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Overall network aspects and functions, ISDN user-
network interfaces

TERMINAL SELECTION IN ISDN

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NOTES

1 CCITT Recommendation I.333 was published in Fascicle III.8 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

TERMINAL SELECTION IN ISDN

(Melbourne, 1988)

1 Introduction

This Recommendation defines “terminal selection” as the procedures carried out between a terminating ISDN exchange and ISDN terminal equipment situated behind an ISDN interface leading to customer premises whereby terminal response equivalent to answer or rejection is solicited. The procedures apply to both point-to-point and point-to-multipoint terminal operations.

Note that in case of an existing terminal (TE2) connected via a terminal adaptor (TA) to an ISDN access, the combination of TA and TE2 is seen as to provide the same functionality as a TEi. As there should be no modifications to the existing terminal, the functions described are provided by the terminal adaptor.

Note – In the context of this Recommendation “terminal” is an abstract term and does not constrain the implementation of physical terminals which may consist of one or more logical terminals.

1.1 Terminal selection responsibilities

The network responsibility is to deliver a call to the interface identified by the called number using connection types consistent with the service requested by the calling party. It is the responsibility of the called party to arrange the terminals on the interface so that incoming calls properly originated are accepted only by the appropriate terminal(s). The network may provide additional functions to aid in the completion of calls from dedicated networks. The network may provide additional services to ensure that calls are completed only to terminals consistent with information provided by the caller. It is the responsibility of the terminal manufacturer and/or service provider to provide terminals that use the terminal selection data in a way that is consistent with the intended application of the terminal, (e.g. for telematic terminals according to Recommendation T.90).

The calling party agrees, when placing a call, to accept the terminating capabilities provided by the called party. The terminating exchange has a cooperative role with the terminal in establishing an information transfer which lends itself to the required terminal selection needs for a given interface.

1.2 Identification requirements

An ISDN number identifies any of the interfaces at reference point S (Recommendation I.330, § 2.1). Additional identifiers or terminal selection functions are therefore needed in those cases where the number is insufficient to make needed distinctions among terminals. This Recommendation addresses the general principles to be applied in identifying:

- 1) specific individual terminals or
- 2) groups of terminals among which no further distinction is required by the terminating user.

Specific sequences in which identifying information is applied are not specified.

1.3 General operations

While specific selection sequences for the application of terminal identifiers are not required, the ISDN number is a fundamental discriminator. The whole network – including the terminating exchange – relies heavily on this resource. The bearer capability must also be given a high status since its transfer across the interface is mandatory with every call request. Other information potentially useful in the selection process is given in § 4. An originator of a call is generally not required to provide any of the other information in every call. Exceptions for telematic terminals are listed in Recommendation T.90.

If terminal selection is to be successful in establishing a connection between the calling and the called terminal in a prescribed manner, the calling terminal should conform to the reasonable expectations of the called subscriber's terminal arrangement. A calling subscriber who does not conform to the expectations of the called subscriber's terminal arrangement is inviting an irregularity. The terminating subscriber has a corresponding obligation to provide a means for needed discrimination among terminals. It should be noted that information expected at a called subscriber's terminal configuration may not, in all cases, be provided by the calling subscriber (for example, interworking with a non-ISDN).

The point-to-multipoint operation tends to be emphasized in subsequent text because distinctions in this mode of operation require some terminal selection functions. Nevertheless, the treatment of both point-to-point and point-to-multipoint selection procedures are considered appropriate for this Recommendation. The terminal selection stage is said to be completed when an individual terminal reacts and is awarded the call. In the case of NT2, the call award need not come as a direct result of the point-to-point procedure but may come later from a terminal attached to the NT2.

The details regarding the processing of this information by the terminating exchange and the sequence used in offering this information to the user-network interface may be a matter of formal agreement between the subscriber and the Administration at the time of service provisioning. The call set-up and terminal selection procedures in ISDN require that the terminating exchange and the terminals play cooperative roles.

2 Objective

2.1 The primary objective of this Recommendation is to provide overall principles on terminal selection in ISDN. This Recommendation therefore provides a framework within which Administrations may choose appropriate terminal selection procedures, to suit their own operating environment and applications.

2.2 The guidelines contained in the appendices do not represent requirements on terminals for terminal selection functionality, but represent terminal selection techniques that are useful in appropriate circumstances. Possible choices are contained in appendices. However, other Recommendations, e.g. Recommendation T.90 have also to be taken into account.

3 Scope

3.1 It is recognized that call set-up is an end-to-end process requiring appropriate switching, signalling and terminal functionality at both ends. However, the frame of reference used in this Recommendation is mainly the terminating ISDN exchange and the terminal configuration(s) served by that exchange. The originating exchange and the terminal configuration(s) served by that exchange are covered only if a specific request for a terminal function at the calling side, supporting the terminal selection procedure at the called side, is identified.

3.2 It is also recognized that calls originating from existing dedicated networks with limited addressing and signalling capabilities will not be able to avail themselves of the full range of terminal identification functions. This Recommendation therefore addresses the terminal selection for the following types of calls:

- calls within the ISDN:
 - i) selection based on network assisted capabilities (e.g. see Appendices II and III);
 - ii) selection based on end-to-end user capability (e.g. see Appendices I and II);
- calls from public dedicated networks to ISDN.

Note – Calls from private networks to ISDN are not currently addressed in this Recommendation.

3.3 This Recommendation addresses terminal selection in ISDN for both basic and primary rate access.

3.4 Though selection of a specific terminal in a multipoint configuration in ISDN for maintenance and operation purposes may be a requirement, this Recommendation does not currently address this application.

- 3.5 This Recommendation is related to and/or is compatible with the following Recommendations:
- Recommendations of the I.200-Series on ISDN services;
 - Recommendation I.330: ISDN numbering and addressing principles;
 - Recommendation I.331 (E.164): Numbering plan for the ISDN era;
 - Recommendations I.410, I.411, I.412: ISDN user-network interfaces;
 - Recommendation I.441 (Q.921): ISDN user-network interfaces: layer 2 specifications;
 - Recommendation I.451 (Q.931): ISDN user-network interfaces: layer 3 specifications;
 - Recommendations of the I.500-Series defining interworking between various networks;
 - Recommendation Q.932, Annex A: Generic procedures for the control of ISDN supplementary services – User service profiles and terminal identification;
 - Recommendation T.90: Characteristics and protocols for terminals for telematic services in ISDN.

