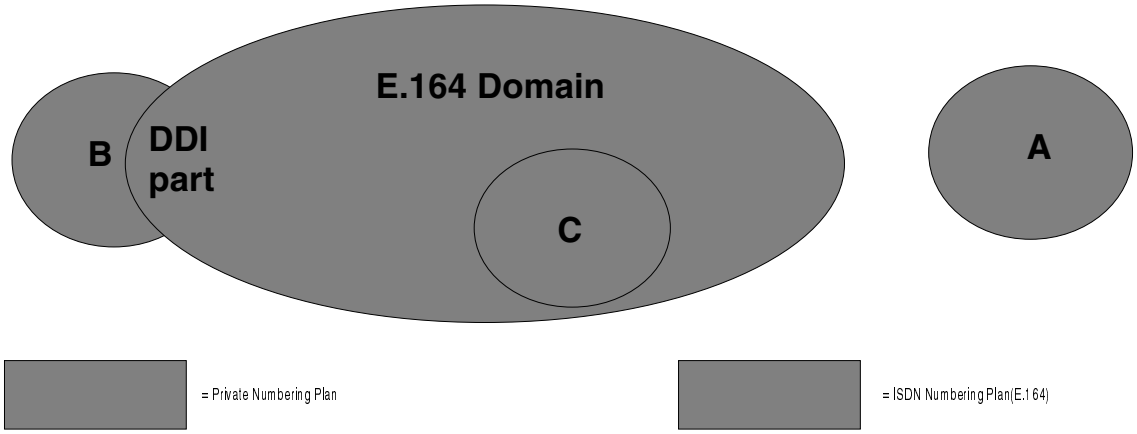
Annex B

(informative)

Use of Private and Public ISDN Numbering Plans within a PISN Numbering Plan

Figure B-1 shows the relationships between the Private Numbering Plan (PNP) and the ISDN Numbering Plan (ITU-T Rec. E.164).



Legend: A, B, C: Possible numbering domains of PISNs

Figure B-1 - Employment of PNP and/or ISDN Numbering Plans in PISN NPs

Domain A employs a private numbering plan exclusively, which means that its PISN does not provide any addressable entity that could be directly reached from the public ISDN.

Domain B employs a PNP and the ISDN numbering plan, such that each addressable entity within the double-shaded area has a number from each numbering plan.

Note B.1 - In the extreme, all addressable entities in the domain can have a number from each numbering plan.

Domain C employs the ISDN numbering plan exclusively, which means that no addressable entity can be operated in this domain with a number of a significance different from that of the ISDN NP. Although such a restriction is conceivable in theory, it is very unlikely in practice, since such a concept would preclude also any private network specific or abbreviated number.

Assuming that a PISN typically is connected to the public ISDN numbering domain via its DDI supplementary service, or that, if not so, the PISN Administrator may choose at any time to have DDI provided, a PISN will have to be prepared to conform to two numbering plans in parallel, namely:

- its own PNP which, in principle, allows the use of the same digits or digit sequences as in the public ISDN, however, with a different significance, and
- the numbering plan of the public ISDN.

Note B.2 - Not each of the addressable entities need to be a member of both numbering plans.

Interworking between both numbering plans will be simplified if the PNP number digits form a subset of the ISDN number digits, i.e. when the last significant digits of both numbers are identical. Otherwise, mapping between the PISN and the public ISDN numbering plan will be more complex and will require the PISN users to publish both numbers separately for intra-PISN and for public ISDN communication.

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Annex C

(normative)

MSN Arrangements

C.1 Introduction

MSN arrangements allow the use of PISN numbers to identify addressable entities beyond the access at the S reference point. These can be

- different applications within a given TE and/or
- different TEs attached to an access with a point-to-multipoint configuration.

MSN can be arranged for basic and primary rate PISN accesses.

For the behaviour of the PISN see 8.1.2.1 and 8.2.1.1; for the behaviour of the TE see 9.2.1.

A terminal supporting the MSN supplementary service shall have the capability of being programmed with, and of storing, the digits and parameters of the Multiple Subscriber Number or Numbers which the terminal is to serve. How this information is given to the memory of the TE is a function of the TE's configuration management entity and is beyond the scope of this International Standard.

Note - A description of the MSN Supplementary Service can be found in ETS 300 050.

C.2 Parameters of the MSN arrangement

The parameters of the MSN arrangement shall relate to each number individually and shall be independent of the access(es) to which the number(s) are assigned.

