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**Information technology —
Telecommunications and information
exchange between systems — Numbering
and sub-addressing in private integrated
services networks**

*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Comptage et sous-adressage dans les
réseaux privés avec intégration de service*



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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 Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

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

Introduction

This International Standard is one of a series of ISO Standards applicable to Private Integrated Services Networks. The series uses the ISDN concepts as developed by CCITT and is also within the concepts of Standards for Open Systems Interconnections as defined by ISO.

This particular standard defines Addressing in Private Integrated Services Networks. Its purpose is to serve as a general and common reference for all addressing statements in the other Standards on Private integrated Services Networks.

This International Standard enables the PISN Administrator to choose:

- the ISDN Numbering Plan according to CCITT Recommendation E.164 (1988 Blue Book); or
- a Private Numbering Plan; or
- an Implicit Numbering Plan; or
- any combination of these numbering plans

as the native numbering plan(s) in its PISN.

In addition, the administrator can employ sub-addressing in order to expand the available addressing capacity beyond the capacity of the PISN Numbering Plan (PISN NP).

The impact on terminal interchangeability between accesses of public and private ISDNs can be found in annex D.

Information technology — Telecommunications and information exchange between systems — Numbering and sub-addressing in private integrated services networks

1 Scope

This International Standard defines the requirements for the handling of network addresses for the identification of entities which use/provide telecommunications services offered by Private Integrated Services Networks (PISNs). This International Standard covers numbering, including the requirements for the support of a Private Numbering Plan, and the support of sub-addressing.

This International Standard is applicable to Private Integrated Services Network Exchanges (PINXs) and to terminals attached to the 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 Standard does not explicitly describe its application to location independent (mobile) addressable entities, this application is not precluded.

In order to conform to this International Standard, a PINX shall meet the mandatory requirements of clauses 5, 6, 7, and 9 and for a terminal attached to a PINX it shall meet the mandatory requirements of clauses 8 and 10.

2 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 8348:1993, *Information technology - Open Systems Interconnection - Network Service Definition*.

ISO/IEC 11579:¹⁾ *Information technology - Telecommunications and information exchange between systems - Reference configuration for Private Integrated Services Networking (PISN) Exchanges*.

CCITT Recommendation I.334; 1988. *Principals relating ISDN Numbers/Addresses to the OSI Reference Model Network Layer Addresses*.

CCITT Recommendation E.160, 1988. *Definitions relating to National and International Numbering Plans*.

CCITT Recommendation E.164, 1988. *Numbering Plan for the ISDN Era*.

CCITT Recommendation Q.931, 1988. *ISDN User-Network Interface Layer 3 Specification For Basic Call Control*.

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

3 Definitions

The definitions in ISO/IEC 8348 and CCITT Recommendation E.160 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).

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

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

3.1.1.1 PISN Number : A number in the domain covered by a PISN Numbering Plan.

¹⁾ To be Published

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

3.1.2 Sub-address : A part of an address beyond the addressing capability of a numbering plan.

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

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

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

3.4 Implicit Numbering Plan : A numbering plan in which no explicit indication is given to indicate which numbering plan applies. Instead the identification has to be determined from the number digits themselves.

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

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

3.5 Native Numbering Plan : The numbering plan employed by a PISN Administrator in a given network in a way in which it unambiguously identifies the addressable entities of a PISN.

3.6 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.

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

3.8 ISDN Numbering Plan (ISDN NP) : The numbering plan explicitly relating to global ISDN as defined by CCITT Recommendation E.164.

NOTE - The ISDN NP can fulfill the function of the PISN NP.

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

NOTE - The PNP can fulfill the function of the PISN NP.

3.9.1 PNP Number : A number belonging to a PNP.

3.9.2 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.

3.9.3 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.

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

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

3.10 Unknown Numbering Plan : The numbering plan reflecting a dialling plan which is implicitly based on a particular private numbering domain as defined by the PISN Administrator.