4 Terminal selection functions

4.1 Any information which categorizes attributes of an incoming call may be used for the terminal selection process (some information given hereafter is service oriented and some is terminal oriented):

- 1) an ISDN number;
- 2) bearer capability;
- 3) other low layer functionality;
- 4) higher layer functionality;
- 5) direct dialling-in (DDI) number, multiple subscriber number, or subaddress;
- 6) ISDN/non-ISDN call source indicator;
- 7) local exchange functionality.

In a point-to-multipoint configuration, call set-up information from the terminating ISDN exchange to the terminal configuration is transferred via broadcast procedures. All active terminals receive attribute values and determine whether or not to respond.

In the case of more than one terminal supporting the same service, the supplementary service Multiple Subscriber Number (MSN) (Note 1) or Direct Dialling-In (DDI) (Note 2) may be used to identify a specific terminal. To support these services the terminal must be able to recognize its own identity based typically on a number of digits, which consist of the whole, or a part of the Subscriber Number (SN) in the ISDN numbering plan. Alternatively, § 4.3 may apply.

This principle applies for both a homogeneous ISDN environment and for interworking cases with non-ISDN. In a homogeneous ISDN environment the subaddressing function (Note 3) may be used alternatively. However, it cannot be used in all cases of interworking.

Note 1 – Based on the use of distinct ISDN numbers, the multiple subscriber number supplementary service enables specific terminal(s), connected to the basic access in a point-to-multipoint configuration, to be indicated by the called party number.

Note 2 – Based on the use of distinct ISDN numbers, the direct dialling-in supplementary service enables a user to establish a connection to another user or an ISPBX, or other private system without attendant intervention.

Note 3 – Based on an extension of the addressing capability beyond the E.164 (I.331) numbering plan, subaddressing enables the calling user to select a specific terminal at the called user's termination and/or to invoke a specific process in the called terminal at the called user's termination.

4.2 The terminal selection function in § 4.1 is currently supported by Recommendation Q.931 (I.451) call set-up protocols, Q.932 and Q.921 as follows:

- 1) called party number information element;
- 2) bearer capability information element;
- 3) low layer compatibility information element;
- 4) High Layer Compatibility (HLC) information element;
- 5) called party number/subaddress information element;
- 6) progress indicator information element;
- 7) End point Identifier (EID) information element (see Q.932, Annex A);
- 8) Terminal End point Identifier (TEI) (see Q.921, § 3.3.4).

4.3 It is recognized that a local procedure, between the ISDN exchange and terminal, may be provided to allow the exchange to assign a particular terminal with network parameters (e.g. logical terminal profile). This identification mechanism will assist the exchange in providing additional terminal selection or service features (see Appendix III).

5 Terminal selection

5.1 Calls within ISDN(s)

5.1.1 Terminal selection functions

These are described in § 4.

5.1.2 Processing of selection functions

In the terminating exchange, the called subscriber number and the bearer capability are checked. If any form of subscriber profile exists for the interface, it may also be consulted.

a) For point-to-point applications

Proceed to establish the connection according to subscriber requirements; for an NT2 transfer all appropriate information.

b) For point-to-multipoint applications (broadcast)

i) As information is broadcast from the terminating exchange to the terminal configuration, each active terminal receives the presented information to identify the requested service, as described in § 4.1.

ii) Each active terminal which wishes to be awarded the call will inform the network. The network will award the call to the first terminal equipment which requests connection.

When supporting multiple types of terminals, e.g. telematic and telephone terminals, on a point-to-multipoint configuration, improper call handling will occur if inappropriate terminals request connection of the call. Appendices I, II and III provide possible solutions to these problems. e.g. solutions specifically aimed at telematic terminals are included in Appendix I.

The development of terminal configurations in addition to those described in the appendices which will operate successfully in specific circumstances (e.g. select a specific terminal from among several for services, supplementary services, maintenance operations, etc.) are for further study. Provision of guidance to terminal manufacturers, ISDN subscribers, and network operators about how terminals might respond in such circumstances, requires further study.

5.1.3 Terminal differentiation

The terminating party is expected to arrange available terminals to facilitate access. Distinctions may be drawn, for example, by taking notice in a terminal of the presence or absence (not the content) of a subaddress (see also § 4.2). Calls interworking from PSTN (bearer capability 3.1 kHz audio), for example, could be accepted by terminals sensing no subaddress, while allowing more capable terminals to bid for calls with the same bearer capability and subaddress as well.

5.2 *Calls from PSTN to ISDN*

A call originated in the PSTN, supported by conventional signalling prior to arrival at the ISDN interworking point, will belong to one of two indistinguishable call types, i.e. ordinary speech or voiceband data. At the interworking point the bearer capability "3.1 kHz audio" will be assigned to assure compatibility with these call types. A progress indicator is also applied to mark a non-ISDN call source. Some PSTN customers, however, will be served from ISDN-capable exchanges and calls will be supported by common channel signalling for the entire connection. This affords some added opportunities to make distinctions. The extent to which this should be recommended is for further study.

Those cases where the bearer capability "3.1 kHz audio" does not apply (such as digital data service based on digital PSTNs) require further study, based on Recommendation I.231, and Recommendation I.515.

5.3 *Calls from PSPDN to ISDN*

A call originated in the PSPDN will carry either a circuit or a packet bearer capability when presented to an ISDN terminal (case A or B according to Recommendation X.31). Terminal selection procedures in these cases are for further study.

5.4 *Calls from CSPDN to ISDN*

A call originated in the CSPDN will carry a circuit bearer capability and indicate the kind of bitrate adaption used when presented to an ISDN terminal configuration. If the CSPDN is used to offer a teleservice, e.g. Teletex in some countries, the interworking point may not be able to provide this information to ISDN. Therefore, a distinction between a circuit mode data call and a Teletex call may not be possible and again the only basic principle which allows individual distinction between terminals is the supplementary service multiple subscriber number.

APPENDIX I

(to Recommendation I.333)

Examples of terminal selection for general purpose terminals

I.1 *Scope*

The aim of this Appendix is to describe terminal selection functions for general purpose terminals which allow operation when multiple terminals supporting a variety of services (including telematic services) are in a point-to-multipoint configuration (S/T bus), and the full complement of terminal selection functions (including HLC information element) have to be invoked for successful terminal selection.

Terminals which comply with the clauses below do not impose any constraints on terminal configurations with respect to existing recommendations dealing with telematic services.

