ATIS-1000666.1999(S2019)

Signalling System Number 7 (SS7) – Operator Services Network Capabilities

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Contents

Foreword (This foreword is not part of American National Standard T1.666-1999.)

This document is entitled *American National Standard for Telecommunications - Signalling System Number 7 (SS7) - Operator Services Network Capabilities (OSNC). OSNC* is a suite of network capabilities which may provide support for an operator service or another network capability. It includes the following operator services network capabilities and general network capabilities: Operator Services Originating Connection; Operator Services Transfer Connection; Operator Services Terminating Connection; Connection Hold; Coin Station Control; and Network Service Recall. *OSNC* has been developed for use between U.S. networks to meet the anticipated needs and applications of those entities. This standard is the result of extensive work by members of the T1S1.3 Working Group on U.S. Standards for Common Channel Signalling.

This standard is intended for use in conjunction with *American National Standard for Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*, ANSI T1.113-1995, which includes chapters on overview, messages and signals, protocol formats, procedures, and performance. It should be noted, however, that some procedures specific to this standard are extensions beyond ANSI T1.113-1995.

Footnotes are not officially part of this standard.

Future control of this document will reside with Accredited Standards Committee on Telecommunications, T1. This control of additions to the specification, such as protocol evolution, new applications and operational requirements, will permit compatibility among U.S. networks. Such additions will be incorporated in an orderly manner with due consideration to the ITU-T layered model principles, conventions, and functional boundaries.

Suggestions for improvement of this standard will be welcome. These should be sent to the Alliance for Telecommunications Industry Solutions, T1 Secretariat, 1200 G Street, NW, Suite 500, Washington DC 20005.

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Section 1

Operator Services Originating Connection Network Capability

Table of Contents

American National Standard for Telecommunications – Signalling System Number 7 (SS7) – Operator Services Network Capabilities

1 Scope, Purpose, and Application

This document describes the operator services originating connection network capability, which permits the establishment and release of a network connection between a user and an operator service or services. This capability builds upon the existing basic call control procedures, defined in ANSI T1.113, for establishing and releasing connections.

A service invoking the operator services originating connection network capability may also invoke:

- User-Network Interaction network procedures (ANSI T1.113.4)
- Other network capabilities, e.g., Connection Hold (ANSI T1.666.4)

The transmission of information elements and related procedures defined in this document involve appropriate agreements between transmitting and receiving networks. These agreements are beyond the scope of this document.

This standard applies to the Integrated Services Digital Network (ISDN) User Part (ISUP) and is intended to supplement the signaling functions and call procedures described in ANSI T1.113. This standard could be used in conjunction with other American National Standards related to supplementary services and network capabilities. For a more complete understanding of the interactions between the Operator Services Originating Connection and other ANSI services and network capabilities, the appropriate American National Standards should be consulted.

2 Normative References

The following documents contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.113-1995, *Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*

3 Abbreviations and Definitions

3.1 Abbreviations

The following abbreviations are used in this document.

ACM	Address Complete Message
ANM	Answer Message
ANSI	American National Standards Institute
CIP	Carrier Identification parameter
DTMF	dual-tone multifrequency
DP	dial-pulse
FE	functional entity
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	Integrated Services Digital Network User Part

LE	local exchange
OC1	originating connection functions group 1
OC2	originating connection functions group 2
OSAP	operator services access point
OSI	Operator Services Information parameter
REL	Release Message
SS7	Signaling System Number 7
TNS	Transit Network Selection parameter
TR	transit exchange

3.2 Definitions of Terms

The generic definitions in this subclause have been formulated for use within this document.

3.2.1 Intercept Call Request: An operator services call request initiated by the network because of the service condition of the line of the called party (e.g., line out of service, etc.).

3.2.2 Operator Service Access Point (OSAP): The functional entity which provides access to an operator service from an exchange in the network. The operator service may be co-located with the exchange or located elsewhere; however, the interface between the OSAP and the operator service is beyond the scope of this document.

3.2.3 Operator Services: A set of services including toll and assistance, listing services and intercept, which make use of the operator services originating connection network capability.

3.2.4 Originating Connection: The connection between the termination of a user-network interface and an operator service access point that is used for communication between the user and the operator service.

3.2.5 Originating Connection Destination Exchange: The Originating Connection Destination Exchange is the exchange which is the terminating point for the originating connection. The Originating Connection Destination Exchange provides additional service capabilities, not available at the Originating Connection initiating exchange.

3.2.6 Originating Connection Initiating Exchange: The Originating Connection Initiating Exchange is the exchange which recognizes the need for operator services on a call and invokes the originating connection network capability. The Originating Connection Initiating Exchange may be an originating exchange or an intermediate exchange.

3.2.7 Originating Connection Intermediate Exchange: The Originating Connection Intermediate Exchange is an exchange participating in the originating connection which succeeds the originating connection initiating exchange and precedes the originating connection destination exchange

3.2.8 Screened Call Request: An operator services call request initiated by the network because of the type of originating station used (e.g., coin or other restricted line).

3.2.9 Served User: A person who interacts with an operator service.

4 Description of Network Capability

4.1 General Description

When access to an operator service is requested, the network establishes an originating connection between the user and an operator service access point (OSAP).

During the establishment of the originating connection, the operator service may attempt to invoke the connection hold network capability (see ANSI T1.666.4). This prevents the release of the originating connection by the calling party.

4.2 Procedures

4.2.1 Provision/Withdrawal

A user does not subscribe to the originating connection network capability. The originating connection network capability is invokable on calls identified as requiring operator services.

4.2.2 Normal Procedures

4.2.2.1 Activation/Deactivation

The originating connection network capability is activated/deactivated on a per-network basis.

4.2.2.2 Invocation and Operation

4.2.2.2.1 Establishing the Originating Connection

The network establishes an originating connection upon receipt of an operator services request. This request may be initiated by:

- the user in the form of the dialing prefix 0
- the user in the form of a network service code, such as 411 or NPA-555-XXXX.
- the network because of the type of originating station used, i.e., screened call requests
- the network because of the service condition of the line of the called party, e.g., intercept call requests.

The originating connection is established in support of the following call requests: “0-”, “0+”, “1+ screened”, 1+ network service code, and intercept. The 0+, 1+ screened, 1+ service code, and intercept call requests include either the destination address of a called party, or a network service code. 0-call requests do not include the destination address of a called party.

The terms 0-, 0+, etc., are used to reflect user dialing patterns, which generally cause the network to invoke an operator services originating connection. While a network service may invoke an operator services originating connection without such user activity, the connection must be classified as one of these types, so that the encoding rules for the messages on the connection are known.

If it is necessary to route intercept call requests to a different destination node than other types of operator call requests, then it will be necessary for each intermediate node in the call path to recognize new call routing information, or to route the intercept call requests on a dedicated path.

4.2.2.2.2 Releasing the Originating Connection

The network releases an originating connection upon receipt of a release request from either the user or the operator service. If connection hold is in effect, the user-initiated release request is communicated to the operator service without causing release (see ANSI T1.666.4).

4.2.3 Exceptional Procedures

None identified.

4.3 Interworking Considerations

None identified.

4.4 Network Capabilities for Charging

None identified.

4.5 Interactions with supplementary services and other network capabilities

4.5.1 Transfer Connection Network Capability

See ANSI T1.666.2.

4.5.2 Terminating Connection Network Capability

See ANSI T1.666.3.

4.5.3 Connection Hold Network Capability

See ANSI T1.666.4.

4.5.4 User-to-User Signaling

The originating connection network capability will not support the passing of User-to-User signaling information due to existing incompatibilities between ISDN services and operator services.

4.5.5 Calling Line Identification Presentation/Calling Line Identification Restriction (CLIP/CLIR)

If available, information related to the calling party (e.g., calling party address presentation indicator) should be passed unchanged to the OSAP, following the procedures described in ANSI T1.113.4, Section 2.

4.5.6 Calling Name Identification Presentation/Calling Name Identification Restriction (CNIP/CNIR)

If available to the OSAP, information related to the calling party (e.g., generic name presentation indicator) should be passed unchanged, following the procedures described in ANSI T1.113.4, Section 2.

5 Functional Capabilities and Information Flows

5.1 Functional Entity (FE) Model

This subclause describes a functional entity model for establishing and releasing an operator services originating connection. A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. Figure 1 shows the functional entity model for the operator services originating connection network capability.

FE1 - FE5 represent basic service functional entities. Additional functions for the operator services originating connection network capability are provided as an extension to the basic service functional entity and are divided into two groups. Originating Connection functions group 1 (OC1) and Originating Connection functions group 2 (OC2). The service invoking the originating connection network capability is depicted in Figure 1, but is not defined in this document.

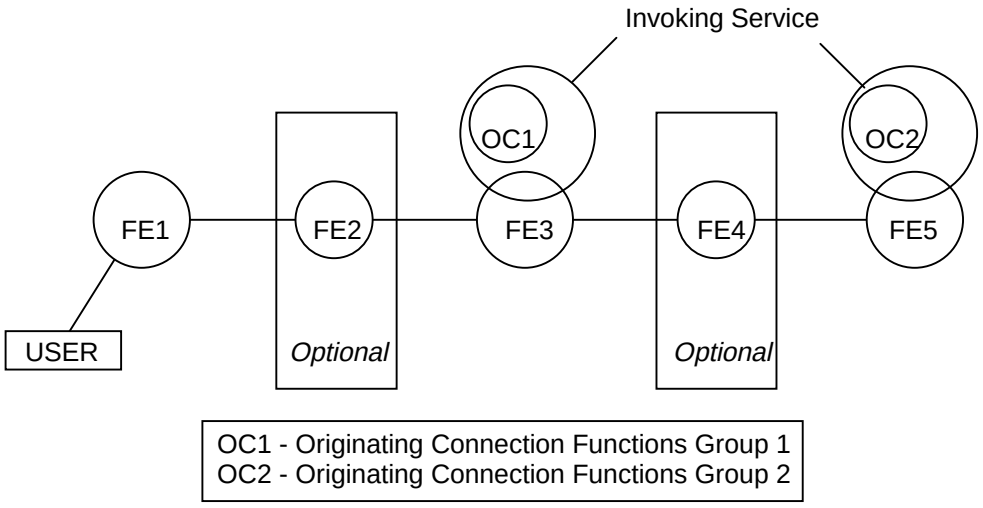


Figure 1 - Operator Services Originating Connection Functional Entity Model

5.1.1 Description of Functional Entity 1 (FE1), Functional Entity 2 (FE2), and Functional Entity 4 (FE4)

The operator services originating connection functional entity model builds upon basic call control functions. Basic call control functions provided by FE1, FE2 and FE4 include the ability to transfer information elements defined for the operator services originating connection network capability. FE1, FE2 and FE4 may also need to support the user-network interaction network procedures (see ANSI T1.113.4) during operator service call processing.

In order to perform forward routing, FE4 may use received information identifying the type of operator service required.

5.1.2 Description of Functional Entity 3 (FE3)

FE3 provides basic call control capabilities, may support user-network interaction network procedures during operator service processing, and interacts with OC1 functions. FE3 recognizes that a call request from a user requires access to an operator service and informs OC1.

5.1.3 Description of Originating Connection Functions Group 1 (OC1)

OC1 provides additional functions for the operator services originating connection network capability as an extension of basic service.

During establishment of an operator services originating connection, OC1 is able to:
- Receive a notification from FE3 that a call request from the user requires access to an operator service.
- Recognize the type of operator service request required, as described in 4.2.2.2.1.
- Generate operator service request information which is included in the outgoing call set-up request.

5.1.4 Description of Functional Entity 5 (FE5)

FE5 provides basic service capabilities and interacts with OC2 functions. FE5 recognizes an operator services call set-up request and informs OC2.

During the release of an operator services originating connection, FE5 is able to:
- Initiate normal release procedures when a Call Disconnect request is received from FE3.
- Send a Call Disconnect request toward FE3 to end the connection, when requested by OC2.

5.1.5 Description of Originating Connection Functions Group 2 (OC2)

OC2 provides additional functions for the operator services originating connection network capability as an extension of basic service.

During establishment of an operator services originating connection, OC2 is able to:
- Receive information of an operator services call set-up from FE5.
- Provide access to the requested operator service(s).
- Notify FE5 that a call acknowledgment should be sent toward FE3 and that a request for establishment of a two-way transmission path should be included in the call acknowledgment.

5.1.6 Limiting Assumptions

None identified.

5.2 Information Flow Model

5.2.1 Establishing the Originating Connection

5.2.1.1 Procedures

The procedures described in this subclause are depicted in Figure 2. Significant events in the procedure flows are indicated in both the text and the figure by the "Δ" symbol.

A user submits a Call Request to FE1 (Δ1). FE1 forwards a CALL REQuest toward FE3. FE3 receives this CALL REQuest, recognizes that operator services are required based either upon information supplied by the user in the CALL REQuest or upon information maintained by FE3, and informs OC1. OC1 generates operator services request information, which is included in a CALL REQuest message sent forward from FE3 (Δ2). This CALL REQuest includes any information that would be included in a basic (non-operator services) call set-up request, plus the information elements appearing in 5.2.1.2, Table 1. If any or all of these additional information elements in Table 1 are unavailable to OC1, OC1 will include only the available information. This CALL REQuest is forwarded to FE5.

When FE5 receives the CALL REQuest which it recognizes as an operator services set-up request, FE5 will notify OC2 of the request. OC2 generates information for inclusion in the CALL ACKnowledgment message (Δ3). FE5 sends a CALL ACKnowledgment message toward FE3 (Δ4). This CALL ACKnowledgment includes any information that would be included in a basic (non-operator services) call set-up acknowledgment, plus an information element which is included as a result of a request from OC2 to FE5. This element, which appears in 5.2.1.2, Table 2, will cause other FEs in the connection to invoke the user-network interaction capability. Each FE in the connection receives the CALL ACKnowledgment, invokes the user-network interaction network capability to provide a two-way transmission path, and sends the message toward FE1 (Δ5).

The originating connection then enters the Operator Service In Progress state.

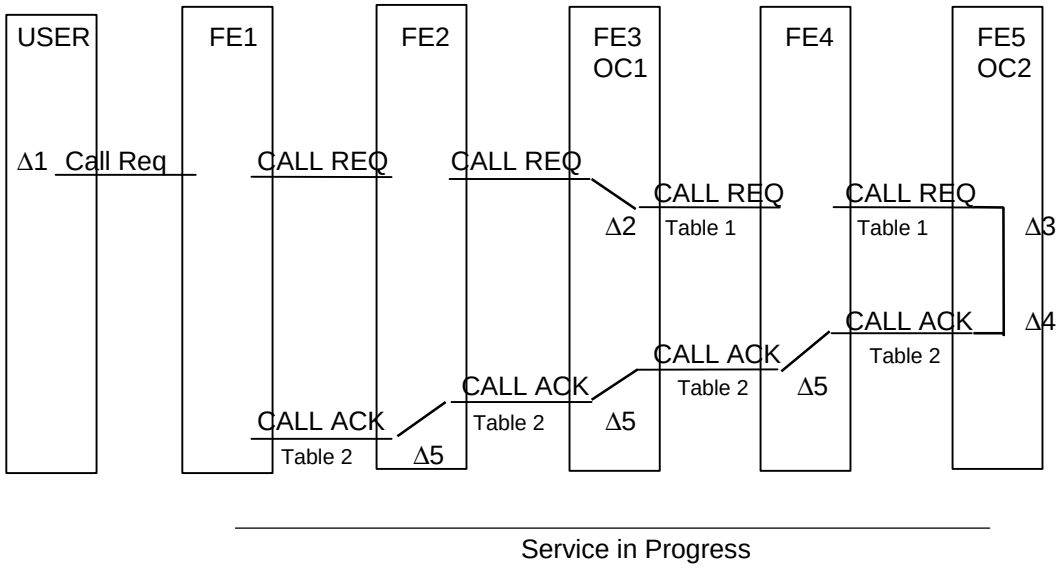


Figure 2 - Establishing the Originating Connection: Information Flow

5.2.1.2 Information Elements

Tables 1 and 2 list the information elements related to the establishment of an originating connection.