3.11 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 to which the addressable entity belongs.

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

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

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

3.15 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 sub-addresses.

3.16 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 sub-addresses.

3.17 Multiple Subscriber Number (MSN) : A full or a partial number assigned to a user-to-network access for which an arrangement has been established in the context of the MSN supplementary service ("MSN arrangement").

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

4 Symbols and abbreviations

AFI	Addressing plan and Format Identifier
CN	Complete Number
CLIR	Calling Line Identification Restriction
COLR	Connected Line Identification Restriction
DDI	Direct Dialling-In supplementary service
DSS1	Digital Subscriber Signalling System No. 1
ISDN	Integrated Services Digital Network
MSN	Multiple Subscriber Number supplementary service
NP	Numbering Plan
NPI	Numbering Plan Identifier
NSAP	Network layer Service Access Point
OSI	Open Systems Interconnection
PNP	Private Numbering Plan
PINX	PISN Exchange
PISN NP	PISN Numbering Plan
PISN	Private Integrated Services Network
PSTN	Public Switched Telephone Network
Q	Q Reference Point
RC	Region Code
RN	Regional Number
S	S Reference point
SA	Sub-Address
SPNP	Support of Private Numbering Plans supplementary service
T	T Reference point
TON	Type of Number
TOS	Type of Sub-Address

5 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.

NOTES 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).

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 a one-to-one correspondence between the interface and a particular application with a one-to-one correspondence to a particular channel.

3 A particular PISN number can fulfill only one of these 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.

6 Requirements on numbering plans, and on their interrelationships

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 CCITT Recommendation E.164 [4], hereafter referred to as "ISDN NP"; or
- a Private Numbering Plan, hereafter referred to as "PNP"; or
- an Implicit Numbering Plan; or
- any combinations of these numbering plans.

In order for the PISN to employ CCITT Recommendation E.164 as the native numbering plan, the PISN Administrator must first secure the allocation of the numbering resources from the appropriate national body 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.
- 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.

6.1 Content of PISN numbers

Number information can be presented in two formats, the explicit and the implicit format. In both formats the number digits shall be accompanied by a type of number (TON) value, in accordance with table 1.

Table 1 - TON Values for the E.164, PNP, and Unknown NP Indications

	Explicit Format	Explicit Format	Implicit Format
NPI	E.164	PNP	UNKNOWN
TON	International Number	Level 2 Regional Number	
	National Number	Level 1 Regional Number	
	Subscriber Number	Level 0 Regional Number	
		(Local Number)	
	Partial Number (Note 1)	Partial Number (Note 1)	
	Unknown (Note 1)	Unknown (Note 1)	Unknown (Note 2)
		PISN Specific Number (Note 3)	
		Abbreviated Number (Note 3)	

NOTES 1 In the standards on DSS1 of public ISDNs the TON values "Unknown" and "Partial" share the same code points. Distinction is made by the direction of the number information flows.

At the boundary between the public ISDN and a PINX the meaning 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 meaning 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 meaning is reversed.

- 2 The number digits follow an implicit numbering plan and can include prefixes.
- 3 The use of this type of number is under the control of the PISN Administrator and the application is outside the scope of this standard.

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.

6.2 Content of the number digits in a PISN numbering plan

6.2.1 ISDN NP

The content of digits of the ISDN NP is outside the scope of this International Standard. Information can be found in CCITT Recommendation E.164 [4].

6.2.2 PNP

A PNP Number shall be comprised of 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 a different value of x . The maximum value of x shall be the same as for the public ISDN numbering plan, see CCITT Recommendation E.164 [4].

- NOTES 1 Within this range, the minimum/maximum value of x in a particular PISN will be determined by the PISN Administrator.
- 2 It is the PISN Administrator's responsibility to choose the appropriate numbering capabilities of the PINX and terminals for that PISN.

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

- 3 The definition of prefixes (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.

6.2.3 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 (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.