Application of the terminal selection guidelines contained in this Appendix is described in § I.3.

I.2 *Terminal functions*

To meet the requirements mentioned in the scope of this Appendix, the following functions shall be provided by terminals connected to an ISDN. The functions are grouped into those which shall be provided as a minimum for offering an adequate quality of service and into those which may be implemented additionally.

Note – The processing of information at the called side can be executed in the order appropriate to a particular customer installation. The order chosen in this Recommendation is for description and does not impose any constraints on implementations.

I.2.1 *Terminals supporting bearer services*

I.2.1.1 *Minimum functions*

I.2.1.1.1 For outgoing calls, generation of information defining the service and address information, i.e. bearer capability and called address.

I.2.1.1.2 For incoming calls, analysis of whether a bearer service is requested (not a teleservice). If a higher layer protocol (representing a specific teleservice) is requested, the terminal shall ignore the call. This function may be provided by the simple determination of the *existence* of higher layer protocol information received with the incoming call message.

I.2.1.1.3 For incoming calls, analysis of the individual bearer service requested. This function is obtained by the analysis of the bearer capability information received with the incoming call message.

I.2.1.1.4 For incoming calls, analysis of multiple subscriber number information, if provided. A call shall only be answered if the requested multiple subscriber number matches the identity assigned to the terminal.

Terminals which do not support the multiple subscriber number supplementary service, shall at least detect the presence of this information. If present, such terminals shall not answer the call.

Terminals supporting the multiple subscriber number supplementary service must analyze this information and will only answer the call if the received information matches the pre-assigned identity or if there is a global call.

I.2.1.1.5 For incoming calls, analysis of subaddress information. A call shall only be answered if the requested subaddress matches the one assigned to the terminal.

Terminals which do not support the subaddressing mechanism, shall at least detect the presence of this information. If present, such terminals shall not answer the call.

Terminals supporting the subaddressing mechanism must analyze this information and will only answer the call if the received information matches the pre-assigned information. Terminals with subaddress capability shall not reject calls on the absence of subaddress information.

I.2.1.1.6 Terminals supporting more than one bearer service must apply rules of §§ I.2.1.1.1, I.2.1.1.2 and I.2.1.1.3 individually. The assignment of a multiple subscriber number or a subaddress may be common for all bearer services.

I.2.1.2 *Optional functions*

I.2.1.2.1 Terminals supporting the multiple subscriber number supplementary service may be pre-assigned more than one number and will therefore answer incoming calls which match one of the pre-assigned identities or which have a global identity (global call) (see Note).

I.2.1.2.2 Terminals supporting the subaddressing mechanism may be pre-assigned more than one subaddress and will therefore answer incoming calls which match one of the pre-assigned subaddress or which have no subaddress (global call).

Note – An incoming call is global if there is no information contained in the call set-up message to relate the call to sub-set of the terminal population based on terminal identity (information on terminal identity is conveyed in the called party number information element). The term “global identity” is used to reflect the global relationship with respect to terminal identity, and suitable coding methods are:

- to omit the called party number information element;
- to define a specific called party number as a global number (see also Recommendation Q.931).

I.2.2 *Terminals supporting teleservices*

I.2.2.1 *Minimum functions*

I.2.2.1.1 For outgoing calls, generation of information defining the service and address information, i.e. bearer capability, higher layer protocol information specifying the requested teleservice and called address.

I.2.2.1.2 For incoming calls, analysis of whether a teleservice is requested (and not a bearer service), i.e. if high layer protocol information (representing a specific teleservice) is *not* requested, the terminal shall ignore the call. This function may be provided by the simple determination of the *existence* of high layer protocol information received with the incoming call message. As high layer compatibility (HLC) information may not be provided in the case of interworking with a non-ISDN, its absence should not be used as a reason for rejecting the call (see § I.2.3.1).

I.2.2.1.3 For incoming calls, analysis of the individual teleservice requested. This function is obtained by the analysis of the bearer capability information and the high layer protocol information received with the incoming call message.

I.2.2.1.4 For incoming calls, analysis of multiple subscriber number information. A call shall only be answered if the requested multiple subscriber number matches the identity assigned to the terminal.

Terminals which do not support the multiple subscriber number supplementary service, shall at least detect the presence of this information. If present, such terminals shall not answer the call.

Terminals supporting the multiple subscriber number supplementary service must analyze this information and will only answer the call if the received information matches the pre-assigned identity or if there is a global call.

I.2.2.1.5 For incoming calls, analysis of subaddress information. A call shall only be answered if the requested subaddress matches the one assigned to the terminal.

Terminals which do not support the subaddressing mechanism shall at least detect the presence of this information. If present, such terminals shall not answer the call.

Terminals supporting the subaddressing mechanism must analyze this information and will only answer the call if the received information matches the pre-assigned information. Terminals with subaddress capability shall not reject calls on the absence of subaddress information.

I.2.2.1.6 Terminals supporting more than one teleservice must apply rules of §§ I.2.2.1.1, I.2.2.1.2 and I.2.2.1.3 individually. The assignment of a multiple subscriber number or a subaddress may be common for all teleservices.

I.2.2.2 *Optional functions*

I.2.2.2.1 Terminals supporting the multiple subscriber number supplementary service may be pre-assigned more than one number and will therefore answer incoming calls which match one of the pre-assigned identities or which have a global identity (global call).

I.2.2.2.2 Terminals supporting the subaddressing mechanism may be pre-assigned more than one subaddress and will therefore answer incoming calls which match one of the pre-assigned subaddress or which have no subaddress (global call).

I.2.3 *Terminals interworking with dedicated networks*

I.2.3.1 *General*

For calls from the ISDN to a dedicated network the interworking function has to make provision that only calls which can be handled by the dedicated network are forwarded.

For calls originated in the dedicated network the interworking function may be unable to provide all elements exactly specifying the service requested according to the rules for a call within the ISDN. For example a call from the telephone network may be a request for telephony, for facsimile or for modem-based data transmission and is presented to the ISDN as a request for the 3.1 kHz audio bearer service.

In the case of interworking with a dedicated network, appropriate information is generated by the interworking function (progress indicator). The presence/absence of this information should be used as a criterion for different treatment of a call depending on whether the call originated within ISDN or within a dedicated network.