If an information element is designated “Optional”, and if that information is available at the time of the establishment of the originating connection, OC1 includes that information element in the CALL REQuest. The call type determines which of these information elements are necessary. OC1 does not include a given element if either the information is not available or the originating connection does not support the transmission of that element. The absence of any of the information elements listed in Table 1 does not interfere with the network’s ability to establish the originating connection.

Table 1 - CALL REQuest Information Elements

Information Element	
Charge Number Information	O
Originating Line Characteristics	O
Access Signaling Information	O
Access Prefix Information	O
Carrier Identification Information	O
Carrier Selection Information	O
Intercepted Number	O
Intercept Call Information	O
Transit Network Selection Information	O

KEY:

*O Element optional; absence non-fatal***.**

Table 2 - CALL ACKnowledgment Information Elements

Information Element	
User-Network Interaction Information	R

KEY:
R *Element required*.

5.2.1.2.1 Charge Number Information (Calling User Billing Number).

An information element providing a chargeable number for the calling party. Charge number information never refers to an alternately billed party.

5.2.1.2.2 Originating Line Characteristics.

An information element providing the toll class-of-service or other characteristic of the line or the call.

5.2.1.2.3 Access Signaling Information.

An information element identifying whether the calling user is using Dual-Tone Multifrequency (DTMF), Dial-Pulse (DP), or an undetermined method of access signaling. (A calling user, using an ISDN access, is considered as DTMF.)

5.2.1.2.4 Access Prefix Information.

An information element indicating whether or not the call request received from the calling user is a 0-, 0+, or 1+ call request.

5.2.1.2.5 Carrier Identification Information.

An information element identifying the interexchange carrier (IC) or international carrier (INC) that may be used for transport beyond the operator system's provider FE. This information is not used to route the call to the OSAP.

5.2.1.2.6 Carrier Selection Information.

An information element providing the criteria used by the network to select the carrier identified in the Carrier Identification Information element associated with the operator services request.

5.2.1.2.7 User-Network Interaction Information.

An information element requesting that a two-way transmission path between the user and the network be provided.

5.2.1.2.8 Intercepted Number

An information element provided when the originating connection network capability is invoked by the network because of stored information about the party the calling user is attempting to reach. This information element contains the number of the intended called party.

5.2.1.2.9 Intercept Call Information

An information element provided when the originating connection network capability is invoked by the network because of stored information about the party the calling user is attempting to reach. This information element identifies the call as requiring intercept service.

5.2.1.2.10 Transit Network Selection Information.

An information element identifying the carrier providing operator services for the carrier identified in the Carrier Identification Information.

5.2.2 Releasing the Originating Connection

Release of the originating connection call begins when FE1 recognizes a user disconnect request, or when FE5 sends a Call Disconnect message to FE1.

If the user initiates the disconnect request and the connection hold network capability has been successfully invoked, the release procedures described in the connection hold network capability (ANSI T1.666.4) are initiated. If the user initiates the disconnect request and the connection hold network capability has not been invoked or if FE5 sends a Call Disconnect message, standard release procedures as described in ANSI T1.113.4 are initiated.

5.3 Allocation of Functions to Equipment

This subclause identifies five scenarios for allocating the functional entities to specific network equipment.

Table 3 - Allocation of Functions to Equipment

FE Scenario	FE1	FE2	FE3/ OC1	FE4	FE5/ OC2
Scenario 1	LE	-	LE	-	TR1
Scenario 2	LE	-	LE	TR1	TR2
Scenario 3	LE	TR1	TR2	-	TR3
Scenario 4	LE	TR1	TR2	TR3	TR4
Scenario 5	LE	-	LE	-	LE

KEY:
LE - Local Exchange
TR*n* - Transit Exchange *n*

In the ISDN-UP procedures text, the local exchange supporting FE1 is referred to as the Call Originating Exchange, the exchange supporting FE3/OC1 is referred to as the Service Initiating Exchange, and the exchange supporting FE5/OC2 is the Service Controlling Exchange.

5.3.1 Examples of Operator Services Mapped to Allocation Scenarios

Table 4 reorganizes the information appearing in Table 3. In Table 4, FEs allocated to the same equipment are grouped together.

Table 4 - FEs Grouped by Equipment

Equip. Scenario	LE	TR1	TR2	TR3	TR4
Scenario 1	FE1, FE3/OC1	FE5/OC2	-	-	-
Scenario 2	FE1, FE3/OC1	FE4	FE5/OC2	-	-
Scenario 3	FE1	FE2	FE3/OC1	FE5/OC2	-
Scenario 4	FE1	FE2	FE3/OC1	FE4	FE5/OC2
Scenario 5	FE1, FE3/OC1, FE5/OC2	-	-	-	-

KEY:
LE - Local Exchange
TR*n* - Transit Exchange *n*

Below are examples of operator services scenarios which map to the allocation scenarios presented above. These examples are for illustrative purposes *only.*

- **Scenario 1.** The exchange which terminates the caller's user-network interface recognizes the operator service request, and the caller's exchange has a direct connection to the operator services access point. Common examples of this scenario include 0-, 0+, network service code and 1+ screened calls.
- **Scenario 2.** This scenario is identical to Scenario 1, except that one or more intermediate exchanges exist between the caller's exchange and the operator services access point. Common examples of this scenario include 0-, 0+, network service code and 1+ screened calls.
- **Scenario 3.** The caller's exchange does not recognize an operator services request, and instead treats the call as a non-operator services call. Another exchange (a "subsequent exchange") receiving the call set-up from the caller recognizes the need for operator services and re-routes the call, adding information as needed. A direct connection exists between the subsequent exchange and the operator services access point. A common example of this scenario is an intercept call.

- **Scenario 4.** This scenario is identical to Scenario 3, except that one or more intermediate exchanges exist between the subsequent exchange and the operator services access point.
- **Scenario 5.** The caller's exchange is the operator services access point.

6 Protocols and Procedures

6.1 Protocol and procedural assumptions

Table 5 shows the explicit relationship of the Originating Connection information flows to SS7 protocol messages.

Table 5 - Relationship of Flows to SS7 ISUP Protocol

Flow	Message
CALL REQ	IAM
CALL ACK	ACM
CALL DISCONNECT REQUEST	REL

6.2 Formats and codes

6.2.1 Parameters for IAM

Table 6 - ISUP Parameters for Elements Found in Table 1

Information Element	Parameter/Indicator	Msg	Coding	Include.	Trigger
Charge Number Information	Charge Number	IAM	NC	O	OSCI
Originating Line Characteristics	Originating Line Info.	IAM	NC	O	OSCI
Access Signaling Info	Operator Services Info	IAM	6.2.3	O	OSCI
Access Prefix Info	Operator Services Info (Note 1)	IAM	6.2.3	O	OSCI
Carrier Identification Info	Carrier Identification	IAM	Note 2	O	OSCI
Carrier Selection Info	Carrier Selection	IAM	Note 2	O	OSCI
Intercepted Number	Called Party Number	IAM	NC	O	OSCI INT
Intercept Call Information	Service Activation	IAM	6.2.4	O	OSCI INT

Key:
INT - Intercept Call Identified
NC - No Changes
OSCI - Operator Services Call Identified, as described in 4.2.2.2.
O - Optional. The call type determines which information elements are necessarily available.

Note 1: Access Prefix does not map into the Nature of Address field of the Called Number parameter. The Access Prefix "1+" may be used either on operator services calls, (e.g., coin), or on non-operator services calls (e.g., station-paid).

Note 2: In operator services calls, two carriers may be identified. The carrier identified in the Transit Network Selection parameter is the carrier to which the operator services request is routed; the carrier identified in the Carrier Identification parameter is the carrier that may be used by the operator service to complete a new leg of the call to a called party. This impacts the interpretation of the Carrier Selection parameter. In non-operator services calls, Carrier Selection refers directly to the carrier identified in the TNS parameter. However, in operator services calls, Carrier Selection refers directly to the carrier identified in the Carrier Identification parameter.

6.2.2 Parameters for ACM

Table 7 - ISUP Parameters for Elements Found in Table 2

Information Element	Parameter/Indicator	Msg	Coding	Include.	Trigger
User-Network Interaction	Opt. Backward Call Indicators/User-Network Interaction Indicator	ACM	NC	R	OS

Key:
NC - No Changes
OS - Operator Services call logic
R - Required for proper service operation. If not included, originating connection will be established but no service transactions can occur.

6.2.3 Coding of Operator Services Information Parameter

Table 8 shows the structure of the Operator Services Information parameter which, if present, contains a set of one or more information elements identified in Table 6.

The Operator Services Information parameter uses a parameter name code, a field definition and codepoints as follows:

1100 0010 Operator Services Information Parameter name code

Table 8 - Operator Services Information Parameter Field Structure

8	7	6	5	4	3	2	1
ext	Information Type			Information Value			

Note:

Extension indicator (ext):

0 octet continues through the next octet (for example, octet 2 to 2a, 2a to 2b, etc.)

1 last octet

Table 9 - Operator Services Information Parameter Codepoints

Info Type Codepoints	Info Value Codepoints
000 Unknown	0000 Unknown
001 Original Access Prefix	0000 Unknown 0001 1+ or 011+ 0010 0+ or 01+ 0011 0- remaining spare
010 Assigned for 011 Use On Other OS 100 Connections 101	
110 spare	
111 Access Signaling	0000 Unknown 0001 Dial Pulse 0010 Dual-Tone Multifrequency remaining spare

Table 9 shows the information type code points identified by the Originating Connection Originating Exchange and the information value code points corresponding to each information type.

6.2.4 Intercept Information

6.2.4.1 Service Activation Parameter

The Service Activation Parameter/Feature Code indicator field requires a codepoint to indicate that intercept service is required:

Feature Code Indicator	Value
10010000	Intercept

6.3 ISDN-UP Procedures for Establishing the Originating Connection

6.3.1 Originating Connection Initiating Exchange is Call Originating Exchange

6.3.1.1 Forward Address Signaling

6.3.1.1.1 Actions Required at Originating Connection Initiating Exchange

As described in 4.2.2.2.1, a service at the call originating exchange may determine the need to invoke an operator services originating connection, based on the information received from the calling party and internally stored information on the calling party's line.

The Originating Connection Initiating Exchange will generate an Initial Address Message (IAM) as described in ANSI T1.113.4. The IAM will include parameters identified in ANSI T1.113.3 as mandatory for an IAM, with the following observations on encoding:

- **Called Party Number/Nature of Address Field.** The service will encode the Nature of Address field of the Called Party Number parameter using the "operator requested" codepoint appropriate for the address, if the operator services connection was invoked in response to a 0-, 0+, 1+ screened, 1+ network service code, or intercept call request, as defined in 4.2.2.2.1.

- **User Service Information.** When establishing an operator services originating connection, the only valid codepoints for the Information Transfer Capability field are speech and 3.1 kHz audio.

The following parameters are identified as Optional in ANSI T1.113.3 for the IAM. When establishing an originating connection, the Originating Connection Initiating Exchange may include the following parameters in the IAM as described here:

- **Charge Number.**
- **Originating Line Information.**
- **Carrier Selection Information.**
- **Carrier Identification (CIP).**
- **Transit Network Selection (TNS).**

As in non-operator services calls, the Carrier Identification parameter will contain the carrier which is specified either by call set-up signaling received from the calling party or by subscription, and the Carrier Selection Information parameter will indicate the method of carrier selection. The Originating Connection Initiating Exchange will then identify a carrier to which to route operator services requests for the carrier identified in the CIP. The Originating Connection Initiating Exchange will encode the TNS with the "routed-to" carrier thus identified.

The Originating Connection Initiating Exchange will include the following parameter, coded as described below, provided all associated fields are not to be coded "unknown.":

- **Operator Services Information (OSI).** (See 6.2.3.)

  Original access prefix type:

  - "0-" for 0- call requests (as defined in 4.2.2.2.1)
  - "0+ or 01+" for 0+ call requests (as defined in 4.2.2.2.1)
  - "1+ or 011+" for 1+ screened and 1 + network service code requests (as defined in 4.2.2.2.1).
  - "Unknown" for intercept or if none of the above apply

  Access signaling type:
  "Dial Pulse" if the calling party used dial pulse signaling when signaling call selection information to the Originating Connection Initiating Exchange for this call.
  "Dual-Tone Multifrequency" if the calling party used dual-tone multifrequency signaling when signaling call setup information to the Originating Connection Initiating Exchange for this call, or if the call is originated by a calling party with an ISDN access interface.
  "Unknown" if the signaling used by the calling party when signaling call setup information to the Originating Connection Initiating Exchange for this call is not known.

If the originating connection network capability has been triggered because of the status of the line the calling party has attempted to reach (e.g., the called line is under intercept treatment), the Originating Connection Initiating Exchange will also include the following parameter:

- **Service Activation.**

  Feature Code Indicator field (coded following 6.2.4):

  - "intercept" for all intercept calls

The Originating Connection Initiating Exchange will forward the IAM toward the Originating Connection Destination Exchange.

6.3.1.1.2 Actions Required at the Originating Connection Intermediate Exchange

The intermediate exchange may be required to analyze the Service Activation parameter to determine forward routing.

6.3.1.1.3 Actions Required at Originating Connection Destination Exchange

Upon receipt of an IAM, the Originating Connection Destination Exchange analyzes the Called Party Number Parameter and Service Activation Parameter, informs the service processing logic and establishes a connection to the service providing capabilities (e.g. tone receivers, operator position).

6.3.1.2 Address Complete Message

6.3.1.2.1 Actions Required at Originating Connection Destination Exchange

The Originating Connection Destination Exchange will return an Address Complete Message (ACM) for User-Network Interaction toward the Originating Connection Initiating Exchange (see ANSI T1.113.4, 4A.6).

6.3.1.2.2 Actions Required at the Originating Connection Intermediate Exchange

No change to the procedures defined in ANSI T1.113.4 is required.

6.3.1.2.3 Actions Required at the Originating Connection Initiating Exchange

No change to the procedures defined in ANSI T1.113.4 is required.

6.3.1.3 Answer Message

Generally, no Answer Message (ANM) is expected from the Originating Connection Destination Exchange. If the Originating Connection Initiating Exchange receives an ANM, however, it will be processed as described in ANSI T1.113.4.

6.3.2 Originating Connection Initiating Exchange is Intermediate Exchange

6.3.2.1 Forward Address Signaling

6.3.2.1.1 Actions required at the Originating Connection Initiating Exchange

When a destination exchange for a call determines that a called party is receiving intercept treatment, the exchange acts as an Originating Connection Initiating Exchange to generate an IAM forwarding the call to an operator services access point.

The Originating Connection Initiating Exchange will generate an IAM as described in ANSI T1.113.4, for an intermediate exchange. The IAM will include parameters identified in ANSI T1.113.3 as mandatory for an IAM, with the following observations on encoding:

- **Called Party Number/Nature of Address Field.** The service will encode the Nature of Address field of the Called Party Number parameter using the “subscriber number - operator service requested” or “national number - operator service requested” codepoint if the operator services connection was invoked in response to an intercept call request, as defined in 4.2.2.2.1. The service will encode the called party number as received from the previous exchange.

- **User Service Information.** If the incoming IAM indicates a bearer capability of other than speech or 3.1 kHz audio, the call should be released with a cause value 22, - "number changed."

The following parameters are identified as Optional in ANSI T1.113.3 for the IAM. When establishing an originating connection, the Originating Connection Initiating Exchange may include the following parameters in the IAM as described here:

- **Charge Number & Originating Line Information.** If the IAM which the Originating Connection Initiating Exchange received contains either or both of these parameters, the Originating Connection Initiating Exchange will include them in the IAM being generated. If these parameters are not received, the Originating Connection Initiating Exchange will not include them in the IAM being generated.
- **Carrier Selection Information & Carrier Identification (CIP).** The Originating Connection Initiating Exchange will encode the Carrier Selection Information parameter and the CIP as received from the previous exchange.
- **Transit Network Selection (TNS).** The Originating Connection Initiating Exchange will optionally include a TNS, based on the intercepted party's service provider.
- **Service Activation.**

  Feature Code Indicator field (coded following 6.2.4):

  - "intercept" for all intercept calls

The Originating Connection Initiating Exchange will forward the IAM toward the Originating Connection Destination Exchange.