6.3 Structure of the Private numbering plans

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 be comprised of 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.

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

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

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). A Regional Number for the highest level which exists within a PNP shall be called a complete number (CN).

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

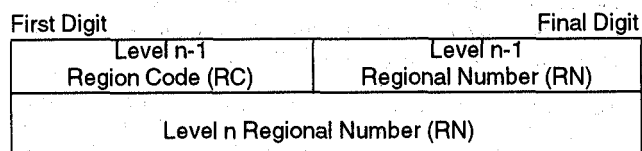


Figure 1 - Structure of a Level n Regional Number (RN)

A full 3 level structure is shown in Figure 2.

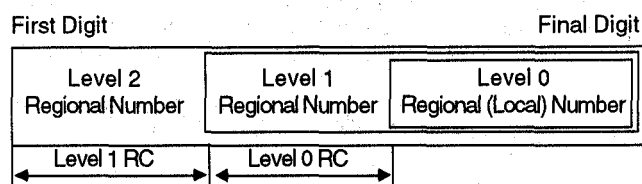


Figure 2 - Structure of a PNP Number with Three Levels of Regions

A level n Regional Number 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 a Regional Number of level greater than n. Only a CN shall have significance throughout the entire PNP.

It shall not be necessary for 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 zero.

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

6.4 Relationship between the PNP and the ISDN numbering plans

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

NOTES 1 For the membership of addressable PISN entities of NPs other than the PNP or the ISDN NP see 6.6.

2 A simple relationship between PNP Numbers and the ISDN NP 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.

3 The case where a PISN's user has a PNP Number but no ISDN NP Number does not prevent the user from communicating with users of public ISDNs. Outgoing calls from the user to the public ISDN are possible, although no identification of the originating user (other than a possible sub-address) 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).

6.5 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 its own PISN PNP.

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

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

6.6 Relationship with numbering plans other than the PISN NP or ISDN numbering plans

A PISN can recognize the International Numbering plan for public Data Networks according to CCITT Recommendation X.121 and the Plan for Telex Destination Codes according to CCITT Recommendation F.69, as described below. Interworking with other numbering plans, e.g., with National Standard NPs or the ISO Addressing Plans ICD and DCC, is outside the scope of this International Standard.

6.6.1 Explicit Interworking

Explicit Interworking with other numbering domains occurs when the number information of an addressable entity explicitly contains a numbering plan identification, which is neither the PNP nor the ISDN NP.

NOTE 1 Explicit interworking from the E.164 NP to the X.121 NP (and vice versa) can alternatively be achieved by using an escape code, see CCITT Recommendations E.166 and X.122.

If the PISN is able to recognize a particular foreign NP, it shall, by processing Selection Numbers, be able to route the path, by virtue of the numbering plan indication, to a gateway function which leads to the corresponding foreign numbering domain.

If a PISN is not able to recognize a particular foreign numbering plan, it shall in an orderly manner reject the addressing requested.

- NOTES 2 The gateway can be a direct or indirect one, depending on whether the foreign numbering domain attaches to the PISN immediately or via an intermediate domain as, for example, the public ISDN. The definition of the routing data is subject to PISN management control and is outside the scope of this International Standard.
- 3 Explicit interworking can embed further interworking, e.g., a number of the X.121 NP can include an escape code leading back to the ISDN NP (see CCITT Recommendation X.122)

When a PISN receives an Identification Number of a foreign number domain it shall not alter it.

When transmitting its native Identification Numbers, the PISN shall where possible present them according to the ISDN NP. If this is not possible, the PISN shall indicate to the foreign numbering domain that an Identification Number is not available, due to interworking reasons.