I.2.3.1.1 *Calls from PSTN to ISDN*

A PSTN call, supported by conventional signalling prior to arrival at an ISDN interworking point, will belong to one of two indistinguishable call types, i.e. ordinary speech of voiceband data, of which the latter includes facsimile and modem-based data. At the interworking point the bearer capability "3.1 kHz audio" is routinely assigned to assure

compatibility with any of these call types. A “progress indicator” is also applied to mark a non-ISDN call source. Some PSTN customers, however, will be served from ISDN-capable exchanges and calls will be supported by common channel signalling for the entire connection. This affords some added opportunities to make distinctions between the call types. The extent to which this should be recommended is for further study.

I.2.3.1.2 *Calls from PSPDN to ISDN*

(See § 5.3 of this Recommendation.)

I.2.3.1.3 *Calls from PSPDN to ISDN*

(See § 5.4 of this Recommendation.)

I.2.3.1.4 *Calls from networks referred to as digital PSTNs, pre-ISDNs, pilot ISDNs or extended IDNs to ISDNs*

Calls providing a 64 kbit/s transfer rate transparently from one of the above-mentioned networks to an ISDN terminal configuration are not yet finally defined. The 64 kbit/s unrestricted bearer service will be used, but in any case there is an interworking taking place. A progress indicator is present, indicating a non-ISDN call source. Specific high or low layer functionality information cannot, however, be guaranteed. Therefore, the only basic principle which allows distinction between individual terminals is the supplementary service multiple subscriber number.

I.2.3.2 *Telephone terminals in ISDN*

Telephone terminals have certain particular characteristics which have to be taken into account. With these terminals, compatibility checking will be aided by the HLC. Details are for further study. In the case of absence of HLC information, telephone terminals may be considered in a similar manner as terminals supporting bearer services described in § I.2.1 above – even if telephony is a teleservice.

Telephone terminals must interwork with the existing analogue telephone network. For incoming calls they must therefore accept not only the bearer capability “speech”, which occurs in calls within ISDN, but also the bearer capability “3,1 kHz audio”, which is the bearer capability in case of interworking with the analogue telephone network and which is accompanied with call progress information indicating the interworking case.

I.2.3.3 *Facsimile terminals in ISDN*

A facsimile terminal on ISDN may have the capability to support both Group 2/3 mode and Group 4 mode (Group 3/Group 4 machine), Group 2/3 mode only (Group 3 machine) or Group 4 mode only (Group 4 machine).

In order to cater for the case where calls are incoming from networks not able to convey HLC information (e.g. PSTN, switched 64 kbit/s, non-ISDN networks) it must be possible for a facsimile terminal to accept calls without the provision of an HLC information element. This may involve subscription to the Multiple Subscriber Number (MSN) supplementary service, in order to substitute the missing HLC information element. Moreover, for successful call establishment the facsimile terminal has to support the bearer service offered by the interworking function and the mode requested by the calling facsimile terminal.

Similar problems may occur for facsimile calls within the ISDN, if a Group 3 machine in combination with a terminal adaptor (TA) function is connected to the ISDN.

It is obvious that a Group 4 machine and a Group 3 machine are unable to communicate, whatever the network configuration is, when interworking with a dedicated network or TA. However, a Group 3/Group 4 machine is able to communicate to a facsimile machine connected to a dedicated network (this is a Group 3 machine in the case of PSTN, and a Group 4 machine in the case of switched 64 kbit/s, non-ISDN Networks) or connected to the ISDN by means of a TA function. Appendix IV describes the circumstances and capabilities of facsimile terminals for the interworking situations identified above.

I.2.3.4 *Data terminals in ISDN*

Data terminals in ISDN may interwork with compatible data terminals in a dedicated data network or in the telephone network. For outgoing calls, the terminal has to operate as described in § I.2.1 above and it selects the proper bearer capability according to the service request. For incoming calls, a data terminal shall function as described for terminals supporting bearer services in § I.2.1 above. In case of interworking with the telephone network it has to accept calls indicating the bearer capability 3.1 kHz audio which is accompanied with the call progress information.

Automatic answering data terminals connected to the ISDN and interworking with the telephone network or with the CSPDN shall support the multiple subscriber number supplementary service, because this is the only safeguard to avoid that a data terminal will capture each incoming telephone call, facsimile call from the PSTN or possibly each teletex call from the CSPDN.

I.3 *Applications*

Terminals (or terminal adaptors) that follow these terminal selection guidelines can be used on the same point-to-multipoint configuration with terminals of different functionality (e.g. Telefax, Teletex), but following the same terminal selection guidelines, thereby allowing incoming calls to be selected by the appropriate terminal. The inclusion on a point-to-multipoint configuration of terminals not following these guidelines may result in the mishandling of some calls.

Since the application of the terminal selection guidelines is not mandatory for ISDN terminals, it is essential to ensure that the terminals used on each multipoint interface are compatible among themselves for terminal selection.

APPENDIX II

(to Recommendation I.333)

Examples of terminal selection in illustrative configurations

II.1 *Scope*

This appendix describes arrangements indicating some methods which could be used in terminal selection. The different terminal capabilities described in the arrangements are for illustration only. It is the responsibility of the terminal provider to provide terminals with capabilities appropriate to the intended use of the terminal. It is the responsibility of the called party to arrange the terminals on the interface so that incoming calls are handled according to the desires of the called party.

Each illustration indicates likely circumstances for use, and the potential impact of using the terminals on a point-to-multipoint configuration with terminals having different terminal selection functionality. Other terminal selection arrangements may be useful for certain circumstances.

Since the application of the terminal selection guidelines is not mandatory for ISDN terminals, it is essential that the terminals used on each multipoint interface are compatible among themselves for terminal selection.

II.2 *Limited functionality speech terminal*

II.2.1 *Configuration*

An example of a simple terminal configuration is illustrated in Figure II-1/I.333. The multiple terminal configuration example consists of up to eight voice terminals without terminal selection logic.

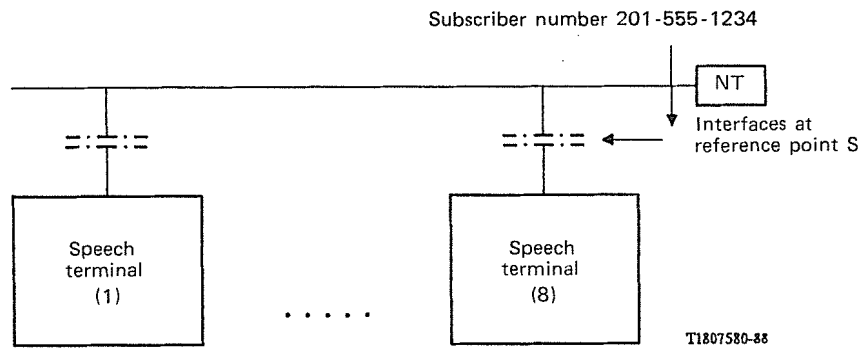


FIGURE II-1/I.333
Limited functionality speech terminals

II.2.2 *Terminals and network capabilities*

Calls are delivered to the interface on the basis of an ISDN subscriber number (ISDN-SN). The terminals respond to the call offered on the basis of presumed eligibility to complete the call.