6.3.2.2 Address Complete Message

6.3.2.2.1 Actions Required at Originating Connection Destination Exchange

The Originating Connection Destination Exchange will return an Address Complete Message (ACM) for User-Network Interaction toward the Originating Connection Initiating Exchange (see ANSI T1.113.4, 4A6).

6.3.2.2.2 Actions Required at the Originating Connection Initiating Exchange

The Originating Connection Initiating Exchange, now an intermediate exchange between the calling user and the Originating Connection Destination Exchange, will process the ACM as is described for an intermediate switch. No change to the procedures defined in ANSI T1.113.4 is required.

6.3.2.3 Answer Message

Generally, no Answer Message (ANM) is expected from the Originating Connection Destination Exchange. If the Originating Connection Initiating Exchange receives an ANM, however, the Originating Connection Initiating Exchange will process the ANM as described for intermediate switches in ANSI T1.113.4.

Section 2
Operator Services Transfer Connection Network Capability

Table of Contents

1 Scope, Purpose, and Application

A transfer connection is a network connection between two operator service access points (it may be an intranetwork or internetwork connection) which is established to access additional service capabilities. Two types of transfer connections are identified in clause 4, distinguished by whether there is a connection between the user and the subsequent operator services access point (OSAP).

This standard applies to the Integrated Service Digital Network (ISDN) User Part (ISUP) and is intended to supplement the signaling functions and call procedures described in ANSI T1.113. This standard could be used in conjunction with other American National Standards related to supplementary services and network capabilities. For a more complete understanding of the interactions between the Operator Services Transfer Connection and other ANSI services and network capabilities, the appropriate American National Standards should be consulted.

2 Normative References

The following documents contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.104-1991, (R1997), *Telecommunications - Exchange-Interexchange Carrier Interfaces - Individual Channel Signaling Protocols*

ANSI T1.113-1995, *Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*

3 Abbreviations and Definitions

3.1 Abbreviations

The following abbreviations are used in this document.

ACG	Automatic Call Gapping
ACM	Address Complete Message
ANM	Answer Message
ANSI	American National Standards Institute
CIP	Carrier Identification parameter
FE	functional entity
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	Integrated Services Digital Network User Part
LE	local exchange
LEC	local exchange carrier
NIDB	network information database
OC1	originating connection functions group 1
OC2	originating connection functions group 2
OSAP	operator services access point
OSDC	Operator Special Dialed Code
OSI	Operator Services Information parameter
REL	Release Message

SCCP	Signalling Connection Control Part
SS7	Signalling System Number 7
TC1	transfer connection functions group 1
TC2	transfer connection functions group 2
TNS	Transit Network Selection parameter
TR	transit exchange
TTC	Terminating Toll Center Code

3.2 Definition of Terms

The generic definitions in this subclause have been formulated for use within this document.

3.2.1 Network: A collection of elements serving an operator service request.

3.2.2 Operator Services Access Point (OSAP): The functional entity which provides access to an operator service. The operator service may be co-located with the OSAP or may be located elsewhere, but the interface between the OSAP and the operator service is beyond the scope of this document.

3.2.3 Operator Services: A set of services including toll and assistance services, listing services and intercept services which make use of the Operator Services Transfer Connection Network Capability.

3.2.4 Operator Special Dialed Code (OSDC): A three-, four-, or five-digit code, starting with a 1, that identifies a specific inward operator service request.

3.2.5 Served User: A "person" who interacts with an operator service in the network and generally, the calling user.

3.2.6 Terminating Toll Center Code (TTC): A three-digit code, of the form 0XX or 1XX, that indicates a particular access point for an operator service within an NPA.

3.2.7 Transfer Connection Destination Exchange: The transfer connection destination exchange is the exchange which is the terminating point for the transfer connection. The transfer connection destination exchange provides additional service capabilities not available at the transfer connection initiating exchange.

3.2.8 Transfer Connection Initiating Exchange: The transfer connection initiating exchange is the exchange which initiates establishment of a transfer connection when the transfer connection network capability is invoked by service processing. The transfer connection initiating exchange may be an originating exchange or an intermediate exchange.

3.2.9 Transfer Connection Intermediate Exchange: The transfer connection intermediate exchange is an exchange participating in the transfer connection which succeeds the transfer connection initiating exchange and precedes the transfer connection destination exchange.

3.2.10 Transfer Connection: A connection between two operator service access points (OSAPs).

4 Description of Network Capability

4.1 General description

Accessing operator services by establishing a transfer connection is transparent to the served user. When an operator service at an OSAP, OSAP1, determines that additional service capabilities are needed and invokes the transfer connection network capability, the network establishes a transfer connection between OSAP1 and a subsequent OSAP, OSAP2.

Two transfer connection types are identified below based on the relationship between the served user and OSAP2.

1. Type 1 Transfer Connection - "No User to OSAP2 Connection"

When a type 1 transfer connection is established between OSAP1 and OSAP2, the service capabilities provided via OSAP1 interact with the service capabilities provided via OSAP2. The transfer connection functionality is terminated when the service interaction is complete. The originating connection is not affected by release of the transfer connection. A type 1 transfer connection does not result in a served-user-to-OSAP2 call or signaling connection. OSAP1 does not connect the originating connection and the transfer connection.

2. Type 2 Transfer Connection - "User to OSAP2 Connection"

When a type 2 transfer connection is established between OSAP1 and OSAP2, service processing is transferred from the service capabilities provided via OSAP1 to the service capabilities provided via OSAP2. The transfer connection functionality is terminated when the service capabilities provided via OSAP2 are completed. A served-user-to-OSAP2 call or signaling connection exists from the transfer connection establishment until the transfer connection release. While the transfer connection is established, OSAP1 does not respond to mid-service requests from the user, i.e., OSAP1 relays operator service signaling information from the user to OSAP2.

4.2 Procedures

4.2.1 Provision/withdrawal

An ordinary served user cannot subscribe to the transfer connection network capability. Networks provide this capability to operator services access points when required to meet operator service needs.

4.2.2 Normal procedures

4.2.2.1 Activation/deactivation.

The transfer connection network capability is activated or deactivated on a per-network basis.

4.2.2.2 Invocation and operation

An operator service invokes the transfer connection network capability when it determines that additional service capabilities are required.

4.2.3 Exceptional procedures

None identified.

4.2.4 Alternate procedures

None identified.

4.3 Interworking considerations

None identified.

4.4 Network capabilities for charging

None identified.

4.5 Interactions with supplementary services and other network capabilities

4.5.1 Connection Hold Network Capability

During and after the establishment of a type 2 transfer connection, service capabilities may invoke the connection hold network capability via OSAP2.

4.5.2 Coin Station Control Network Capability

During and after the establishment of a type 2 transfer connection, service capabilities may invoke the coin station control network capability via OSAP2.

4.5.3 Network Service Recall Network Capability

After a type 1 transfer connection is established, service capabilities may invoke the network service recall capability via OSAP1 to recall a service capability accessed via OSAP2 (e.g., ring forward).

After a type 2 transfer connection is established, the network service recall capability may be invoked by the served user to recall a service capability accessed via OSAP2.

4.5.4 User-to-User Signaling

Due to existing incompatibilities between ISDN services and operator services, the transfer connection network capability will not support the passing of User-to-User Signaling information.

4.5.5 Calling Line Identification Presentation/Calling Line Identification Restriction (CLIP/CLIR)

If available to OSAP1, information related to the calling party (e.g., calling party address presentation indicator) should be passed unchanged to the transfer connection destination exchange, following procedures described in ANSI T1.113.4, Section 2.

4.5.6 Calling Name Identification Presentation/Calling Name Identification Restriction (CNIP/CNIR)

If available to OSAP1, information related to the calling party (e.g., generic name presentation indicator) should be passed unchanged to the transfer connection destination exchange, following procedures described in ANSI T1.113.4, Section 2.

5 Functional Capabilities and Information Flows

5.1 Functional entity model

This subclause describes a functional entity model for:

- Establishing and Releasing a Type 1 Transfer Connection
- Establishing and Releasing a Type 2 Transfer Connection

A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. Figure 1 shows the functional entity model for the operator services transfer connection network capability.

FE1 - FE4 are not involved in establishing the transfer connection and are included in the functional model to highlight the relationship between the originating connection and the transfer connection.

FE5 - FE7 represent basic service functional entities. Additional functions for the operator service transfer connection network capability are provided as an extension to a basic service functional entity and are divided into two groups, Transfer Connection functions group 1 (TC1) and Transfer Connection functions group 2 (TC2).

Whenever an optional FE is not present in the connection, its function is assumed by an adjacent FE.

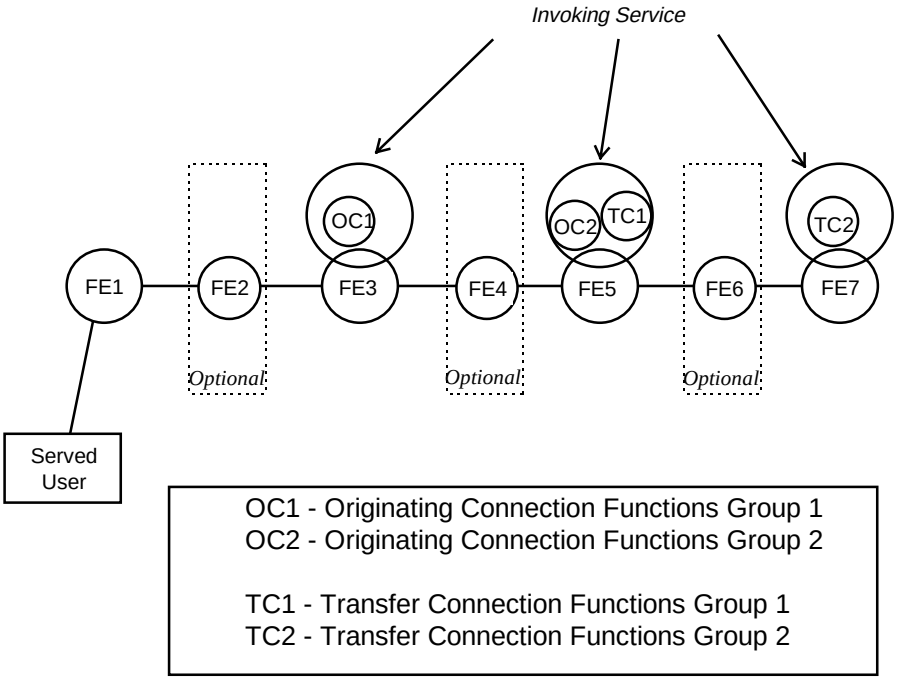


Figure 1 - Operator Services Transfer Connection Functional Entity Model

5.1.1 Descriptions of Functional Entities 1 - 4

See the Operator Services Originating Connection Network Capability.

5.1.2 Description of Functional Entity 5

5.1.2.1 General Capabilities

FE5 provides access to operator service capabilities, i.e., FE5 performs the functions of an OSAP under control of the associated operator services capabilities, TC1. It receives operator service requests and notifications from FE4 and either informs TC1 or relays the operator service information to FE6. FE5 generates and sends operator service requests and notifications to FE4, when instructed by TC1. FE5 transmits a transfer connection set up request to FE6, when requested by TC1. FE5 receives operator service requests, responses and notifications from FE6 and either informs TC1 or relays the information to FE4.

5.1.2.2 Capabilities for Establishing Type 1 Transfer Connection

When establishing a type 1 transfer connection FE5 is able to:

- Recognize a request from TC1 to initiate a type 1 transfer connection, while an originating connection is in progress,
- Formulate and send FE6 a request to set up a type 1 transfer connection.
- Recognize an acknowledgment response received from FE6 and establish a voice path between the "service requesting functions" (e.g., an operator position) and the transfer connection.
- Transfer inband information and receive inband information.

5.1.2.3 Capabilities for Releasing a Type 1 Transfer Connection

When releasing a type 1 transfer connection FE5 is able to:

- Transmit a disconnect request to FE6 when instructed by TC1, without affecting the originating connection.
- Receive a disconnect request from FE6 and release the transfer connection, without affecting the originating connection.

5.1.2.4 Capabilities for Establishing the Type 2 Transfer Connection

When establishing a type 2 transfer connection, FE5 is able to:

- Recognize a request from TC1 to initiate a type 2 transfer connection, while an originating connection exists.
- Formulate and send to FE6 a request to set up a type 2 transfer connection.
- Establish a transmission path between the associated incoming, originating connection and the outgoing transfer connection, when an acknowledgment response is received from FE6. In addition, FE5 is able to through connect the transmission path, in both directions, when instructed by the acknowledgment response. When FE5 through-connects the transmission path, FE5 is able to relay toward FE4 the acknowledgment information received during call set-up from FE6.
- Relay all operator service requests or notifications received from FE6 to FE4 and relay all operator service requests or notifications received from FE4 to FE6, after an acknowledgment response has been received from FE6. (Note: The intent is that FE5 terminates its operator service actions following the acknowledgment response from FE6. For example, FE5 relays, with no service action, a report of a user disconnect or end operator service request, coin control signals and calling user flash signals.)

5.1.2.5 Capabilities for Releasing a Type 2 Connection

When releasing a type 2 transfer connection FE5 is able to:

- Initiate normal release procedures when a disconnect request is received from FE4. (If network capabilities affecting disconnect procedures are active, see the Connection Hold network capability, ANSI T1.666.4.)
- Receive a disconnect message from FE6 and release the transfer connection, without affecting the originating connection. After releasing the transfer connection, an FE1-to-FE7 connection no longer exists; it is truncated to an FE1-to-FE5 connection. At the release of the transfer connection, FE5 is able to formulate a notification that will provide a new description of the end-to-end (FE1-to-FE5) connection and to transmit that notification toward FE4.

5.1.3 Description of Functional Entity 6

5.1.3.1 General Capabilities

FE6 relays operator service signaling information between FE5 and FE7. FE6 is an optional element of the functional model

5.1.3.2 Capabilities for Establishing a Type 1 or Type 2 Transfer Connection

While establishing a transfer connection FE6 is able to:

- Relay a transfer connection set up request between FE5 to FE7.
- Relay an acknowledgment response between FE7 to FE5.
- Through connect the transmission path in both directions, when requested by the acknowledgment response from FE7.

5.1.3.3 Capabilities for Releasing a Type 1 or Type 2 Transfer Connection

When releasing a transfer connection FE6 is able to:

- Initiate normal release procedures when a call disconnect request is received from FE5 or FE7.

5.1.4 Description of Functional Entity 7

5.1.4.1 General Capabilities

FE7 provides access to operator service capabilities, i.e., functions as an OSAP under control of the associated operator services capabilities, TC2. FE7 generates and transmits to FE6 operator service requests, responses and notifications. FE7 receives and interprets operator service requests, responses and notifications it receives from FE6.

5.1.4.2 Capabilities for Establishing A Type 1 Transfer Connection

While a type 1 transfer connection is being established, FE7 is able to:

- Receive and interpret a type 1 transfer connection set up request from FE6.
- Establish a voice path between the transfer connection and "service providing functions" (e.g., an operator position, tone receivers).
- Transmit an acknowledgment response to FE6, which includes a user network interaction request.
- Receive and transmit inband information.

5.1.4.3 Capabilities for Releasing a Type 1 Transfer Connection

When releasing a type 1 transfer connection, FE7 is able to:

- Transmit a disconnect request to FE6 when requested by TC2.
- Initiate normal release procedures when it receives a call disconnect request from FE6.

5.1.4.4 Capabilities for Establishing a Type 2 Transfer Connection

While a type 2 transfer connection is being established, FE7 is able to:

- Receive and recognize a type 2 transfer connection set up request from FE6.
- Establish a voice path between the transfer connection and the "service providing functions".
- Transmit an acknowledgment response to FE6, which may include an operator hold request, a user network interaction request, or both.
- Receive and transmit inband information.

5.1.4.5 Capabilities for Releasing a Type 2 Transfer Connection

When releasing a type 2 transfer connection, FE7 is able to:

- Transmit a disconnect request to FE6 (without affecting the terminating connection, if one exists), when instructed by TC2.
- Release the incoming, transfer connection when a disconnect request is received from FE6, without affecting the terminating connection (if one exists). (If network capabilities affecting disconnect procedures are active, see the Connection Hold network capability, ANSI T1.666.4.)