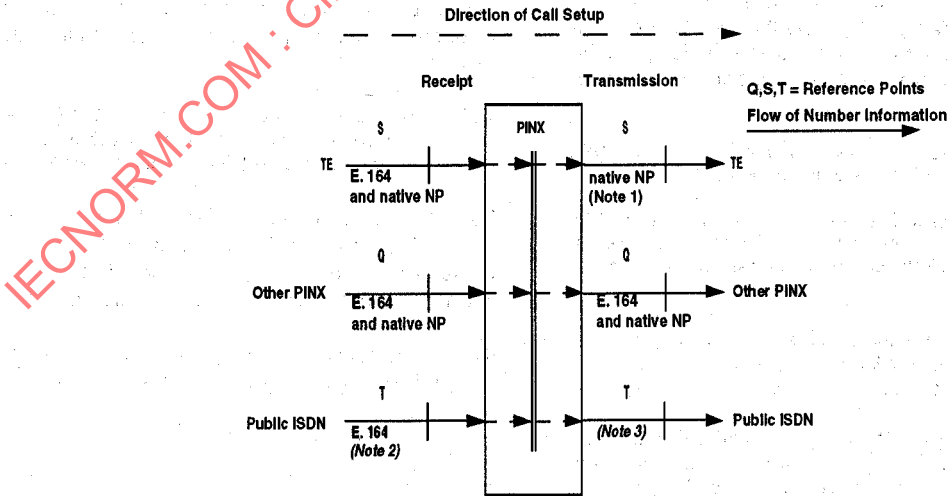
6.6.2 Implicit interworking

Implicit interworking with other numbering domains occurs when

- the PISN concerned adheres to the implicit numbering concept, and
- the number information of the addressable entity contains prefixes which lead to a foreign numbering domain.

The reference points are defined in DIS xxxx (Reference Configurations)

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



- NOTES 1 In the case of an MSN arrangement only, see annex C.
2 In the case of the DDI supplementary service only.
3 Specified in Standards for the Public ISDN

Figure 3 - Explicit Numbering Formats for Selection Numbers

When processing Selection Numbers, the PISN shall be able to route the path, by virtue of the prefixes, to a gateway function which leads to the corresponding foreign numbering domain.

NOTE - The gateway can be a direct or indirect one, depending on whether the foreign numbering domain attaches to the PISN directly or via an intermediate domain as, for example, the public ISDN. The definition of the routing data is subject to PISN management control and is outside the scope of this International Standard.

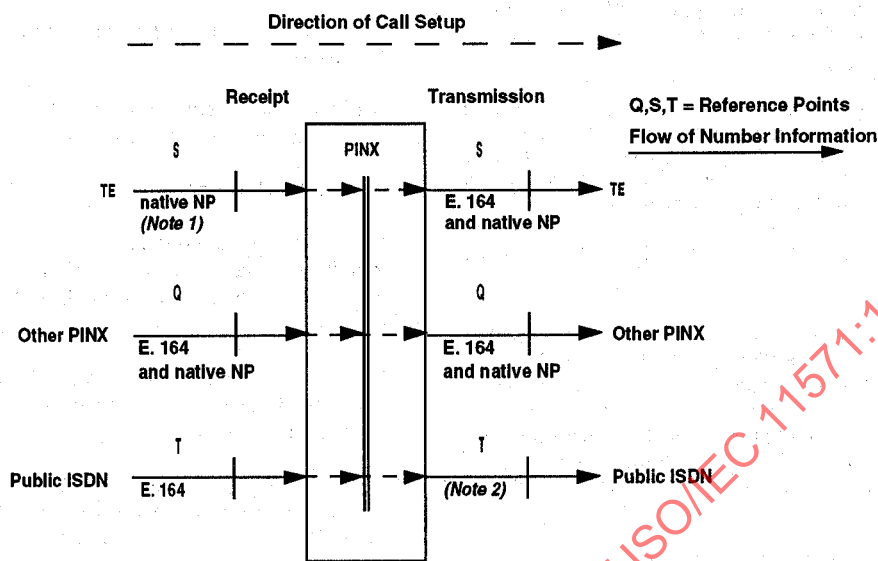
When receiving Identification Numbers of a foreign numbering domain the PISN can be required to alter them, e.g., by adding a prefix. When transmitting its native Identification Numbers, the PISN can be required to alter them, e.g., by adding a prefix.