For each PISN access a default Identification Number shall be defined, to be used by the PISN if its screening process on TE provided Identification Numbers fail (see 8.1.2.1).

Note 1 - The number of Multiple Subscriber Numbers supported by a PISN on a particular basic or primary rate access, or by a terminal, depends on their implementations.

The NPI and TON values which can be employed shall be those indicated in table 1 of this International Standard. As a minimum the *PINX* and the TE shall support the combination NPI = UNKNOWN/ TON = UNKNOWN.

Note 2 - This enables terminal interchangeability between accesses of a PISN and of a public ISDN.

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Annex D

(informative)

Terminal Interchangeability

A terminal following this International Standard will be interchangeable between public and private ISDN accesses if it supports

- the implicit numbering concept, and/or
- explicitly the ISDN Numbering Plan according to ITU-T Rec. E.164 and the Private Numbering Plan as defined in detail in this International Standard.

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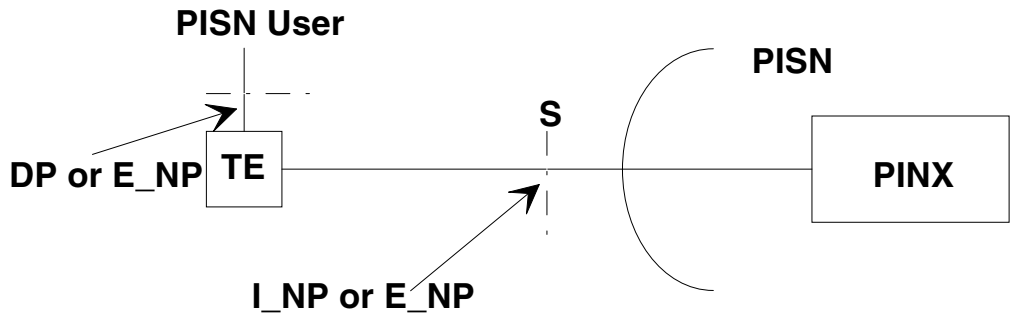
Annex E

(informative)

Relationship between Dialling and Numbering Plans at the PISN User Interface, and Numbering Plans at the PISN-to-Terminal Interface

An overview of the situation is given in figure E-1.



DP: Dialling Plan

E_NP: Explicit Numbering Plan

I_NP: Implicit Numbering Plan

Figure E-1 - Relationship between Dialling Plan and Implicit Numbering Plan

Two groups of PISN users of an ISDN can be distinguished: those who are used to the traditional PSTN environment (private or public), and those who are used to the PSDN (Public Switched Data Network) environment. While the first one is used to operating dialling plans, the latter one is largely used to operating explicitly numbering plans.

The actual dialling procedures for a particular TE depends on the design of the operational interface to the PISN user. Name keys, menus or icons on a screen allow a variety of user customized procedures.

However, in essence it must be assumed that the majority of terminals does not have the capability to convert, at the PISN user interface and the terminal to PISN interface, between a dialling plan and an explicit numbering plan. Still, it can and must be assumed that the TEs have the capability to transfer dialling information into an implicit numbering plan (and, if supported, also vice versa for Identification Numbers). Thus, at the PISN-to-terminal interface, the PISN Administrator can, and in practice will have to, determine that, beside explicit numbering plans, also an implicit numbering plan should apply.

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Annex F

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Coding of Number Information

F.1 Coding types

The coding types applicable with the numbering plans which can be employed in a PISN are shown in table F-1.

Table F-1 - Coding types of PISN numbering plans

Numbering Plan	IA5	Binary
E.164	yes	yes (Note 1)
PNP	yes	yes
Implicit NP	yes	no
DCC NP	no	yes
ICD NP	no	yes

Note 1 - This coding type is also known as the OSI NSAP encapsulated ISDN numbering format.

F.1.1 IA5-coding

The coding of these types shall be as specified in ITU-T (formerly: CCITT) Recommendation Q.931, table 4-8/Q.931.

F.1.2 Binary coding

For the details of the concept and the purpose of the binary coding formats see ISO/IEC 8348.

F.1.2.1 OSI NSAP encapsulated E.164 numbering format

The coding applicable to this format shall be as shown in figure F-1.