5.2 Information flow model

This subclause identifies the information that needs to be passed between functional entities to establish a type 1 transfer connection (see Figure 2) and to establish a type 2 transfer connection (see Figure 3) for access to operator services. The information elements are models and could be implemented as a new message or as an addition to an existing message in a call control signaling system.

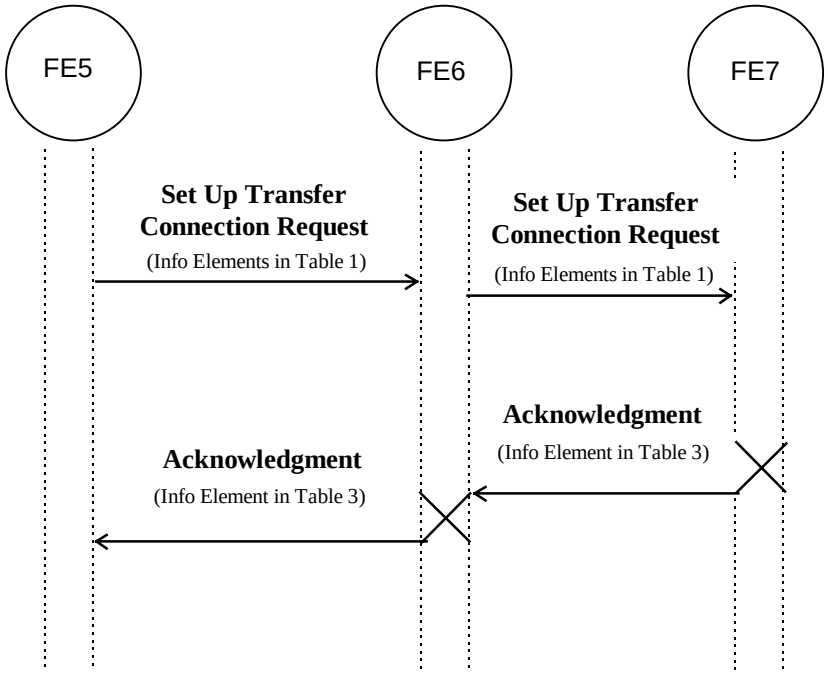


Figure 2 - Establishing a Type 1 Transfer Connection

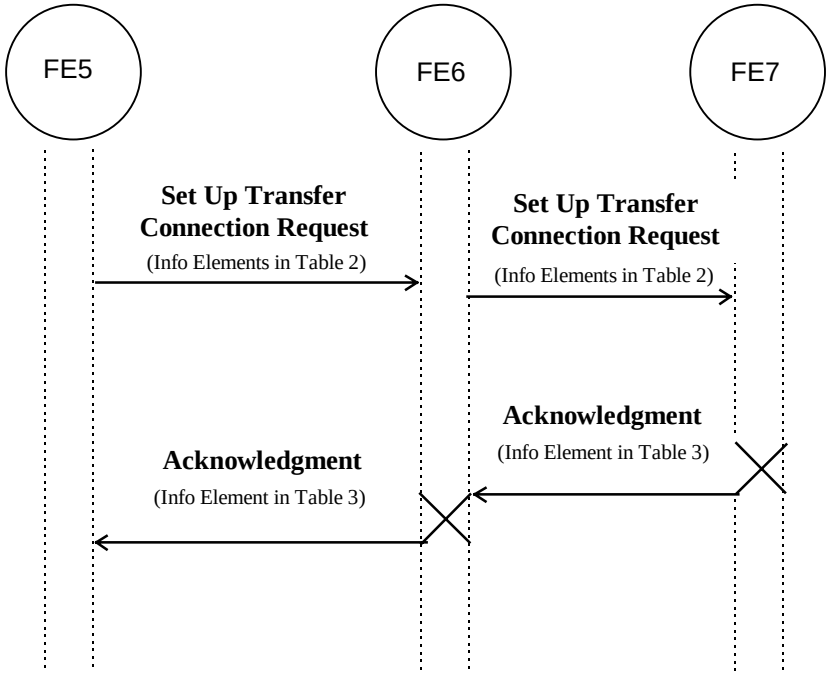


Figure 3 - Establishing a Type 2 Transfer Connection

5.2.1 Definition of Individual Information Flows

5.2.1.1 Charge Number Information

An information element providing a chargeable number for the calling party. Charge number information never refers to an alternately billed party.

5.2.1.2 Originating Line Characteristics

An information element providing the line class-of-service or other characteristic of the line or the call.

5.2.1.3 Access Signaling Information

An information element identifying whether the calling user is using Dual-Tone Multifrequency (DTMF), Dial-Pulse (DP), or an undetermined method of access signaling.

5.2.1.4 Access Prefix Information

An information element indicating whether or not the call request received from the calling user is a 0-, 0+, or 1+ call request.

5.2.1.5 Carrier Identification Information

An information element providing the interexchange carrier (IC) or international carrier (INC) that was selected as a carrier for the operator services request. This information is not used to route the call to the OSAP.

5.2.1.6 Carrier Selection Information

Information sent from FE5 to identify the method used to select a carrier. The information identifies one of the following:

1. Carrier Access Code Dialed by User
2. Predesignated Carrier of User
3. Primary Preferred Carrier of the Charged Party
4. Alternate Preferred Carrier of the Charged Party
5. (Verbal) Instructions from the Calling Party
6. (Verbal) Instructions from the Charged Party
7. Emergency Call Handling

5.2.1.7 Bill To Type Indicator

Information sent from FE5 to identify the type of billing. The information identifies one of the following:

1. Collect
2. Third Number
3. Sent Paid
4. Card - 89C format
5. Card - 14-digit format
6. Card - Other format

5.2.1.8 Bill To Digits

Information sent from FE5 to identify a card number or third party billing number. The information identifies from 10 to 35 digits.

5.2.1.9 Bill To Specific Information

Information sent from FE5 to identify a network information data base (NIDB) response to a billing number query. The information identifies one of the following:

1. Information usually provided but LEC made no NIDB query.
2. Information usually provided but no response from NIDB query.
3. Information usually provided but NIDB reports information not available.
4. Information provided and NIDB reports verify by automated method.
5. Information provided and NIDB reports verify by operator.
6. Information provided and NIDB reports authorized accept.
7. Information not provided by agreement.
8. Information usually provided but no response obtained within time-out period.
9. Information usually provided but reject component received in response.
10. Information usually provided but no response because ACG is in effect.
11. Information usually provided but query resulted in SCCP failure.

5.2.1.10 Information Entry Type

Information sent from FE5 to identify how the billing number was provided. The information identifies one of the following:

1. Manual by Operator.
2. Automated from Tone input.
3. Automated from Spoken input.

5.2.1.11 Call Connection Type

Information sent from FE5 to identify the class of service desired by the served user. The information identifies the class of service as one of the following:

1. Station-to-Station
2. Person-to-Person

5.2.1.12 Special Handling Request

Information sent from FE5 to identify a served user's special request. The information identifies one of the following special request types:

1. Call Completion
2. Time and Charges
3. Rate Information
4. Trouble Reporting
5. Credit Reporting
6. General Assistance

5.2.1.13 Associated Forward Number

Information sent from FE5 in a type 1 transfer connection set up request. The information identifies a 10 - 15 digit E.164 address "associated" with a type 1 request and is not used for routing. For example, on a busy line verification request the information identifies the target line's address. (Note: This information does not have an equivalent MF signal specified in ANSI T1.104).

5.2.1.14 User-Network Interaction Request

Information sent from FE7 to identify that user network interaction is required for the connection (i.e., through-connection of the transmission path, in both directions, is required).

5.2.2 Information elements

Table 1 shows the information sent from FE5 in a type 1 transfer connection set up request.

Table 1 - Type 1 Transfer Connection Request Information Element

Information Element	
Associated Forward Number	O

KEY
O information optional

Table 2 shows the information sent from FE5 in a type 2 transfer connection set up request.

Table 2 - Type 2 Transfer Connection Request Information Elements

Information Element	
Calling Line Billing Number	R
Originating Line Characteristics	R
Access Signaling Information	O
Access prefix Information	O
Carrier Identification Information	O
Carrier Selection Information	O
Bill To Type Information	O
Bill To Digits	O
Bill To Specific Information	O
Information Entry Type	O
Call Connection Type	O
Special Handling Request	O

KEY
R information required
O information optional

Table 3 shows the information elements sent from FE7 to acknowledge a request to set up a transfer connection.

Table 3 - Acknowledgment Information Element

Information Element	
User-Network Interaction Indicator	O

KEY
O information optional

5.2.3 Exceptional procedures

None identified.

5.3 Allocation of functions to equipment

This subclause identifies some scenarios for allocating the functional entities to specific network equipment.

Table 4 - Allocation of Functions to Equipment

Scenario	FE5	FE6	FE7
Scenario 1	TR1	-	TR2
Scenario 2	TR2	TR3	TR4
Scenario 3	LE1	-	TR1
Scenario 4	LE1	TR1	TR2

KEY
LE Local Exchange
TR Transit Exchange

5.4 Limiting assumptions

None Identified.

6 Protocols and Procedures

6.1 Protocol and procedural assumptions

ISUP protocol and procedures are required for the Transfer Connection Network Capability. No TCAP procedures are required for this network capability.

6.2 ISUP formats and codes

6.2.1 Messages

The ISUP messages used for the transfer connection network capability are given below.

Table 5a - Mapping of Information Flows to SS7 ISUP Messages

Flow	Message	Format Reference
Set Up Transfer Connection Request	IAM	See below
Acknowledgment	ACM	ANSI T1.113.3
Acknowledgment	CPG	ANSI T1.113.3
Release	REL	ANSI T1.113.3
Release	RLC	ANSI T1.113.3

Table 5b - Mapping of Information Elements to SS7 ISUP Parameters

Information Element	Parameter
Calling Line Billing Information	Originating Line Information
Access Signaling Information	Operator Services Information
Access Prefix Information	Operator Services Information
Carrier Identification Information	Carrier Identification
Carrier Selection Information	Carrier Selection
Bill to Type Information	Operator Services Information
Bill to Digits	Operator Services Information
Bill to Specific Information	Operator Services Information
Information Entry Type	Operator Services Information
Call Connection Type	Operator Services Information
Special Handling Request	Operator Services Information

The format of the Address Complete, Call Progress, Release and Release Complete messages are contained in ANSI T1.113.3. An additional optional parameter, Operator Services Information Parameter, is added to the IAM parameters in ANSI T1.113.3.

Table 6 - Additions to IAM Format

Parameter	Type	Length (octets)
Operator Service Information	O	1-6

6.2.2 Parameters

The ISUP parameters used for the transfer connection network capability are referenced in Tables 7 and 8 below.

Table 7 - Transfer Connection Network Capability - Parameters for Establishing a Type 1 Transfer Connection

Parameter	Format Reference
Operator Services Information	ANSI T1.666.1
Generic Address	Table 10

Table 8 - Transfer Connection Network Capability - Parameters for Establishing a Type 2 Transfer Connection

Parameter	Format Reference
Operator Services Information	See Table 12
Generic Address	See Table 10
Generic Digits	See Table 11
Carrier Selection Information	See Table 9

The format of the Carrier Selection Information parameter, Generic Address parameter, and Generic digits parameter are shown in ANSI T1.113.3, and the parameter values to be used for the transfer connection network capability are shown in Tables 9, 10, and 11, respectively.

The format of the Operator Services Information parameter is shown in ANSI T1.666.1, and the parameter values to be used for the transfer connection network capability are shown in Table 12.

Table 9 - Carrier Selection Information Parameter Values

Value
0000 0101 Primary preferred carrier of the charged party
0000 0110 Alternate preferred carrier of the charged party
0000 0111 (Verbal) instructions from the calling party
0000 1000 (Verbal) instructions from the charged party
0000 1001 Emergency call handling

Table 10 - Generic Address Parameter Codepoints

Field/Indicator	Value
Type of Address field	1111 0110 Alternately billed number (third number) 1111 0111 Associated forward number
Odd/even indicator	See ANSI T1.113.3, section 3.6
Nature of address indicator	See ANSI T1.113.3, section 3.20
Numbering plan field	See ANSI T1.113.3, section 3.6
Address signals	See ANSI T1.113.3, section 3.6
Filler	See ANSI T1.113.3, section 3.6
Address presentation restriction indicator	See ANSI T1.113.3, section 3.7

Table 11 - Generic Digits Parameter Codepoints

Field/Indicator	Value
Type of digits	01111 - Bill to number
Encoding scheme	ANSI T1.113.3, section 3.20B
Digits	ANSI T1.113.3, section 3.20B

Table 12 - Operator Services Information Parameter Codepoints

Information Type	Information Value
010 - Bill to Information Entry Type and Handling Type	0000 information entry unknown, unknown handling 0001 information entry manual by operator, station handling 0010 information entry manual by operator, person handling 0011 information entry automated by tone input, station handling 0100 information entry unknown, station handling 0101 information entry unknown, person handling 0110 information entry manual by operator, unknown handling 0111 information entry automated by tone input, unknown handling 1000 information entry automated by tone input, person handling 1001 information entry automated by spoken input, unknown handling 1010 information entry automated by spoken input, station handling 1011 information entry automated by spoken input, person handling
011 - Bill to Type	0001 card - 14-digit format 0010 card - 89C format 0011 card - other format 0100 collect 0101 third number 0110 sent paid
100 - Bill to Specific Information	0001 NIDB authorizes 0010 NIDB reports, verify by automated means 0011 NIDB reports, verify by operator 0100 no NIDB query 0101 no NIDB response 0110 NIDB reports unavailable 0111 no NIDB response - timeout 0100 no NIDB response - reject component 1001 no NIDB response - ACG in effect 1010 no NIDB response - SCCP failure
101 - Special Handling	0001 call completion 0010 rate information 0011 trouble reporting 0100 time and charges 0101 credit reporting 0110 general assistance

6.3 ISUP procedures

6.3.1 Procedures for a Type 1 Transfer Connection

6.3.1.1 Procedures for Establishing a Type 1 Transfer Connection

6.3.1.1.1 Procedures at the Transfer Connection Initiating Exchange

When service processing at the transfer connection initiating exchange invokes the transfer connection network capability and identifies that a type 1 transfer connection is required, the exchange performs route selection and sends an Initial Address message to the subsequent exchange. The Initial Address message contains the Nature of Connections Indicator Parameter, Forward Call Indicators Parameter, Calling Party's Category Parameter, User Service Information Parameter, Called Party Number Parameter, Generic Address Parameter and may optionally contain the Operator Services Information Parameter.

A. The Nature of Connections Indicator Parameter is set appropriately based on the characteristics of the selected outgoing circuit.

B. The Forward Call Indicators Parameter is coded:

- Incoming International Call Indicator - "not an incoming international call"
- End-to-End Method Indicator - "no end-to-end method available "
- Interworking Indicator - "no interworking encountered"
- IAM Segmentation Indicator - "no segment follows"
- ISDN-UP Preference Indicator - "ISDN user part preferred all the way"
- ISDN Access Indicator - "originating access ISDN" or "originating access non-ISDN"
- SCCP method Indicator - "no indication"
- ISDN User Part Indicator - “ISDN user part used all the way”

C. The Calling Party Category Parameter is coded "national operator".

D. The User Service Information Parameter is coded to identify an information transfer capability of either "speech" or "3.1 kHz audio"

E. The Called Party Number Parameter is coded:

- Nature of Address - "subscriber number, or national number"
- Numbering Plan Indicator - "unknown"
- Address Signals - encoded to carry, 2 digits per octet, the called party number.

The called party number may be supplied by service processing at the transfer connection initiating exchange, in the form of either NPA + NXX + XXXX or NPA + TTC + OSDC (for inward calls).

where:

NPA = Numbering Plan Area

NXX = Exchange

XXXX = Station or Line Number

TTC = Terminating Toll Center Code - A three-digit code, of the form 0XX or 1XX, that indicates a particular access point for an operator service within an NPA.

OSDC = Operator Special Dialed Code - A three-, four-, or five-digit code, starting with a 1, that identifies a specific inward service request.

Service processing at the transfer connection initiating exchange shall provide the OSDC based on the type of inward service required. If the 3-digit format is received, it should be appended with a zero in the least significant (4th) digit. If the 5-digit format is received, the least significant (5th) digit should be discarded.