If a PISN is not able to support a particular foreign numbering plan, it shall orderly reject the addressing request.

7 Number handling requirements of Private ISDN Network Exchanges

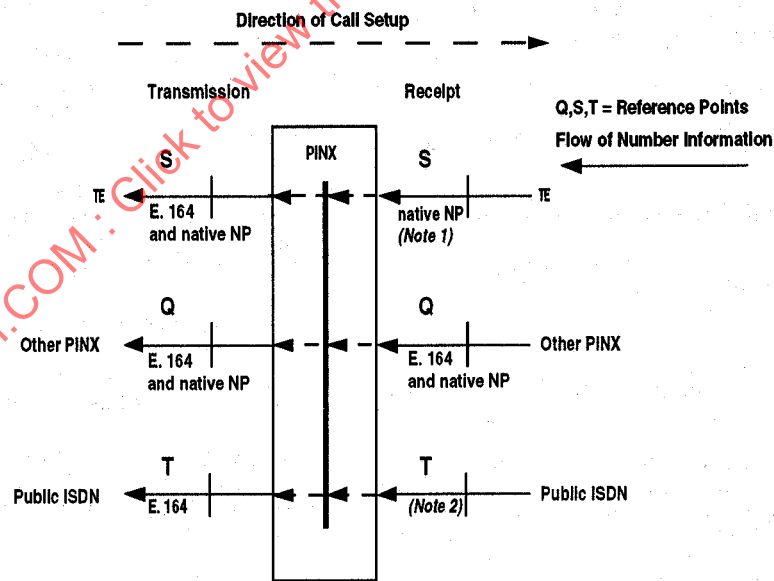
This clause specifies the numbering formats of Selection and Identification Numbers which a PINX shall be able to accept and to provide at the following interfaces:

- 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.



NOTES 1 In the case of an MSN arrangement only, see annex C.
2 Specified in Standards for the Public ISDN.

Figure 4 - Explicit Numbering Formats for Originating Identification Numbers



NOTES 1 In the case of an MSN arrangement only, see annex C.
2 Specified in Standards for the Public ISDN.

Figure 5 - Explicit Numbering Formats for Destination Identification 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 6. 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.

7.1 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 PNP Number with a region level less than the highest level used in that numbering plan (i.e., not a CN) 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 PNP, the received number shall be treated as invalid.

If a PINX receives a PNP number with a TON value which has no meaning within the domain concerned (e.g., region level too high, PISN specific or abbreviated numbers not employed), 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 sub-address.

7.1.1 Numbering formats accepted with selection numbers

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

7.1.1.1 S reference point

Any of the numbering formats specified in 6.2 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 the Selection Number.

7.1.1.2 Q reference point

Any of the numbering formats specified in 6.2 shall be accepted as valid in a received Selection Address, except that for PARTIAL.

7.1.1.3 T reference point

A PINX shall be able to accept any of the formats for DDI numbers according to the DDI arrangements.

7.1.2 Numbering formats accepted with Identification Numbers

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

7.1.2.1 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."

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."

7.1.2.2 Q reference point

Any of the numbering formats specified in 6.2 shall be treated as valid in a received Identification Number, except 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.

7.1.2.3 T reference point

NOTE - The format in which a public ISDN offers Identification numbers to a PISN 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. 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.

7.2 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 a 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.

7.2.1 Numbering Formats provided with Selection Numbers

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

7.2.1.1 S reference point

If MSN has been arranged for 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 6.2; according to the details of the MSN arrangement, see annex C.

7.2.1.2 Q reference point

A number shall be provided in either the explicit or implicit numbering formats, see 6.2. 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 in 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 routing via a public ISDN is necessary.