II.2.3 *Offered call treatment*

A terminal will respond to a set-up message regardless of other terminal selection information (e.g. LLC) present in the set-up message. More than one terminal may answer the offered call, but the network awards the call to the first terminal from which it receives an answer (connect) indication.

II.2.4 *Application*

This type of terminals is appropriate for subscribers who wish only to receive speech calls and who are not concerned with which terminal answers the call. The use of this type of terminal on a point-to-multipoint configuration with terminals designed for anything other than speech calls will result in the mishandling of some calls.

II.3 *Terminal selected by end point identifier (EID) or subaddress*

II.3.1 *Configuration*

- Multiple terminals with the same subscriber number.
- Distinction among the terminals is obtained using the EID or the subaddress (see Figure II-2/I.333).

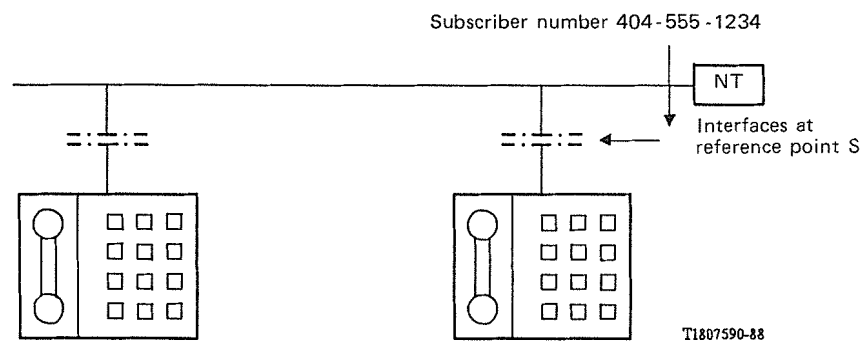


FIGURE II-2/I.333
Multiple terminals with the same ISDN subscriber number

II.3.2 *Terminals and network capabilities*

The network may deliver the call using terminal identification procedures based on the end point identifier (EID). The terminal may respond to the set-up message based on terminal identification procedures (e.g. use of the EID as defined in Recommendation Q.932 or subaddressing).

II.3.3 *Offered call treatment*

The network provides a set-up message with terminal selection information that uniquely identifies a terminal. The terminal identification procedures based on EID or subaddressing schemes will identify a particular terminal and this terminal will respond according to the call or service offered.

II.3.4 *Application*

The EID is provided by the network to identify a specific terminal. The network may make use of a User Service Profile together with terminal selection data to select the EID. In other applications, particularly those involving data terminals, each terminal may be assigned a subaddress and would respond only to calls containing that subaddress.

II.4 *Multiple different terminals on a passive bus*

II.4.1 *Configuration*

This example considers a speech terminal, a terminal adaptor for analogue interface, and a terminal adaptor for digital interface connected on a passive bus. The interface has been assigned three numbers that can be used (by non-ISDN customers) to indicate the terminal they wish to access. The arrangement is shown in Figure II-3/I.333.

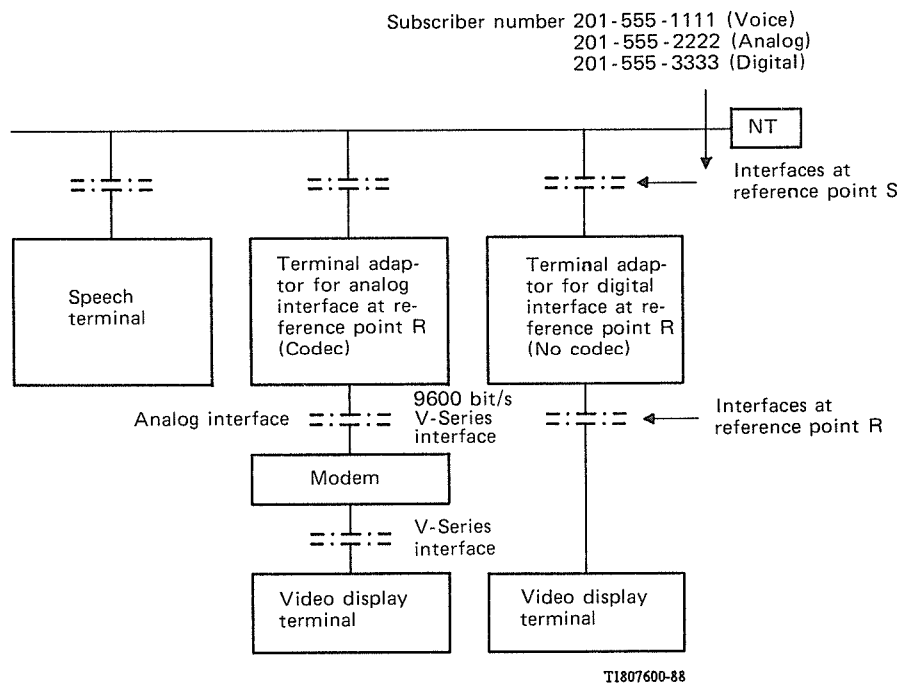


FIGURE II-3/I.333
Multiple different terminals on a passive bus

II.4.2 Terminals and network capabilities

In this example, the terminals are connected to an interface that has been assigned three numbers. Any of the three numbers may be used from another ISDN for any service supported by the subscribers' terminals. For callers from networks that cannot indicate directly the service required (PSTNs, CSPDNs, and PSPDNs), the first number "201-555-1111" is intended for speech services. The second number, "201-555-2222" is intended for modem data services. The third number, "201-555-3333" is intended for access to the terminal adaptor for digital interface.

Terminal selection based on the ISDN subscriber number, bearer capability, and progress indicators is used to identify one (or none) of the three terminals that is appropriate to respond to an offered call.