F. When included in the Initial Address message, the Generic Address Parameter is coded:

- Type of Address - "associated forward number"
- Nature of Address - "subscriber number" or "national number"
- Numbering Plan Indicator - "ISDN"
- Address Presentation Restriction Indicator "presentation allowed"

Operator Services Information Parameter: Service logic in the operator services system, determines the content of the Operator Services Information parameter. This function is outside the scope of the transfer connection network capability.

When the transfer connection initiating exchange receives an Address Complete message containing the Optional Backward Call Indicators Parameter encoded "user network interaction, cut through in both directions" the exchange:

stops the waiting for Address Complete message timer (T7) and through-connects the transmission path in both directions (or in the forward direction, if the backward direction has already been through connected) between the service requesting capabilities (e.g., operator position, tone transmitter) and the outgoing circuit.

The transfer connection initiating exchange does NOT through-connect the transmission path between an associated originating connection, if one exists, and the transfer connection. The transfer connection originating exchange does NOT initiate a corresponding Address Complete message or a corresponding Call PROGress message to the preceding exchange, if one exists.

6.3.1.1.2 Procedures at the Transfer Connection Intermediate Exchange

When a transfer connection intermediate exchange receives an Initial Address Message, the exchange follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.1.2.

When a transfer connection intermediate exchange receives an Address Complete message, the exchange follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.2.4.

When a transfer connection intermediate exchange receives a Call Progress message, the exchange follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.4A.2.

6.3.1.1.3 Procedures at the Transfer Connection Destination Exchange

Upon receipt of an Initial Address message, the transfer connection destination exchange analyzes the Called Party Number Parameter, informs the service processing logic and establishes a connection to the service providing capabilities (e.g., tone receivers, operator position). The transfer connection destination exchange may use the OSDC to determine the associated use of the address field associated in the Generic Address Parameter coded with type, associated forward number.

If a continuity check has been performed on one or more of the circuits involved in the transfer connection, the transfer connection destination exchange delays setting up the connection to the service providing capabilities until the Continuity message is received. Upon setting up a connection to the service providing capabilities, the transfer connection destination exchange sends an

Address Complete message to the previous exchange. The Address Complete message contains the Backward Call Indicators Parameter and the Optional Backward Call Indicators Parameter.

A. The Backward Call Indicators Parameter in the Address Complete message is coded:

- Charge Indicator - "no indication"
- Called Party Status Indicator - "no indication"
- Called Party's Category Indicator - "no indication"
- End-to-End Method Indicator - "no end to end method available"
- Interworking Indicator - "no interworking encountered"
- IAM segmentation Information Indicator - "no indication "
- ISDN-UP Indicator - "ISDN-UP used all the way"
- Holding Indicator - "holding not required"
- ISDN Access Indicator - "terminating access ISDN" or "terminating access non-ISDN"
- Echo Control Device Indicator - encoding as described for destination exchange in ANSI T1.113.4, Section 2.7A.3.1.
- SCCP Method Indicator - "no indication"

B. The Optional Backward Call Indicators Parameter is encoded to identify "user network interaction - cut through in both directions" (the remaining bits are set to 0's).

When a transfer connection destination exchange receives a Call Progress message, the exchange informs the service processing logic and does not automatically initiate a corresponding Call Progress message to the next exchange.

6.3.1.2 Procedures for Releasing a Type 1 Transfer Connection

Transfer connection release procedures may be initiated by the transfer connection initiating exchange or the transfer connection destination exchange.

6.3.1.2.1 Release Initiated by Transfer Connection Initiating Exchange

6.3.1.2.1.1 Transfer Connection Initiating Exchange Procedure

When service capabilities at the transfer connection initiating exchange determine that the service interaction is complete, the transfer connection initiating exchange follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.1. The Release message, sent by the Transfer Connection Initiating Exchange, contains a Cause Indicators Parameter coded "normal clearing". The release does not affect a preceding operator services connection.

6.3.1.2.1.2 Transfer Connection Intermediate Exchange Procedures

The transfer connection intermediate exchange follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.1.

6.3.1.2.1.3 Transfer Connection Destination Exchange Procedures

The transfer connection destination exchange follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.1.

6.3.1.2.2 Release Initiated by Transfer Connection Destination Exchange

6.3.1.2.2.1 Transfer Connection Destination Exchange

When service capabilities at the transfer connection destination exchange determine that the service interaction is complete, the transfer connection destination exchange follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.2. The Release message sent to the preceding exchange contains a Cause Indicators Parameter coded "normal clearing".

6.3.1.2.2.2 Transfer Connection Intermediate Exchange

The transfer connection intermediate exchange follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.2.

6.3.1.2.2.3 Transfer Connection Initiating Exchange

The transfer connection initiating exchange follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.2, and informs the OSAP of the release. The Release does not affect a preceding operator services connection.

6.3.2 Procedures for a Type 2 Transfer Connection

6.3.2.1 Procedures for Establishing a Type 2 Transfer Connection

6.3.2.1.1 Procedures at the Transfer Connection Initiating Exchange

When service processing at the transfer connection initiating exchange invokes the transfer connection network capability and identifies that a type 2 transfer connection is required, the exchange performs route selection and sends an Initial Address message to the subsequent exchange. The Initial Address message contains the Nature of Connections Indicator parameter, Forward Call Indicators parameter, Calling Party Category parameter, User Service Information parameter, Called Party Number parameter, the Generic Address parameter, the Generic Digits parameter, Charge Number parameter, Originating Line Information parameter, Redirecting Number parameter, Carrier Selection Information parameter, Carrier Identification parameter, Transit Network Selection parameter, and may optionally contain the Operator Services Information parameter.

A. The Nature of Connections Indication parameter is coded as described in ANSI T1.113.4. The service initiating exchange follows the coding rules for an intermediate exchange, using as input the Nature of Connections Indicator parameter received from the originating connection.

B. The Forward Call Indicators parameter received over the incoming (originating) connection is included without change.

C. The Calling Party Category parameter received over the incoming (originating) connection is included without change.

D. The User Service Information parameter is coded to identify an information transfer capability of either "speech" or "3.1 kHz audio".

E. The Called Party Number is coded:

- Nature of Address - encoded as appropriate for the address signals, as described in ANSI T1.113.3.
- Numbering Plan Indicator - "ISDN (Telephony)".
- Address Signals - encoded to carry, 2 digits per octet, the called number supplied by service processing. There may be no called number.

The called party number may be supplied by service processing at the transfer connection initiating exchange, in the form of NPA + NXX + XXXX or NPA + TTC + OSDC (for inward calls).

where:

NPA = Numbering Plan Area

NXX = Exchange

XXXX = Station or Line Number

TTC = Terminating Toll Center Code - A three-digit code, of the form 0XX or 1XX, that indicates a particular access point for an operator service within an NPA.

OSDC = Operator Special Dialed Code - A three-, four-, or five-digit code, starting with a 1, that identifies a specific inward service request.

Service processing at the transfer connection initiating exchange shall provide the OSDC based on the type of inward service required. If the 3-digit format is received, it should be appended with a zero in the least significant (4th) digit. If the 5-digit format is received, the least significant (5th) digit should be discarded.

F. When included in the Initial Address message, the Operator Services Information parameter is coded as appropriate by the invoking service. The parameter may include one to six octets of information.

G. When the Operator Services Information parameter is included and contains an octet with the Info Type coded "bill-to type" and the Info Value coded "third number", a Generic Address parameter is included in the Initial Address message, and is coded:

- Type of Address - alternately billed number (third number)
- Nature of Address - "subscriber number" or "national number"
- Numbering Plan Type - "ISDN"
- Address Presentation Restriction Indicator "presentation allowed"
- Address Signals - encoded to carry, 2 digits per octet, the alternately billed (third) number

H. When the Operator Services Information parameter is included and contains an octet with the Info Type coded "bill-to-type" and the Info Value coded either "card - 14-digit format", "card - 89C format", or "card - other format", a Generic Digits parameter is included in the Initial Address message, and is coded:

- Type of Digits - "card number"
- Encoding Scheme - "BCD even" or "BCD odd"
- Digits - encoded to carry, 2 digits octet, the card number

I. When included in the Initial Address message, the Charge Number is coded:

- Nature of Address - "ANI of the calling party; subscriber number" or "ANI not available or not provided"
- Numbering Plan Indicator - "ISDN"
- Address Signals - encoded to carry, 2 digits per octet, the ANI of the calling party, if available.

J. When included in the Initial Address message, the Originating Line Information parameter is encoded with the binary equivalent of the II digits (see ANSI T1.113.3) as supplied by service processing.

K. When included in the Initial Address message, the Carrier Selection Information Carrier Identification and Transit Network Selection parameters are coded as appropriate by the invoking service.

When the transfer connection initiating exchange receives an Address Complete message, containing the Optional Backward Call Indicators parameter encoded "user network interaction, cut through in both directions" the exchange:

- stops the waiting for Address Complete message timer (T7)
- through-connects the transmission path in both directions (or in the forward direction, if the backward direction has already been through connected) between the service requesting capabilities (e.g., operator position, tone transmitter) and the outgoing circuit.

Either concurrent with, or following the invocation of the transfer connection network capability, the service which invoked the capability will indicate that the user-to-OSAP2 connection should be established. After this indication has been provided, and after the Address Complete message has been received over the transfer connection, the service initiating exchange:

- maps the received Address Complete message to a Call PROGress message, as described in ANSI T1.113.4, Section 4A.4, and transmits that Call PROGress message to the preceding exchange. (The preceding exchange is defined within the context of the operator services originating connection capability.)
- through-connects the transmission path between the associated incoming (originating) circuit and the outgoing circuit.

After sending the Call progress message, the service initiating exchange follows the basic call control procedures for an intermediate exchange, as described in ANSI T1.113.3, for the remainder of the call.

6.3.2.1.2 Procedures at the Transfer Connection Intermediate Exchange

The procedures described in 6.3.1.1.2 apply.

6.3.2.1.3 Procedures at the Transfer Connection Destination Exchange

The procedures described in 6.3.1.1.3 apply.

6.3.2.2 Procedures for Releasing a Type 2 Transfer Connection

Transfer connection release procedures may be initiated by the transfer connection initiating exchange before the user-to-transfer-connection-destination-exchange connection is established. Transfer connection release procedures may be initiated by the transfer connection destination exchange at any time.

6.3.2.2.1 Release Initiated by Transfer Connection Initiating Exchange

If the user-to-transfer-connection-destination-exchange connection has not been established, the transfer connection initiating exchange may apply the release procedures described in 6.3.1.2.1.

6.3.2.2.2 Release Initiated by Transfer Connection Destination Exchange

The procedures described in 6.3.1.2.2 apply.

In addition to the procedures of 6.3.1.2.2, after release of the transfer connection, call processing functions at the transfer connection originating exchange may determine the need to maintain the operator services originating connection. In this case, call processing functions do not propogate the Release to the access (originating connection), and instead notify the transfer connection originating exchange to formulate a Call PROGress message as follows, and to transmit that Call PROGress message to the preceding exchange:

- the Event Information parameter coded PROGress
- the Backward Call Indicators parameter

- Charge Indicator, Called party's status indicator, Called party's category indicator, holding indicator are coded default.
- All other indicators as appropriate for the connection.

6.3.3 Specifications for protocol interworking

6.3.3.1 SS7/Inband

If inband signaling is encountered during establishment of a transfer connection, the call establishment should continue. The associated forward number information, if present, will not be delivered to the transfer connection destination exchange, in this case.

If a Transfer Connection Initiating Exchange receives a Suspend (network) message, then the exchange follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3(3) and Section 2.5.3. If a Transfer Connection Initiating Exchange receives a Resume message, following a Suspend message and prior to expiration of Timer T6, then the exchange follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3(3).

7 Abnormal Procedures

7.1 Abnormal Procedures for a Transfer Connection

7.1.1 Establishing a Transfer Connection

If the Transfer Connection Destination Exchange does NOT receive an optional parameter in the Initial Address Message which is required by service processing, then error procedures, if any, are determined by service processing. If the Transfer Connection Destination Exchange receives a Calling Party Category Parameter which is coded other than "national operator", then error procedures, if any, are determined by the service processing.

If the User Service Information Parameter received by the Transfer Connection Destination Exchange in the Initial Address message is NOT coded "speech" and is NOT coded "3.1 kHz audio" then the exchange will not establish the operator services transfer connection.

7.1.2 Releasing a Transfer Connection

When the service capabilities at the transfer connection destination exchange determine that the request cannot be served, the transfer connection destination exchange initiates release of the transfer connection and follows the release procedures specified in ANSI T1.113.4, Section 2.2.1. The Release message sent from the transfer connection destination exchange to the preceding exchange contains the Cause Indicators Parameter coded, "requested facility not subscribed" or "requested facility not implemented" The coding of the Cause Indicators Parameter is based on the input from the service capabilities.

Upon receipt of a Release message from the succeeding exchange, the transfer connection intermediate exchange follows the procedures specified in ANSI T1.113.4, Section 2.2.2.

Upon receipt of a Release message from the succeeding exchange, the transfer connection initiating exchange starts release of the switched path (between the service requesting capabilities and the outgoing circuit) and informs the service capabilities. When the switched path has been fully disconnected at the transfer connection initiating exchange, a Release Complete message is sent to the succeeding exchange.

Section 3
Operator Services Terminating Connection Network Capability

Table of Contents

1 Scope, Purpose, and Application

The terminating connection is a network connection (it may be an intranetwork or internetwork connection) which is established during an operator service to contact a destination user. Three types of terminating connections are identified in Clause 4.

This standard applies to the Integrated Service Digital Network (ISDN) User Part (ISUP) and is intended to supplement the signaling functions and call procedures described in ANSI T1.113. This standard could be used in conjunction with other American National Standards related to supplementary services and network capabilities. For a more complete understanding of the interactions between the Operator Services Terminating Connection and other ANSI services and network capabilities, the appropriate American National Standards should be consulted.

2 Normative References

The following documents contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.104-1991, (R1997), *Telecommunications - Exchange-Interexchange Carrier Interfaces - Individual Channel Signaling Protocols*

ANSI T1.113-1995, *Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*

3 Abbreviations and definitions

3.1 Abbreviations

The following abbreviations are used in this document.

ACM	Address Complete Message
ANM	Answer Message
ANSI	American National Standards Institute
FE	functional entity
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	Integrated Services Digital Network User Part
LE	local exchange
OC1	originating connection functions group 1
OC2	originating connection functions group 2
OSAP	operator services access point
OSS	Operator Services System
REL	Release Message
SS7	Signaling System Number 7
TC1	transfer connection functions group 1
TC2	transfer connection functions group 2
TCAP	Transaction Capabilities Application Part
TM1	terminating connection functions group 1
TM2	terminating connection functions group 2
TR	transit exchange

3.2 Definition of Terms

The generic definitions in this subclause have been formulated for use within this document.

3.2.1 Destination User: A "person" contacted/accessed by an operator service and/or a served user.

3.2.2 Destination User - Network Interface: The user-network interface for the destination user.

3.2.3 Operator Service Access Point (OSAP): The functional entity which provides access to an operator service. The operator service may be co-located with the OSAP or may be located elsewhere, but the interface between the OSAP and the operator service is beyond the scope of this document.

3.2.4 Operator Services: A set of services including toll and assistance services, listing services and intercept services which make use of the Operator Services Terminating Connection Network Capability.

3.2.5 Served User: A "person" who interacts with an operator service in the network and generally, the calling user.

3.2.6 Terminating Connection: The connection between an OSAP and the destination user - network interface.

3.2.7 Terminating Connection Destination Exchange: The Terminating Connection Destination Exchange is the exchange which serves the destination user.

3.2.8 Terminating Connection Initiating Exchange: The Terminating Connection Initiating Exchange is the exchange which initiates establishment of a terminating connection when the terminating connection network capability is invoked. The Terminating Connection Initiating Exchange may be an originating exchange or an intermediate exchange.

3.2.9 Terminating Connection Intermediate Exchange: The Terminating Connection Intermediate Exchange is an exchange participating in the terminating connection which succeeds the terminating connection initiating exchange and precedes the terminating connection destination exchange.