7.2.1.3 T reference point

The format in which a PINX shall transmit Selection Numbers to the public ISDN is beyond the scope of this 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; any TON value can apply, see 6.2, except that for PARTIAL; or
- according to the implicit numbering format with the NPI value UNKNOWN.

7.2.2 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.

7.2.2.1 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 in either the implicit numbering format or in one of the explicit numbering formats, see 6.2.

Any TON value can apply, see 6.2, 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.

7.2.2.2 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 6.2, except that for PARTIAL.

7.2.2.3 T reference point

The format in which a PINX shall transmit Identification Numbers to the public ISDN is beyond the scope of this International Standard.

NOTE - The PISN Administrator 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." Any TON value can apply. See 6.1; 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 is expected to present an Identification Number assigned to the addressable entity in the context of 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.

8 Address handling requirements of terminals Attached to Private ISDN 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 supplementary service; see annex C.

8.1 Selection Number Handling

8.1.1 Outgoing Calls

A terminal shall transmit a Selection Number either in one of the explicit formats or in the implicit format with the values of NPI and TON, as specified in 6.2.

In the case of the explicit formats, any TON value can apply except PARTIAL.

Within the scope of this International Standard any of the NPI values indicated in 6.2 and 6.6 can be used, depending on which numbering domain the addressed entity belongs to.

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

8.1.2 Incoming calls

A terminal arranged for the support of the MSN supplementary service shall be able to accept a Selection Number. Its behaviour is specified in clause 10.

The Selection Number received shall be screened against (one of) the Multiple Subscriber Number(s) which the terminal, in the context of the MSN supplementary service, 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 supplementary service and terminals which are not arranged for the MSN supplementary service 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 supplementary service is processed correctly. It can happen that a terminal not arranged for the MSN supplementary service reacts faster to an incoming call request than a terminal arranged for the MSN supplementary service, i.e., that the MSN supplementary service is overridden by the basic service.

8.2 Identification number handling

8.2.1 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.

8.2.2 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 7.2.2.1; for information on terminal interchangeability between private and public ISDNs see annex D.

9 Sub-addressing 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 sub-address information within its basic services. The length and structure of a sub-address shall follow subclause 1.2 of CCITT Recommendation 1.334, 1988 or subclause 4.5.9 or 4.5.11 of CCITT Recommendation Q.931, 1988.

Applications of sub-addresses can be

1. Selection of a specific application process or terminal at the called user's side;
2. Presentation of the calling party's identity to the called party;
3. Presentation of the connected party's identity to the calling party;
4. Any combination of 1 to 3 above.

This allows the support of a mobile calling party, when it identifies itself against the called party merely by its sub-address.

When sub-addresses are used the appropriate IDI should be populated, for example ISDN number (E.164), see CCITT Recommendation 1.334.

NOTE - Sub-Addressing for terminal selection at the S interface shall follow the following coding:

The Local IDI format (the AFI field coded 50 in BCD) and the IA5 character syntax using only digits 0 to 9 shall be used for the DSP. Each character is encoded in one octet according to CCITT Recommendation T.50/ISO 646, with zero parity in the most significant position.

According to CCITT Recommendation 1.334, a sub-address can compromise a sequence of up to 20 octets, and shall be accompanied by a Type Of Sub-address (TOS) indicator, which can have the values "NSAP" or "User Specified." Where the TOS indicates "NSAP," the structure of the sub-address shall conform to ISO/IEC 8348.

9.1 Treatment of sub-addresses in a pure PISN environment

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

If a sub-address 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 sub-address is available as part of an Identification Address, it shall be passed on across the access (there may be a relationship between delivery of sub-addresses and CLIR and COLR supplementary services).

9.2 Treatment of sub-addresses in interworking situations

In certain interworking situations, e.g., connection with a LAN, a PISN may be required to process sub-addresses, i.e., to analyze them, act upon them and modify them, if applicable.

In this case, a PINX shall accept and submit sub-addresses in accordance with CCITT Recommendation 1.334.