II.4.3 Offered call treatment

II.4.3.1 Speech terminal (see Figure II-4/I.333)

Offered call bearer capability – "Speech":

The terminal responds to the call.

Offered call bearer capability – "3.1 kHz audio":

1) Progress indicator – non-ISDN:

i) Called number – 201-555-1111:

The terminal responds to the call.

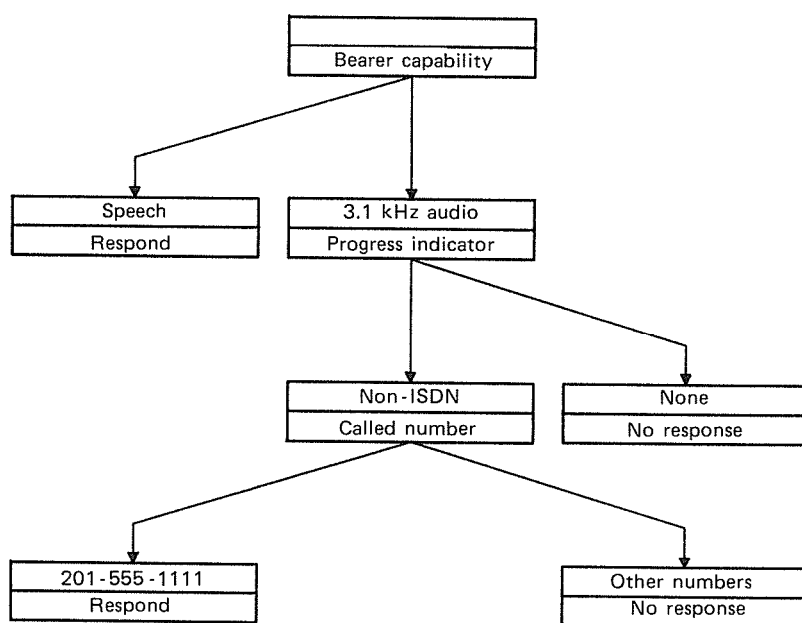
ii) Other called numbers:

The terminal does not respond.

2) No progress indicator – ISDN origination and transit:

The terminal assumes that the call is a data call and does not respond.

Offered call with other bearer capabilities: the terminal does not respond.



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FIGURE II-4/I.333
Logic for speech terminal

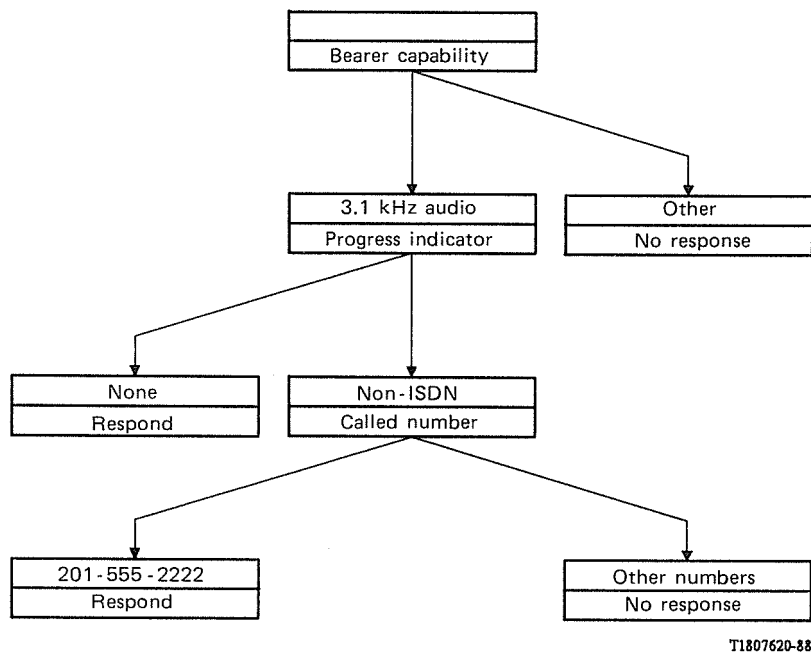
II.4.3.2 TA for analogue interface/video display terminal

The terminal adaptor contains a codec that produces an analogue signal that is connected to a modem; the modem has a V-Series interface to the Video Display Terminal (VDT). The logic is shown in Figure II-5/I.333.

Offered call bearer capability – “3.1 kHz audio”:

- 1) Progress indicator – non-ISDN:
 - i) Called number – 201-555-2222:
 - The terminal adaptor assumes that the call is a data call and responds.
 - The call is connected to the video display terminal through a modem.
 - ii) Other called number:
 - The terminal adaptor does not respond.
- 2) No progress indicator – ISDN origination and transit:
 - The terminal adaptor responds. It assumes that, since the call originated at an ISDN terminal, the call is a data call regardless of the called number.

Offered call with other bearer capabilities: the terminal adaptor does not respond.



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FIGURE II-5/I.333
Logic for the terminal adaptor for analog interface

II.4.3.3 TA for digital interface/video display terminal

The terminal adaptor adapts the V-Series interface to the interface at reference point S of ISDN.

The adaptation includes rate adapting the 9600 bit/s rate of the display terminal to the 64 kbit/s rate of a B-channel. The logic for the digital terminal adaptor is shown in Figure II-6/I.333.

For non-ISDN calls, it is assumed that the call is routed through an interworking function that establishes a bearer capability of 64 kbit/s for the call.

Offered call bearer capability – “64 kbit/s unrestricted”:

- 1) Progress indicator – non-ISDN:
 - i) Called number – 201-555-3333:
The switch routes the connection through an interworking unit (e.g. a modem). The terminal adaptor for digital interface/display terminal answers the call.
 - ii) Other called numbers:
The terminal adaptor does not respond.
- 2) No progress indicator – ISDN origination and transit:
The terminal adaptor responds. It assumes that, since the call originated at an ISDN terminal, the call is a data call regardless of the called number.