4 Description of Network Capability

4.1 General description

The terminating connection network capability establishes a terminating connection when the service capabilities accessed via the OSAP determine that a destination user must be contacted to continue the operator service.

Three terminating connection types are identified below based on the relationship between the served user, the service capabilities accessed via the OSAP and the destination user.

1. Type 1 Terminating Connection - "No Served User to Destination User Call"

A Type 1 Terminating Connection is a terminating connection which results in a service to destination user call and does NOT result in a served user to destination user call.

When the service capabilities accessed via the OSAP determine that a type 1 terminating connection must be established to contact a destination user and invoke the terminating connection network capability, the OSAP initiates a terminating connection. At this point, the OSAP may also optionally invoke the Active Operator Service capability for handling user-network interaction, as described in Annex A. When the destination user answers, a voice path is established between the service capabilities accessed via the OSAP and the destination user. If an associated incoming (i.e., originating or transfer) connection exists, the service capabilities may allow the served user to hear the voice communication between the service capabilities and the destination user.

When the service capabilities are completed or the destination user disconnects, the terminating connection is released. The terminating connection's release does not affect the incoming (i.e., originating or transfer) connection to the OSAP.

2. Type 2 Terminating Connection - "OSAP to Destination User Call Followed by Served User to Destination User Call"

A Type 2 Terminating Connection is a terminating connection which results in a service to destination user call followed by a served user to destination user call.

When the service capabilities accessed via the OSAP determine that a type 2 terminating connection must be established to contact a destination user and invoke the terminating connection network capability, the OSAP initiates a terminating connection. At this point, the OSAP may also optionally invoke the Active Operator Service capability for handling user-network interaction, as described in Annex A. When the destination user answers, a voice path is established between the service capabilities accessed via the OSAP and the destination user. The service capabilities accessed via the OSAP may allow the served user to hear the voice communication between the service capabilities and the destination user.

After the destination user answers and the service capabilities determine that a served user to destination user connection should be established, the OSAP connects the incoming (originating or transfer) connection and the terminating connection.

The terminating connection is released when the destination user disconnects or the service capabilities accessed via the OSAP determine that the terminating connection should be released. Release of the terminating connection does not affect the incoming (originating or transfer) connection to the OSAP.

3. Type 3 Terminating Connection - "Immediate Served User to Destination User Connection"

A Type 3 Terminating Connection is a terminating connection which results in a served user to destination user call and does NOT involve a service to destination user call.

When the service capabilities accessed via the OSAP determine that a type 3 terminating connection must be established to contact a destination user and invoke the terminating connection network capability, the OSAP initiates a terminating connection. When the destination user answers, the served user is connected to the destination user.

The terminating connection is released when the destination user disconnects or the service capabilities accessed via the OSAP determine that the terminating connection should be released. Release of the terminating connection does not affect the incoming (originating or transfer) connection to the OSAP.

4.2 Procedures

4.2.1 Provision/withdrawal

A user does not subscribe to the terminating connection network capability. The terminating connection network capability is invokable on calls identified as requiring operator services.

4.2.2 Normal procedures

4.2.2.1 Activation/deactivation.

The terminating connection network capability is activated/deactivated on a per-network basis.

4.2.2.2 Invocation and operation

4.2.2.2.1 Establishing the Terminating Connection.

A terminating connection is established when the operator service determines that a destination user must be contacted to continue the operator service and invokes the terminating connection network capability.

4.2.2.2.2 Releasing the Terminating Connection

The terminating connection is released when a destination user disconnects or the operator service determines that the terminating connection is no longer needed.

4.2.3 Exceptional procedures

4.2.3.1 Activation/deactivation

None identified.

4.2.3.2 Invocation and operation

None identified.

4.2.4 Alternate procedures

None identified.

4.3 Interworking considerations

Interworking with inband signaling protocols is required.

4.4 Network capabilities for charging

None identified.

4.5 Interactions with supplementary services and other network capabilities

4.5.1 Originating Connection Network Capability

See ANSI T1.666.1.

4.5.2 Transfer Connection Network Capability

See ANSI T1.666.2.

4.5.3 Connection Hold Network Capability

The Connection Hold Network Capability cannot be successfully invoked by the destination user of the terminating connection.

4.5.4 User-to-User Signaling

Due to existing incompatibilities between ISDN services and operator services, the terminating connection network capability will not support the passing of User-to-User Signaling information.

4.5.5 Calling Line Identification Presentation/Calling Line Identification Restriction (CLIP/CLIR)

If available to the OSAP, information related to the calling party (e.g., calling party address presentation indicator) should be passed unchanged to the terminating connection destination exchange, following procedures described in ANSI T1.113.4, Section 2.

4.5.6 Calling Name Identification Presentation/Calling Name Identification Restriction (CNIP/CNIR)

If available to the OSAP, information related to the calling party (e.g., generic name presentation indicator) should be passed unchanged to the terminating connection destination exchange, following procedures described in ANSI T1.113.4, Section 2.

5 Functional Capabilities and Information Flows

5.1 Functional entity model

This subclause describes a functional entity model for establishing and releasing a terminating connection. A functional entity (FE) is a group of functions provided in one node. Multiple functional entities can be implemented in a single node. Figure 1 shows the functional entity model for the terminating connection network capability and includes the optional transfer connection FEs. Figure 2 shows the functional entity model for the terminating connection network capability and does not include the optional transfer connection FEs.

FE1 - FE6 are not involved in establishing a terminating connection and are included in the functional model to highlight the relationship between the originating/transfer connection and the terminating connection.

FE7 - FE9 represent basic service functional entities. Additional functions for the operator services terminating connection network capability are included as an extension to a basic service functional entity.

The FE model in Figure 1 has been assumed in the FE descriptions in 5.1.1 - 5.1.6.

Whenever an optional FE is not present in the connection, its function is assumed by an adjacent FE.

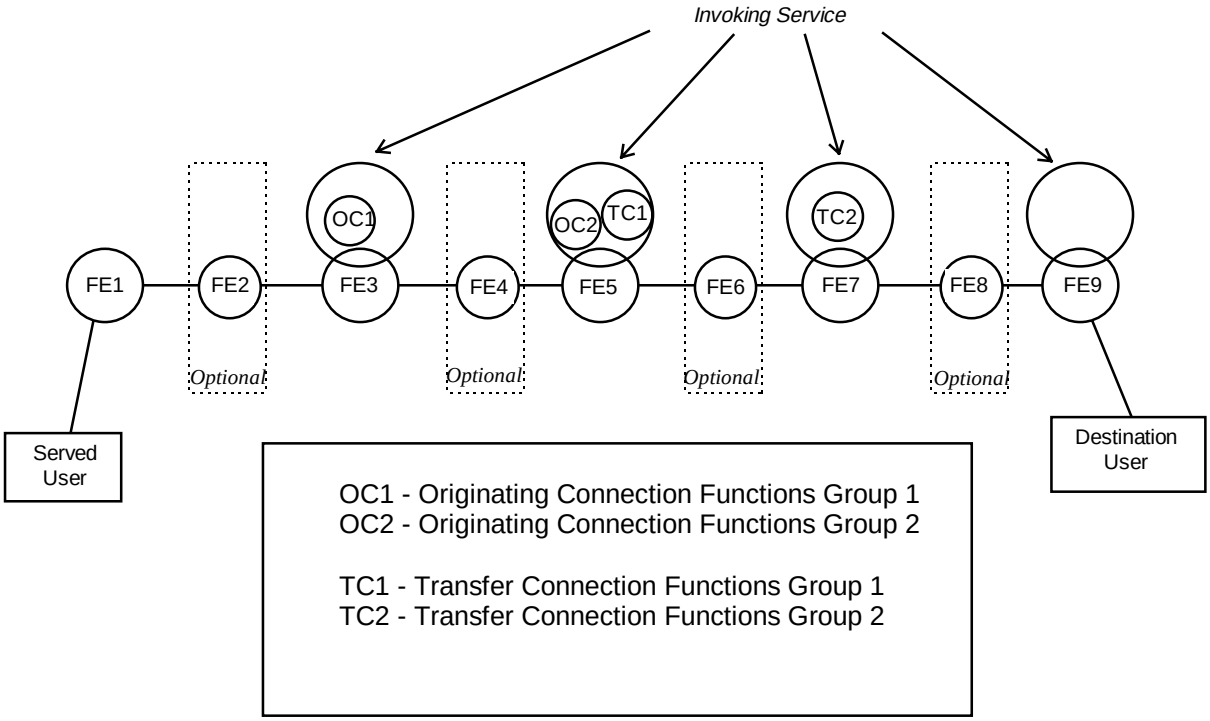


Figure 1 - Operator Services Terminating Connection (with Optional Transfer Connection) Functional Entity Model

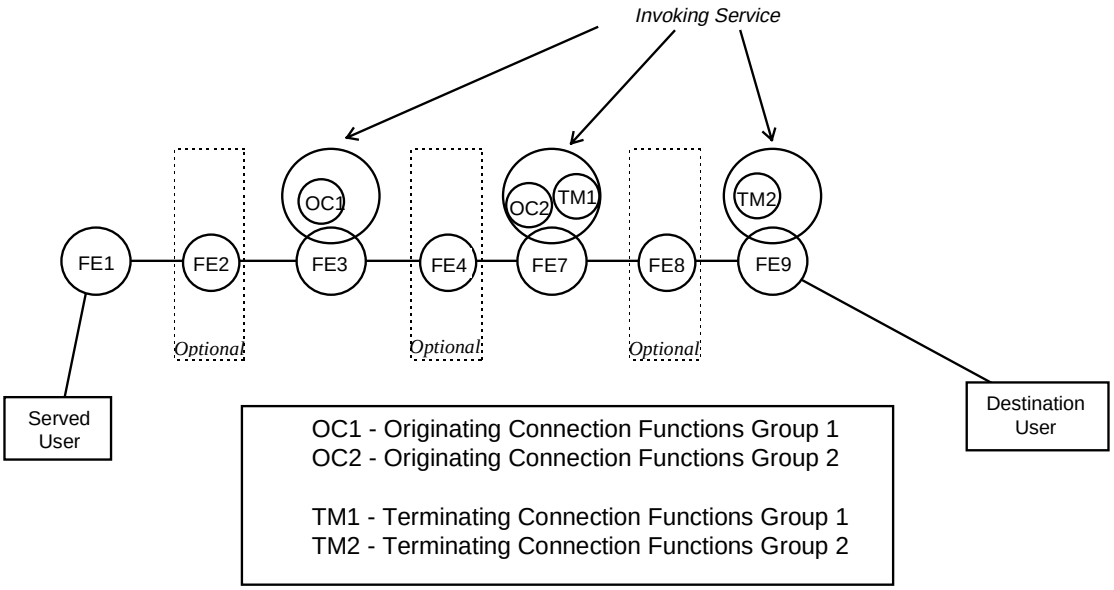


Figure 2 - Operator Services Terminating Connection (without Optional Transfer Connection) Functional Entity Model

5.1.1 Descriptions of Functional Entities 1 - 4

See Operator Services Originating Connection Network Capability.

5.1.2 Description of Functional Entity 5

5.1.2.1 General Capabilities

FE5 provides access to operator service capabilities, i.e., FE5 performs the functions of an OSAP. It receives operator service requests and notifications from FE4 and either informs the operator service capabilities provided via FE5 or relays the operator service information to FE6. FE5 generates and sends operator service requests and notifications to FE4, when instructed by the operator service capabilities provided via FE5. FE5 transmits a transfer connection set-up request to FE6, when requested by the operator service capabilities provided via FE5. FE5 receives operator service requests, responses and notifications from FE6 and either informs the operator service capabilities supported via FE5 or relays the information to FE4. FE5 is part of the functional entity model, only if a transfer connection exists.

5.1.3 Description of Functional Entity 6

5.1.3.1 General Capabilities

FE6 relays operator service signaling information between FE5 and FE7. FE6 is an optional element of the functional model.

5.1.4 Description of Functional Entity 7

5.1.4.1 General Capabilities

FE7 provides access to operator service capabilities, i.e., functions as an OSAP. FE7 generates and transmits to FE6 operator service requests, responses and notifications. FE7 receives and interprets operator service requests, responses and notifications it receives from FE6.

5.1.4.2 Capabilities for Establishing a Type 1 Terminating Connection

During establishment of a terminating connection, FE7 is able to:

- Send a call set-up request, toward FE9, when the service capabilities accessed via FE7 require a type 1 terminating connection.
- Invoke optional active operator service functionalities as described in Annex A.
- Receive a call acknowledgment response and answer response from FE8, and provide access (i.e., a voice path) between the service capabilities and the destination user.

5.1.4.3 Capabilities for Releasing a Type 1 Terminating Connection

During release of a terminating connection, FE7 is able to:

- Release the terminating connection when a call disconnect request is received from FE8, without affecting the incoming (originating or transfer) connection, if one exists. Send a call disconnect message to FE8, when the service capabilities accessed via FE7 determine that the terminating connection must be released.

5.1.4.4 Capabilities for Establishing a Type 2 Terminating Connection

During establishment of a type 2 terminating connection, FE7 is able to

- Send a call set up request, toward FE9, when the service capabilities accessed via FE7 require a type 2 terminating connection.
- Invoke optional active operator service functionalities as described in Annex A.
- Receive a call acknowledgment response and answer response, from FE8, and provide access (i.e., a voice path) between the service capabilities and the destination user.
- Provide a connection between the incoming (originating or transfer) connection and the terminating connection when the service capabilities accessed via FE7 require this connection.

5.1.4.5 Capabilities for Releasing a Type 2 Terminating Connection

During release of a type 2 terminating connection FE7 is able to:

- Follow the release procedures for the connection hold network capability, if that capability has been invoked on the incoming (originating or transfer) connection.

- Release the incoming connection (originating or transfer) when a call disconnect request is received for the incoming (originating or transfer) connection, without affecting the terminating connection.
- Send a call disconnect request to FE8, when the incoming (originating or transfer connection) has been disconnected and the service capabilities accessed via FE7 determine the terminating connection is no longer required.
- Release the terminating connection when a call disconnect request has been received from FE8, without affecting the originating connection.
- Send a call disconnect request toward FE1, when the outgoing (terminating) connection has been disconnected and the service capabilities accessed via FE7 determine that the incoming connection is no longer needed.
- Send a call disconnect request to FE8, when instructed by the service capabilities accessed via FE7, without affecting the incoming (originating or transfer) connection.
- Send a call disconnect request toward FE1, when instructed by the service capabilities accessed via FE7, without affecting the terminating connection.
- Send a call disconnect request to FE8 and a call disconnect request toward FE1, when instructed by the service capabilities accessed via FE7.

5.1.4.6 Capabilities for Establishing a Type 3 Terminating Connection

During establishment of a type 3 terminating connection, FE7 is able to

- Send a call set up request, toward FE9, when the service capabilities accessed via FE7 require a type 3 terminating connection.
- Receive a call acknowledgment response and answer response, from FE8, and connect the incoming (originating or transfer) connection and the terminating connection, no later than when the call acknowledgment response is received.

5.1.4.7 Capabilities for Releasing a Type 3 Terminating Connection

During release of a type 3 terminating connection FE7 is able to:

- Follow the release procedures for the connection hold network capability, if that capability has been invoked on the incoming (originating or transfer) connection.
- Send a call disconnect request to FE8, when the incoming (originating or transfer connection) has been disconnected.
- Release the terminating connection when a call disconnect request has been received from FE8, without affecting the incoming connection to FE7.
- Send a call disconnect request toward FE1, when the outgoing (terminating) connection has been disconnected and the service capabilities accessed via FE7 determine that the incoming connection is no longer needed.
- Send a call disconnect request to FE8 when instructed by the service capabilities accessed via FE7, without affecting the incoming (originating or transfer) connection.
- Send a call disconnect request to FE8 and a call disconnect request toward FE1, when instructed by the service capabilities accessed via FE7.

5.1.5 Description of Functional Entity 8

FE8 relays operator services requests, responses, and notifications between FE7 and FE9. FE8 is an optional element in the model.

5.1.6 Description of Functional Entity 9

5.1.6.1 Capabilities for Establishing a Terminating Connection

FE9 provides the functions of a destination exchange.

In addition, during establishment of a Type 1 and Type 2 terminating connection FE9 is able to:

– Provide optional active operator service functions described in Annex A.