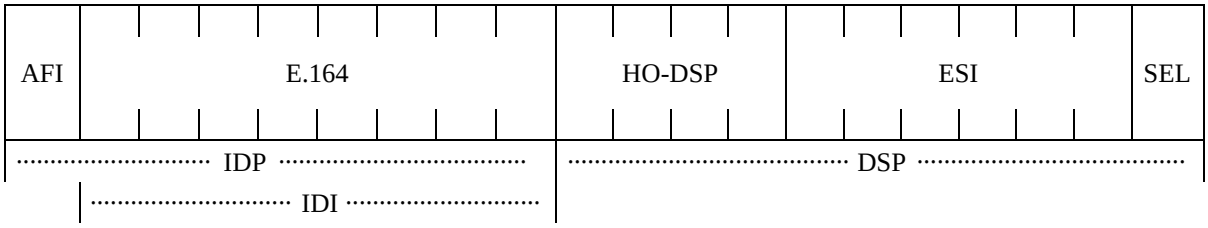

Figure F-1 - OSI NSAP encapsulated E.164 Format

The AFI value shall be set to 59, indicating the OSI NSAP encapsulated E.164 numbering format and the padding of the leading empty half-octets with F_{hex}.

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F.1.2.2 PNP numbering format

The coding applicable to this format shall be as shown in figure F-2.

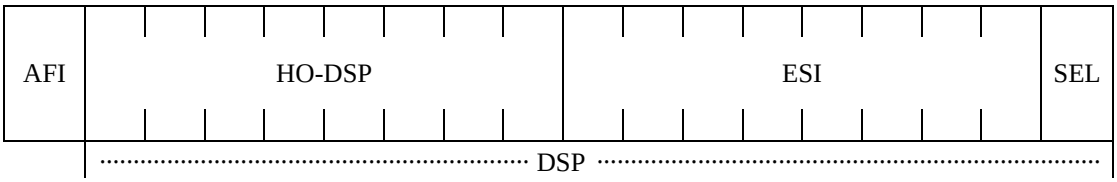

Figure F-2 - OSI NSAP encapsulated PNP Format

The AFI value shall be set to 49, indicating a PNP format. The IDI is Null. The padding of the leading empty half-octets in the HO-DSP field shall be with F_{hex}. The significant information shall be right justified.

Note - In ISO/IEC 8348 this format is called “Local”. However, this term has been substituted here by the term “PNP”, in order to avoid confusion in the context of a “local number”, see table 1.

F.1.2.3 DCC numbering format

The coding applicable to this format shall be as shown in table F-3.

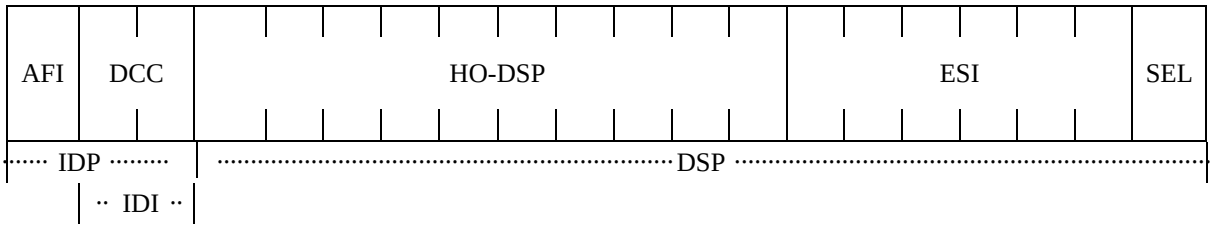

Figure F-3 - DCC Numbering Plan

The AFI value shall be set to 39, indicating the ISO DCC numbering plan format.

F.1.2.4 ICD numbering format

The coding applicable to this format shall be as shown in table F-4.

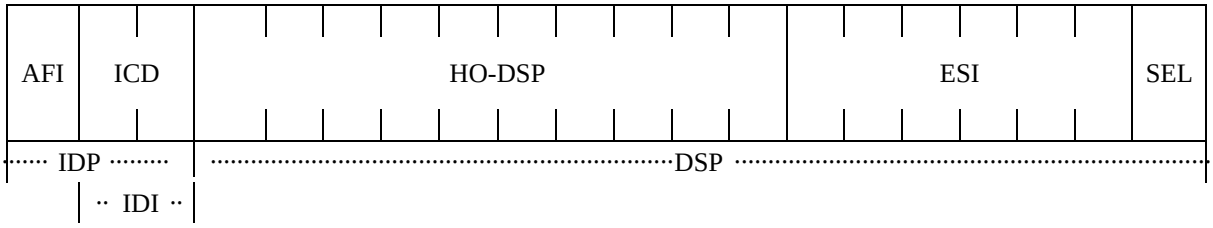

Figure F-4 - ICD ATM Format

The AFI value shall be set to 47, indicating the ISO ICD numbering plan format.

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