Processing of sub-addresses shall be possible for selection and identification purposes (there may be a relationship between delivery of sub-addresses and CLIR and COLR supplementary services.)

9.3 Interworking with the public ISDN

The receipt of sub-address information as part of the Selection Address from a public ISDN is possible only by use of the public ISDN Sub-addressing supplementary service.

NOTE - For an interim period, some public ISDNs will convey sub-addresses of restricted length only.

10 Selection address handling of terminals supporting sub-addressing

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

A terminal with an arrangement for MSN but not for sub-addressing 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, and availability of resources.

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

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

NOTES 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 8.1.2.

2 For information on MSN arrangements see annex C.

ANNEX A (informative)

Bibliography

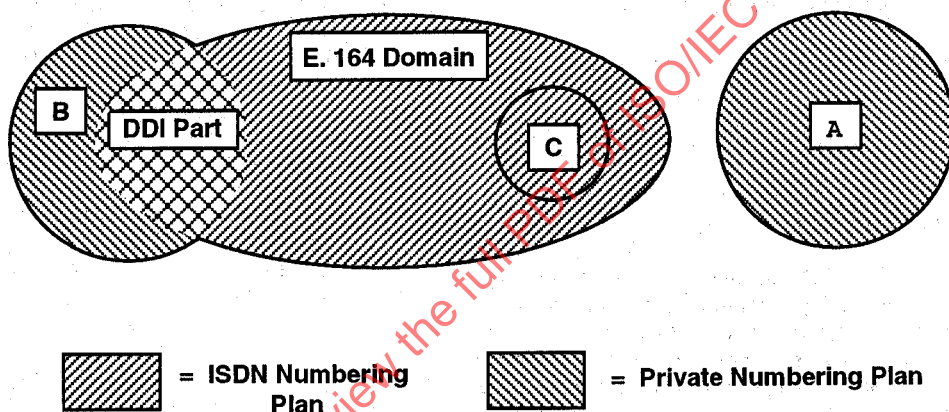
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| CCITT Rec. E.165, 1988 | <i>Timetable for Coordinated Implementation of the Full Capability of the Numbering Plan for the ISDN Era (Recommendation E.164)</i> |
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| CCITT Rec. X.122, 1988 | <i>Numbering Plan Interworking between a Packet Switched Public Data Network (PSPDN) and an Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) in the Short Term</i> |

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 NP (CCITT Recommendation E.164).

Legend: A,B,C: Possible Numbering Domains of a Private Integrated services Network



Legend: A,B,C: Possible Numbering Domains of a Private Integrated services Network

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

Domain A has implemented a private numbering plan which does not provide any addressable entities that could be directly reached from the public ISDN.

Domain B has implemented a PNP in combination with the ISDN NP, such that each addressable entity in the double-shaded area has a number from each numbering plan.

Assuming that a PISN typically is connected to the public ISDN numbering domain via its DDI supplementary service, 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 - Not each of the Addressable entities needs to be a member of both numbering plans, but in order to allow direct connection between all addressable entities, all addressable entities in the domain would have a number from each numbering plan.

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 NP will be more complex and will require the PISN users to publish both numbers separately for intra PISN and Public ISDN communications.

Domain C has implemented the ISDN numbering plan exclusively and has no addressable entities with a number 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 any private network specific addressing such as abbreviated numbering.

Annex C (normative)

MSN arrangements

C.1 Introduction

MSN arrangements allow for the use of PISN numbers to identify addressable entities beyond the access at the S reference point. These can be (see clause 6)

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

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

For behaviour of the PISN see 7.1.2.1 and 7.2.1.1; for the behaviour of the TE see 8.2.1.

A terminal supporting the MSN supplementary service shall have to 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.

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 fails (see 7.1.2.1).

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 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.

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 CCITT Recommendation E.164; and
- the Private Numbering Plan as defined in detail in this International Standard.

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