5.1.6.2 Capabilities for Releasing a Terminating Connection

FE9 does not require any capabilities beyond basic call control capabilities for a destination exchange.

5.2 Information flow model

This subclause identifies the information that needs to be passed between functional entities to establish and release a terminating connection. See Figures 3 - 7. The figures below show the latest possible time at which cut through of the transmission path, in both directions, will occur.

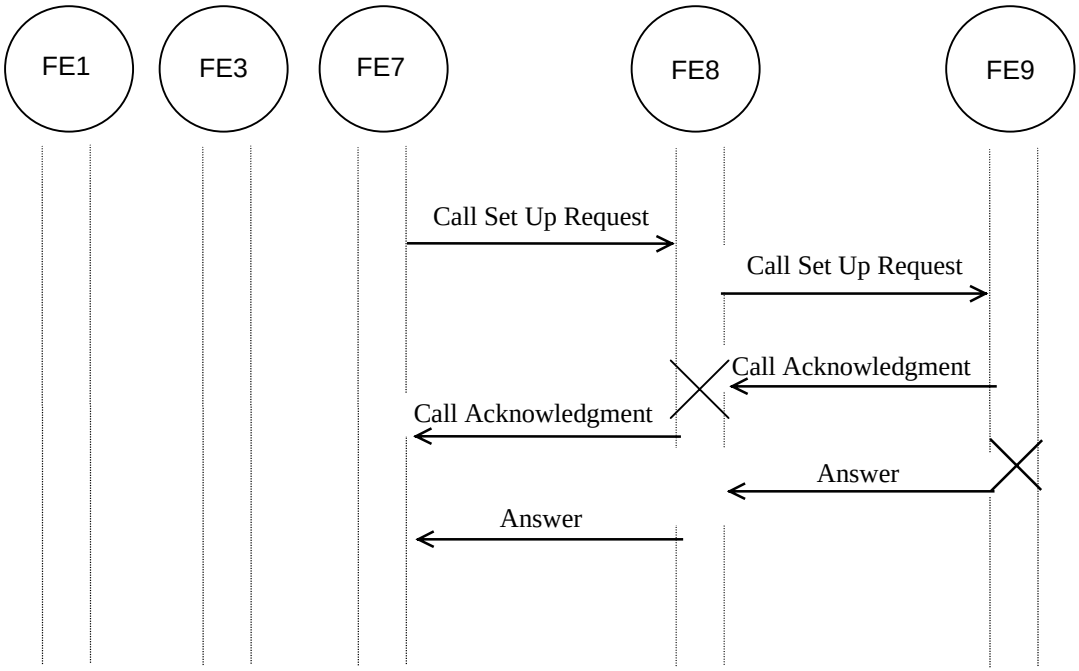


Figure 3 - Establishing a Type 1 Terminating Connection (No Served User to Destination User Call)

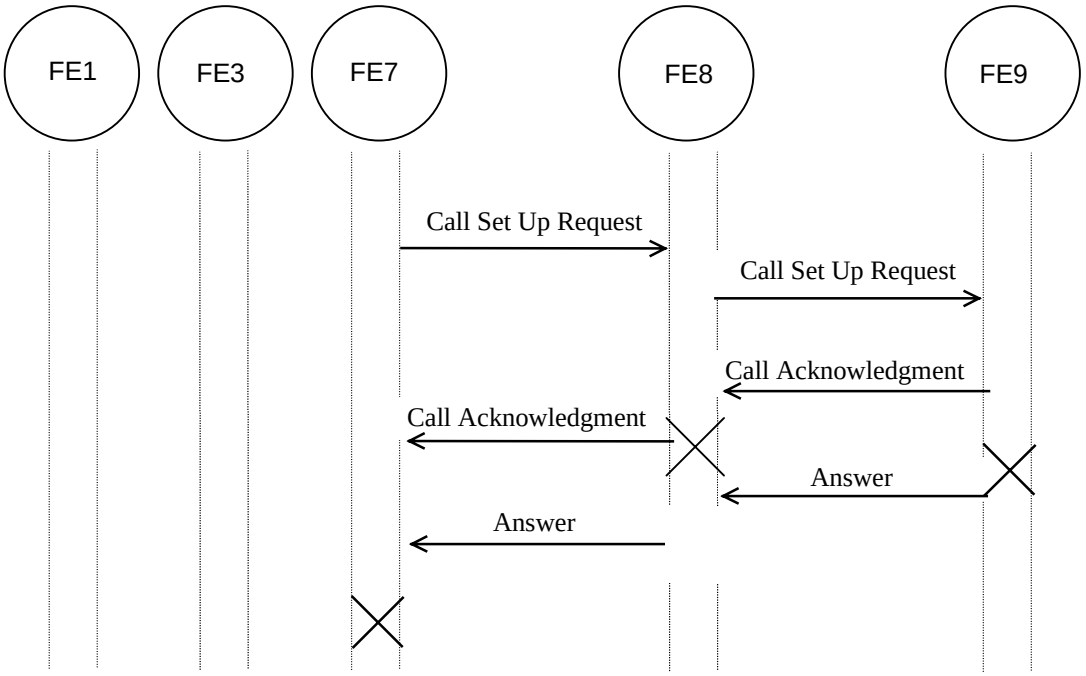


Figure 4 - Establishing a Type 2 Terminating Connection (Delayed Served User to Destination User Call)

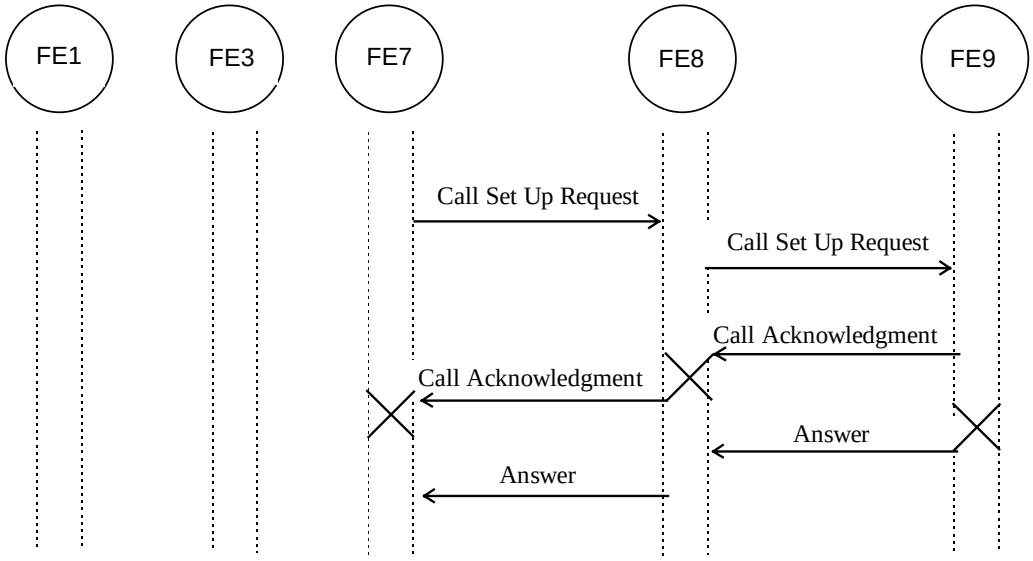


Figure 5. Establishing a Type 3 Terminating Connection
(Immediate Served User to Destination User Call)

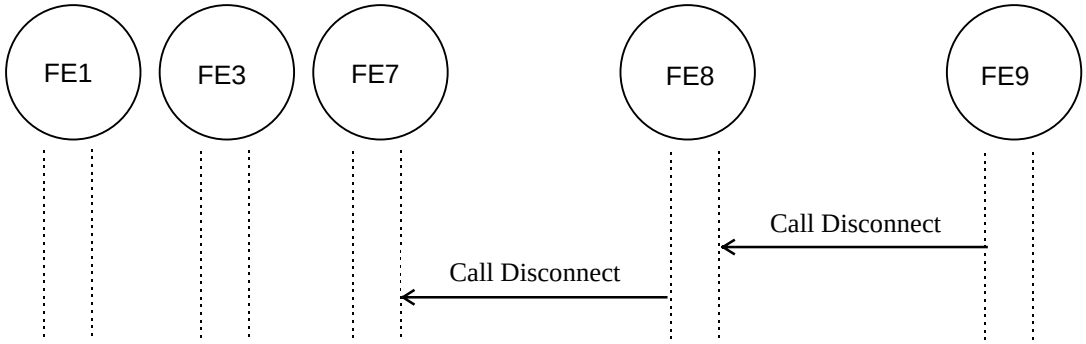


Figure 6 - Releasing the Terminating Connection
(Release Initiated by Terminating Connection Destination Exchange)

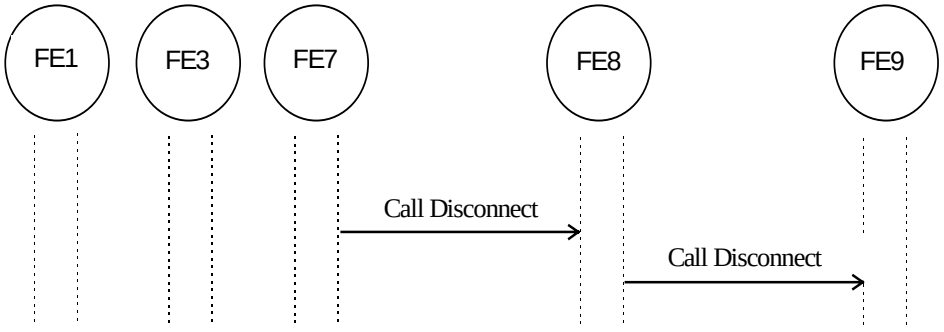


Figure 7 - Releasing a Terminating Connection
(Release Initiated by Terminating Connection Initiating Exchange)

5.2.1 Definition of Individual Information Elements

Billing Verification Information

Information sent from FE7 to FE9 to identify the call as a request for billing verification on a collect or third-number billed call. (Note: This information does not have an equivalent MF signal specified in ANSI T1.104.)

5.2.2 Information elements

Table 1 shows the information sent from FE7 to FE9 in a Type 1 or Type 2 terminating connection call set up request.

Table 1 - Type 1 and Type 2 call setup request information elements

Information Element	
Billing Verification Information	O

KEY

O information optional

5.2.3 Exceptional procedures

None identified.

5.3 Allocation of functions to equipment

Table 2 - Allocation of functions to equipment

Scenario	**FE7**	**FE8**	**FE9**
Scenario 1	TR1	TR2	LE1
Scenario 2	TR1	-	LE1
Scenario 3*	LE1	-	LE1

* - ISDN-UP signaling is NOT required.

5.3.1 Examples of Operator Services Mapped to Allocation Scenarios

Table 3 - Examples of operator services mapped to allocation scenarios

Scenario	**TR1**	**TR2**	**LE1**
Scenario 1	FE7	FE8	FE9
Scenario 2	FE7		FE9
Scenario 3*			FE7&FE9

* - ISDN-UP signaling is NOT required.

Scenarios are defined in ANSI T1.666.1

5.4 Limiting assumptions

None Identified.

6 Protocols and Procedures

6.1 Protocol and procedural assumptions

ISDN-UP protocol and procedures are required for the Terminating Connection Network Capability. No TCAP procedures are required for this network capability.

6.2 ISUP formats and codes

6.2.1 Messages

The ISUP messages used for the terminating connection network capability are given below.

Table 4 - Terminating Connection Network Capability - Messages

Message	Format Reference
IAM	ANSI T1.113.3-1995
ACM	ANSI T1.113.3-1995|
SUS	ANSI T1.113.3-1995|
REL	ANSI T1.113.3-1995|
RES	ANSI T1.113.3-1995|
RLC	ANSI T1.113.3-1995|
CPG	ANSI T1.113.3-1995

6.2.2 Parameters

Service Activation Parameter

The format of the Service Activation Parameter is shown in ANSI T1.113.3. A new codepoint, billing verification, is required in the Service Activation Parameter for the terminating connection network capability. The coding of billing verification in the Service Activation Parameter is shown below.

Table 5 - Values for Service Activation Parameter

Value	
1000 0101	Billing Verification

6.3 ISUP procedures

6.3.1 Procedures for a Type 1 Terminating Connection

6.3.1.1 Procedures for Establishing a Type 1 Terminating Connection

6.3.1.1.1 Procedures at the Terminating Connection Initiating Exchange

When service processing at the terminating connection initiating exchange invokes the terminating connection network capability and identifies a type 1 terminating connection as being required, the exchange performs route selection and sends an Initial Address message to the subsequent exchange. The Initial Address message contains the Nature of Connections Indicator Parameter, Forward Call Indicators Parameter, Calling Party Category Parameter, User Service Information Parameter and Called Party Number Parameter. The Initial Address message may contain additional optional parameters, as described in ANSI T1.113.3, when required by the invoking service.

A. The Nature of Connections Indicator Parameter is coded as described in ANSI T1.113.3.

B. The Forward Call Indicators Parameter is coded as described in ANSI T1.113.3.

C. The Calling Party Category Parameter is coded "national operator".

D. The User Service Information Parameter is coded to identify an information transfer capability of either "speech" or "3.1 kHz audio".

E. The Called Party Number Parameter is coded as described in ANSI T1.113 and contains the destination user’s address provided by the invoking service.

F. When specified by the invoking service, the Service Activation parameter is coded to include the "billing verification”octet. When not specified by the invoking service, no Service Activation parameter is sent, unless it is required by the other network capabilities.

When the terminating connection initiating exchange receives an Address Complete message, the exchange follows the procedures specified for an originating exchange in ANSI T1.113.4, Section 2.1.4.3, where "calling party" in ANSI T1.113.4, Section 2.1.4.3 is replaced with "service capabilities (e.g., operator position) at the terminating connection initiating exchange". The terminating connection initiating exchange does NOT through connect the transmission path between an associated originating or transfer connection, if one exists, and the terminating connection. The terminating connection originating exchange does NOT initiate a corresponding Address Complete message or a corresponding Call PROGress message to the preceding exchange, if one exists.

When the Terminating Connection Initiating Exchange receives an Answer message, it follows the procedures specified in ANSI T1.113, Section 2.1.5.3, with "calling terminal" in ANSI T1.113.4, Section 2.1.5.3 replaced by "service capabilities (e.g., operator position)".

6.3.1.1.2 Procedures at the Terminating Connection Intermediate Exchange

When a terminating connection intermediate exchange receives an Initial Address message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.1.2.

When a terminating connection intermediate exchange receives an Address Complete message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.4.2.

When the terminating connection intermediate exchange receives an Answer Message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.5.2.

6.3.1.1.3 Procedures at the Terminating Connection Destination Exchange

Upon receipt of an Initial Address message, the terminating connection destination exchange follows the procedures specified for a destination exchange in ANSI T1.113.4, Section 2.1.1.3. In addition, if the Service Activation Parameter is coded "billing verification", then this information is delivered to service processing logic at the destination exchange.

The terminating connection destination exchange follows the procedures for returning an Address Complete message and Answer message as specified in ANSI T1.113.4, Section 2.1.4.1 (for Address Complete) and Section 2.1.5.1 (for Answer message).

6.3.1.1.4 Procedures for interactions with the Active Operator Service network capability

Procedures for the Active Operator Service capability can be found in Annex A.

6.3.1.2 Procedures for Releasing a Type 1 Terminating Connection

Terminating connection release procedures may be initiated by the terminating connection initiating exchange or the destination user.

6.3.1.2.1 Release Initiated by Terminating Connection Initiating Exchange

6.3.1.2.1.1 Terminating Connection Initiating Exchange Procedures

When the invoking service at the terminating connection initiating exchange initiates a request to release the terminating connection, the terminating connection initiating exchange follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.1 (1), with "calling party" replaced by "invoking service." The Release message, sent by the Terminating Connection Initiating Exchange, contains a Cause Indicators Parameter coded "normal clearing".

6.3.1.2.1.2 Terminating Connection Intermediate Exchange Procedures

When the terminating connection intermediate exchange receives a Release message from a preceding exchange, it follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.1 (2).

6.3.1.2.1.3 Terminating Connection Destination Exchange Procedures

When the terminating connection destination exchange receives a Release message from a preceding exchange, it follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.1 (3).