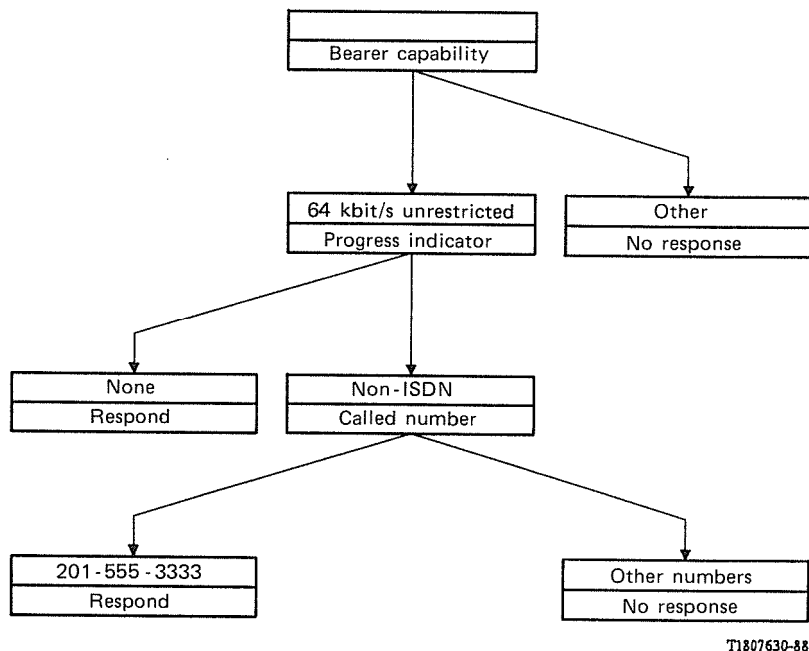


FIGURE II-6/I.333

Logic for the terminal adaptor for digital interface

II.4.4 Application

This example of multiple different terminals on a passive bus illustrates the terminal selection logic that allows the appropriate terminal, from among a speech terminal, a terminal adaptor for analogue interface, and a terminal adaptor for digital interface, to respond to an incoming call. Calls from a non-ISDN network are selected on the basis of the called ISDN number; calls from an ISDN subscriber are selected on the basis of the bearer capability. The addition to the interface of other terminals with different functionality but using the same bearer capability would result in incorrect terminal selection.

APPENDIX III

(to Recommendation I.333)

Examples of terminal selection using local terminal selection procedures

This appendix describes the concept of a logical terminal and its application in assisting the network to provide services to the access through local terminal identification mechanisms.

III.1 *Logical terminals*

There may exist up to 8 physical terminals on an S/T bus. Within each physical terminal there may exist one or more logical terminals (as shown in Figure III-1/I.333). A logical terminal is considered to be the exchange's view of the physical terminal(s) on an interface. The parameters which are maintained by the exchange, which describe the logical terminal characteristics, are collectively termed to be the Logical Terminal Profile (LTP). The LTP may contain such information as subscriber numbers, bearer capabilities supported, services subscribed to, or other information which the exchange may require to successfully offer service to the terminals on the interface. A physical terminal can appear (to the network) to be several logical terminals by using several unique TEIs (see Note), each of which may map into a single LTP. The relationship of logical terminals to LTPs may be one-to-one or many-to-one. The relationship between physical terminals, logical terminals, TEIs and LTPs is illustrated in Figure III-2/I.333).

Note – The terminal end point identifier (TEI) is part of the D-channel layer 2 address field [see Recommendation Q.921 (I.441)].

Eight logical terminals (the inner boxes, labeled LT1 to LT8) are shown in a total of four physical terminals (the outer boxes, labeled PT1 to PT4). Each logical terminal corresponds to one TEI. This arrangement reflects a customer subscribing to the multiple subscriber number (MSN) supplementary service.

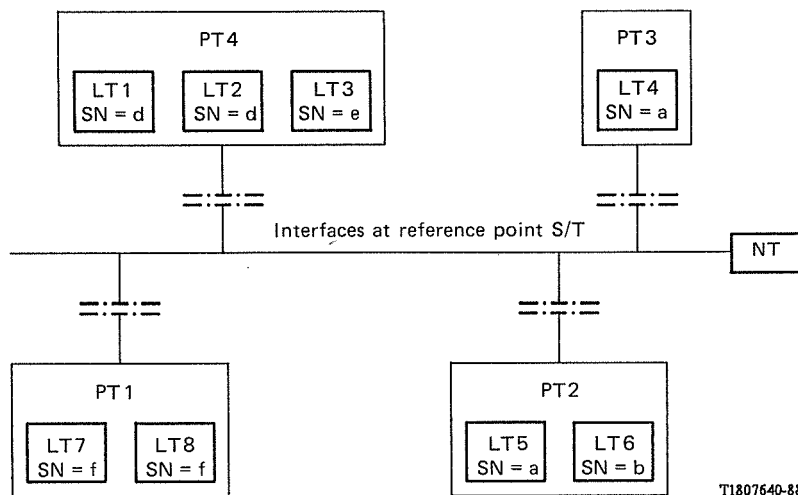
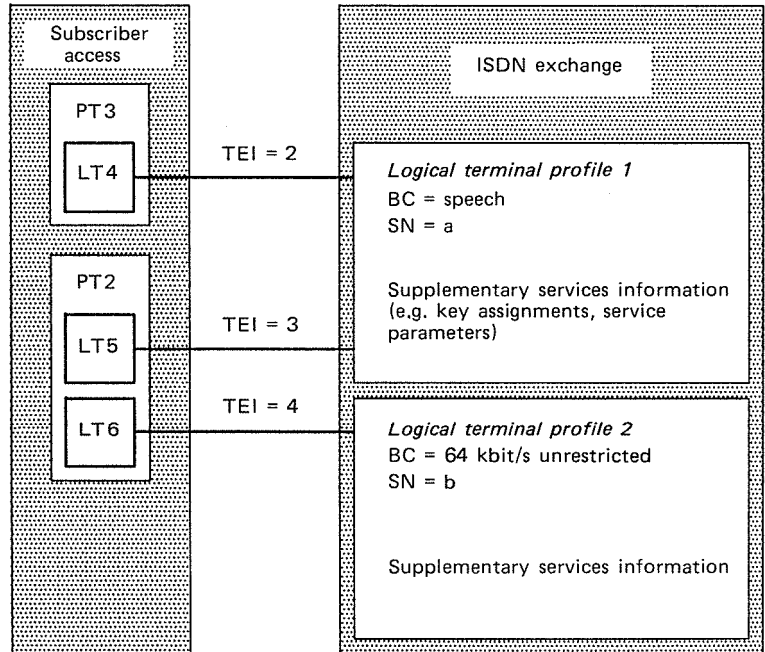


FIGURE III-1/I.333

Example of logical terminal arrangement



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- PT Physical terminal
- LT Logical terminal
- BC Bearer capability
- SN Subscriber number
- SN = a Subscriber number with value "a"
- NT Network termination

FIGURE III-2/I.333
Relationship of LTs and LTPs

III.2 Application

It is considered that the subscriber may want the exchange to provide terminal selection functions for his terminals. A local terminal selection procedure will accommodate this. In addition, future services may be facilitated which could require special call treatment based on knowledge of the terminal(s) maintained in an LTP and identified using a local procedure.

In the context of terminating calls, when an exchange receives digits of a subscriber number (SN) for a call to a terminal on a subscriber line, it would search for the LTP(s) associated with the SN. It would then formulate network-layer call control messages to alert these terminals based on the descriptions associated with the LTP. The Q.932 procedure is used to allow association of a TEI with an LTP. The procedures used for all establishment comply with Recommendation Q.931 (I.451).

APPENDIX IV

(to Recommendation I.333)

Facsimile terminals in ISDN

IV.1 *Outgoing calls*

In accordance with § I.2.2.1.1 a G3/G4 (Group 3/Group 4) machine or a G4 machine attempting a G4 call shall use the bearer capability according to the capabilities of the network, which may be either “circuit-mode 64 kbit/s unrestricted 8 kHz structured” (category I.231.1) or “virtual call” (category I.232.1), or both of them, and provide the HLC information element with high layer characteristics identification “facsimile group 4”.

In accordance with § I.2.2.1.1 a Terminal Adaptor (TA) supporting a G3 machine shall use the 3.1 kHz audio bearer capability and shall provide the HLC information element with high layer characteristics identification “facsimile group 3”.

The actions to be taken by the calling facsimile terminal following an unsuccessful call attempt where incompatibility has been indicated (e.g. cause “incompatible destination” for calls within the ISDN, or call rejection with a suitable cause indication in the case of interworking with a dedicated network) require further study. The optimum condition to achieve compatibility in a call re-attempt greatly depends on the cause indication provided to the calling facsimile terminal and its capability to divert to the requested characteristics for the call re-attempt. For a certain type of facsimile terminal these actions may include:

- i) A G3 machine shall release the call and take no further action.
- ii) A G4 machine shall release the call.

The G4 machine may initiate a call re-attempt, if a mismatch of the bearer capability has been indicated and it can match the requested characteristics, e.g. in the case where the "virtual call" (category I.232.1) bearer capability has been requested by the calling facsimile terminal and interworking with switched 64 kbit/s non-ISDN network takes place. Otherwise it cannot take further actions and is unable to communicate with the called facsimile terminal.

- iii) A G3/G4 machine shall release the call.

If interworking ISDN to PSTN has been indicated, or cause “incompatible destination” for calls within the ISDN, when the call has been rejected, the G3/G4 machine may initiate a re-attempt in the G3 mode. It shall use the 3.1 kHz audio bearer capability and shall provide the HLC information element with high layer characteristics identification “facsimile group 3”.

If interworking ISDN, to switched 64 kbit/s non-ISDN network, has been indicated when the call has been rejected, actions according to item ii) may be appropriate.

IV.2 *Incoming calls*

For incoming calls originated within ISDN, the facsimile terminal shall function as described for terminals supporting teleservices in § I.2.2.

For incoming calls from non-ISDN networks such as the telephone network (PSTN), the facsimile terminal will receive the appropriate information indicating an interworking situation (call progress information). It shall rely on the call progress information element to accept calls which are offered without information specifying high layer protocols, if it matches other elements describing the incoming call. Otherwise it shall release or ignore the call (user options). Facsimile terminals connected to the ISDN and interworking with non-ISDN networks must support the supplementary service Multiple Subscriber Number. This supplementary service allows to substitute the missing information describing the call and is the only means to avoid having a facsimile terminal accept calls which are not appropriate to it, e.g. incoming call from non-ISDN networks such as telephone calls or data calls.

The rules below are applicable to a certain type of facsimile terminal. They define the criteria which should be used by the terminal to determine whether, and in what mode it should answer the call:

- i) A TA supporting a G3 machine should answer the call if the following criteria are fulfilled:
 - a) The called party number information element, if present, contains a number which matches the number assigned to the TA; and
 - b) the bearer capability information element indicates the information transfer capability “3.1 kHz audio”; and
 - c) the progress indicator information element indicates the progress description “call is not end-to-end ISDN” (incoming call from PSTN); and
 - d) the high layer compatibility information element is not present; and
 - e) the called party subaddress information element is not present;or (instead of ci, dl, el)
 - c2) the progress indicator information element is not present (incoming call from ISDN); and
 - d2) the high layer compatibility information element indicates high layer characteristics identification “facsimile group 3”; and
 - e2) the called party subaddress information element, if present, contains a number which matches the subaddress assigned to the terminal.
- ii) A G3/G4 machine should answer the call in the G3 mode (including modem and codec functions) if the following criteria are fulfilled (incoming call from PSTN);
 - a) The called party number information element, if present, contains a number which matches the number assigned to the terminal; and
 - b) the bearer capability information element indicates the information transfer capability “3.1 kHz audio”; and
 - c) the progress indicator information element indicates the progress description “call is not end-to-end ISDN”; and
 - d) the high layer compatibility information element is not present; and
 - e) the called party subaddress information element is not present.
- iii) A G3/G4 machine (or a G4 machine) should answer the call in the G4 mode (neither modem nor codec functions) if the following criteria are fulfilled (incoming call from switched 64 kbit/s network (non-ISDN));
 - a) The called party number information element, if present, contains a number which matches the number assigned to the terminal; and
 - b) the bearer capability information element indicates the information transfer capability “unrestricted digital information” and transfer mode “circuit mode”; and
 - c) the progress indicator information element indicates the progress description “call is not end-to-end ISDN”; and
 - d) the high layer compatibility information element is not present; and
 - e) the called party subaddress information element is not present.
- iv) A G3/G4 machine (or a G4 machine) should answer the call in the G4 mode (neither modem nor codec functions) if the following criteria are fulfilled (incoming call from ISDN);
 - a) The called party number information element, if present, contains a number which matches the number assigned to the terminal; and
 - b) the bearer capability information element indicates the information transfer capability “unrestricted digital information” and a transfer mode which is supported by the called facsimile terminal (“circuit mode” or “packet mode”); and
 - c) the progress indicator information element is not present; and
 - d) the high layer compatibility information element indicates high layer characteristics identification “facsimile group 4”; and
 - e) the called party subaddress information element, if present, contains a number which matches the subaddress assigned to the terminal.

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