6.3.1.2.2 Release Initiated by Destination User

6.3.1.2.2.1 Terminating Connection Destination Exchange

On receipt of a request to release the connection from a destination user, the terminating connection destination exchange follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.2 or may follow the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (1), Suspend Initiated by the Network. If a Release message is sent to the preceding exchange, it contains a Cause Indicators Parameter coded "normal clearing".

6.3.1.2.2.2 Terminating Connection Intermediate Exchange

When a terminating connection intermediate exchange receives a release message from a succeeding exchange, it follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.2. When the terminating connection intermediate exchange receives a Suspend (network) message from a succeeding exchange, it follows the procedures specified in

ANSI T1.113.4, Section 2.5.1.3 (2). When the terminating connection intermediate exchange receives a Resume (network) message from succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3 (2).

6.3.1.2.2.3 Terminating Connection Initiating Exchange

When the terminating connection initiating exchange receives a Release message from a succeeding exchange, it follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.2. When the terminating connection initiating exchange receives a Suspend message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (3). When the terminating connection initiating exchange receives a Resume message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3 (3).

6.3.2 ISUP Procedures for a Type 2 Terminating Connection

6.3.2.1 Procedures for Establishing a Type 2 Terminating Connection

6.3.2.1.1 Procedures at the Terminating Connection Initiating Exchange

When service processing at the terminating connection initiating exchange invokes the terminating connection network capability and identifies a type 2 terminating connection as being required, the exchange performs route selection and sends an Initial Address message to the subsequent exchange. The Initial Address message contains the Nature of Connection Indicators Parameter, Forward Call Indicators Parameter, Calling Party Category Parameter, User Service Information Parameter and Called Party Number Parameter.

The Initial Address message may contain additional optional parameters, as described in ANSI T1.113.3, when required by the invoking service.

A. The Nature of Connections Indicator Parameter is coded as described in ANSI T1.113.3.

B. The Forward Call Indicators Parameter is coded as described in ANSI T1.113.3.

C. The Calling Party Category Parameter is coded "national operator".

D. The User Service Information Parameter is coded to identify an information transfer capability of either "speech" or "3.1 kHz audio"

E. The Called Party Number Parameter is coded as described in ANSI T1.113.3 and contains the destination user’s address provided by the invoking service.

F. When specified by the invoking service, the Service Activation parameter is coded to include the "billing verification” octet. When not specified by the invoking service, no Service Activation parameter is sent, unless it is required by the other network capabilities

When the terminating connection initiating exchange receives an Address Complete message, the exchange follows the procedures specified for an originating exchange in ANSI T1.113.4, Section 2.1.4.3, where, "calling party" is replaced with "service capabilities (e.g., operator position) at the terminating connection initiating exchange."

When the Terminating Connection Initiating Exchange receives an Answer message, it follows the procedures specified for an originating exchange in ANSI T1.113.4, Section 2.1.5.3, with "calling terminal" replaced by "service capabilities (e.g., operator position) at the terminating connection initiating exchange."

At some time following the invocation of the terminating connection network capability, the service which invoked the capability may indicate that the incoming and outgoing connections should be through connected. After this indication has been provided, the service initiating exchange:

– through connects the transmission path between the associated incoming circuit, if one exists, and the outgoing circuit.

– if appropriate, maps Address Complete, and Answer Message[1)] information to a Call Progress message and sends the CPG to the preceding exchange.

The Call PROGress message is coded with:

– The parameters contained within the received ACM, CPG, or ANM, with the exception of connection hold information.

– The Event indicator - "PROGress"

After sending the Call progress message the service initiating exchange follows the basic call control procedures for an intermediate exchange, as described in ANSI T1.113.3, for the remainder of the call.

6.3.2.1.2 Procedures at the Terminating Connection Intermediate Exchange

When a terminating connection intermediate exchange receives an Initial Address message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.1.2.

When a terminating connection intermediate exchange receives an Address Complete message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.4.2.

When the terminating connection intermediate exchange receives an Answer Message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.5.2.

6.3.2.1.3 Procedures at the Terminating Connection Destination Exchange

Upon receipt of an Initial Address message, the terminating connection destination exchange follows the procedures specified for a destination exchange in ANSI T1.113.4, Section 2.1.1.3. The terminating connection destination exchange follows the procedures for returning an Address Complete message and Answer message as specified in ANSI T1.113.4, Section 2.1.4.1 (for Address Complete) and Section 2.1.5.1 (for Answer message).

6.3.2.1.4 Procedures for interactions with the Active Operator Service network capability

Procedures for Active Operator Service are in Annex A.

6.3.2.2 Procedures for Releasing a Type 2 Terminating Connection

Terminating connection release procedures may be initiated by the terminating connection initiating exchange or the destination user.

6.3.2.2.1 Release Initiated by Terminating Connection Initiating Exchange

6.3.2.2.1.1 Terminating Connection Initiating Exchange Procedures

When the invoking service at the terminating connection initiating exchange initiates a request to release the terminating connection, the terminating connection initiating exchange follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.1 (1), with "calling party" replaced by "invoking service." The Release message, sent by the Terminating Connection Initiating Exchange, contains a Cause Indicators Parameter coded "normal clearing".

[1)] There is no need to inform a preceding exchange of any change in basic call state because of receipt of the Answer Message.

6.3.2.2.1.2 Terminating Connection Intermediate Exchange Procedures

When the terminating connection intermediate exchange receives a Release message from a preceding exchange, it follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.1 (2).

6.3.2.2.1.3 Terminating Connection Destination Exchange Procedures

When the terminating connection destination exchange receives a Release message from a preceding exchange, it follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.1 (3).

6.3.2.2.2 Release Initiated by Destination User

6.3.2.2.2.1 Terminating Connection Destination Exchange

On receipt of a request to release the connection from a destination user, the terminating connection destination exchange follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.2 or may follow the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (1), Suspend Initiated by the Network. If a Release message is sent to the preceding exchange, it contains a Cause Indicators Parameter coded "normal clearing".

6.3.2.2.2.2 Terminating Connection Intermediate Exchange

When a terminating connection intermediate exchange receives a release message from a succeeding exchange, it follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.2. When the terminating connection intermediate exchange receives a Suspend (network) message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (2). When the terminating connection intermediate exchange receives a Resume (network) message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3 (2).

6.3.2.2.2.3 Terminating Connection Initiating Exchange

When the terminating connection initiating exchange receives a Release message from a succeeding exchange, it follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.2. However, call processing functions do not propogate the Release to the access (originating or transfer connection) and instead notify the terminating connection initiating exchange to formulate a Call PROGress message as follows, and to transmit that Call PROGress message to the preceding exchange:

- the Event Information parameter coded PROGress
- the Backward Call Indicators parameter
  - Charge Indicator, Called party's status indicator, Called party's category indicator, and Holding indicator are coded as default.
  - All other indicators as appropriate for the connection.

When the terminating connection initiating exchange receives a Suspend message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (3). When the terminating connection initiating exchange receives a Resume message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3 (3).

6.3.3 ISUP Procedures for a Type 3 Terminating Connection

6.3.3.1 Procedures for Establishing a Type 3 Terminating Connection

6.3.3.1.1 Procedures at the Terminating Connection Initiating Exchange

When service processing at the terminating connection initiating exchange invokes the terminating connection network capability and identifies a type 3 terminating connection as being required, the exchange performs route selection and sends an Initial Address message to the subsequent exchange. The Initial Address message contains the Nature of Connections Indicator Parameter, Forward Call Indicators Parameter, Calling Party Category Parameter, User Service Information Parameter and Called Party Number Parameter. The Initial Address message may contain additional optional parameters, as described in ANSI T1.113.3, when required by the invoking service.

A. The Nature of Connections Indicator Parameter is coded as described in ANSI T1.113.4.

B. The Forward Call Indicators Parameter is coded as described in ANSI T1.113.3.

C. The Calling Party Category Parameter is coded with the value received from the incoming connection.

D. The User Service Information Parameter is coded to identify an information transfer capability of either "speech" or "3.1 kHz audio".

E. The Called Party Number Parameter is coded as described in ANSI T1.113 and contains the destination user's address provided by the invoking service.

F. When specified by the invoking service, the Service Activation parameter is coded to include the "billing verification" octet. When not specified by the invoking service, no Service Activation parameter is sent, unless it is required by the other network capabilities.

When the terminating connection initiating exchange receives an Address Complete message, the exchange follows the procedures specified for an originating exchange in ANSI T1.113.4, Section 2.1.4.3, where, "calling party" is replaced with "service capabilities (e.g., operator position) at the terminating connection initiating exchange."

When the Terminating Connection Initiating Exchange receives an Answer message, it follows the procedures specified for an originating exchange in ANSI T1.113.4, Section 2.1.5.3, with "calling terminal" replaced by "service capabilities (e.g., operator position) at the terminating connection initiating exchange."

6.3.3.1.2 Procedures at the Terminating Connection Intermediate Exchange

When a terminating connection intermediate exchange receives an Initial Address message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.1.2.

When a terminating connection intermediate exchange receives an Address Complete message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.4.2.

When the terminating connection intermediate exchange receives an Answer Message, it follows the procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.1.5.2.

6.3.3.1.3 Procedures at the Terminating Connection Destination Exchange

Upon receipt of an Initial Address message, the terminating connection destination exchange follows the procedures specified for a destination exchange in ANSI T1.113.4, Section 2.1.1.3.

The terminating connection destination exchange follows the procedures for returning an Address Complete message and Answer message as specified in ANSI T1.113.4, Section 2.1.4.1 (for Address Complete) and Section 2.1.5.1 (for Answer message).

6.3.3.2 Procedures for Releasing a Type 3 Terminating Connection

Terminating connection release procedures may be initiated by the terminating connection initiating exchange or the destination user.

6.3.3.2.1 Release Initiated by Terminating Connection Initiating Exchange

6.3.3.2.1.1 Terminating Connection Initiating Exchange Procedures

When the invoking service at the terminating connection initiating exchange initiates a request to release the terminating connection, the terminating connection initiating exchange follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.1 (1), with "calling party" replaced by "invoking service" The Release message, sent by the Terminating Connection Initiating Exchange, contains a Cause Indicators Parameter coded "normal clearing".

6.3.3.2.1.2 Terminating Connection Intermediate Exchange Procedures

When the terminating connection intermediate exchange receives a Release message from a preceding exchange, it follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.1 (2).

6.3.3.2.1.3 Terminating Connection Destination Exchange Procedures

When the terminating connection destination exchange receives a Release message from a preceding exchange, it follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.1 (3).

6.3.3.2.2 Release Initiated by Destination User

6.3.3.2.2.1 Terminating Connection Destination Exchange

On receipt of a request to release the connection from a destination user, the terminating connection destination exchange follows the release procedures specified for a destination exchange in ANSI T1.113.4, Section 2.3.2 or may follow the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (1), Suspend Initiated by the Network. If a Release message is sent to the preceding exchange, it contains a Cause Indicators Parameter coded "normal clearing".

6.3.3.2.2.2 Terminating Connection Intermediate Exchange

When a terminating connection intermediate exchange receives a release message from a succeeding exchange, it follows the release procedures specified for an intermediate exchange in ANSI T1.113.4, Section 2.3.2. When the terminating connection intermediate exchange receives a Suspend (network) message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (2). When the terminating connection intermediate exchange receives a Resume (network) message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3 (2).

6.3.3.2.2.3 Terminating Connection Initiating Exchange

When the terminating connection initiating exchange receives a Release message from a succeeding exchange, it follows the release procedures specified for an originating exchange in ANSI T1.113.4, Section 2.3.2. However, call processing functions do not propogate the Release to the access (originating or transfer connection) and instead notify the terminating connection initiating exchange to formulate a Call PROGress message as follows, and to transmit that Call PROGress message to the preceding exchange:

- the Event Information parameter coded PROGress
- the Backward Call Indicators parameter
    - Charge Indicator, Called party's status indicator, Called party's category indicator, and Holding indicator are coded as default
    - All other indicators as appropriate for the connection.

When the terminating connection initiating exchange receives a Suspend message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3 (3). When the terminating connection initiating exchange receives a Resume message from a succeeding exchange, it follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3 (3).

6.3.4 Specifications for protocol interworking

6.3.4.1 SS7/Inband

If inband signaling is encountered during establishment of the terminating connection, the call establishment should continue. For type 1 and type 2 terminating connections, the billing verification indicator will not be delivered to the terminating connection destination exchange.

If a Terminating Connection Initiating Exchange receives a Suspend (network) message, then the exchange follows the procedures specified in ANSI T1.113.4, Section 2.5.1.3(3) and Section 2.5.3. If a Terminating Connection Initiating Exchange receives a Resume message, following a Suspend message and prior to expiration of Timer T6, then the exchange follows the procedures specified in ANSI T1.113.4, Section 2.5.2.3(3).

Annex A
(normative)

Active Operator Service Network Capability

A.1 Scope, Purpose, and Application

This annex describes the optional Active Operator Service network capability, which allows services at a Destination Node to indicate to the Operator Services System (OSS) Node that a user-network interaction is needed prior to the continuation of operator services related processing at the OSS Node. For Active Operator Service, the OSS Node indicates to the Destination Node that there is an active operator service on the call. Active Operator Service functionality is shared between the OSS Node and the Destination Node. The Active Operator Service capability may be invoked by an end user service or other network capability on a per call basis. The specific end user service or other network capability that may invoke Active Operator Service is beyond the scope of this network capability description. When the Active Operator Service capability is active, if the OSS Node receives the start indication of the user-network interaction, it will connect the voice path between the Originating Node and the Destination Node while suspending its own call handling. When notified of the completion of the user-network interaction, the OSS Node may resume operator services related processing from the same point at which it had suspended and may interrupt the voice path from the Originating Node to the Destination Node. This capability builds upon the existing basic call control procedures used for establishing and releasing connections.

If the OSS and Destination Nodes are in different networks, the transmission of information elements and related procedures defined in this annex may require appropriate agreements between transmitting and receiving networks. These agreements are beyond the scope of this annex.

A.2 References

None identified.

A.3 Abbreviations and Definitions

A.3.1 Abbreviations

DSS1 Digital Subscriber Signaling System No. 1
FE Functional entity
ISDN Integrated Services Digital Network
ISUP ISDN User Part
OSS Operator services system
SAP Service activation parameter
SS7 Signaling System No. 7

A.3.2 Definitions

- Called User
  The Called User is the subscriber to one or more services which may make use of the Active Operator Service capability. The Called User is accessed by an operator service and/or a Calling User.
- Calling User
  The Calling User is the invoker of one or more services which may invoke the Active Operator Service capability. The Calling User interacts with an operator service in the network.
- Destination Node
  The Destination Node is the network element that sends the start indication of the user-

network interaction and the resume indication of the active operator service capability. The Destination Node serves the Called User.

- Originating Node
  The Originating Node serves the Calling User.
- OSS Node
  The OSS Node is the network element that alerts the Destination Node to the presence of an active operator service on the call.

A.4 Description of Network Capability

A.4.1 General Description

The optional Active Operator Service network capability permits an operator service at an OSS Node to indicate to the Destination Node that there is an active operator service on the call. It also allows services at a Destination Node to indicate to the OSS Node that a user-network interaction is needed prior to the continuation of operator services related processing. Figure A.1 provides an example of an operator services related call.

In Figure A.1, the OSS Node has determined it should establish a connection to a Destination Node for operator services related processing. The OSS Node sends the Destination Node notification that operator services are in progress. If the Destination Node determines that user-network interaction is needed prior to the continuation of operator services related processing in the OSS Node, the Destination Node sends the start indication of the user-network interaction to the OSS Node.[2)] The OSS Node suspends its operator services related processing and connects the voice path between the Originating Node and the Destination Node. When the OSS Node receives the resume indication from the Destination Node, or the call state changes, it may resume its operator services related processing from the same point at which it had suspended, which may include interruption of the voice path from the Originating Node to the Destination Node.

If the Destination Node does not determine that user-network interaction is needed, the OSS Terminating Connection process continues.

The specific end user services that may invoke Active Operator Service as well as the interactions between the Calling party and Originating Node and the Called party and Destination Node are beyond the scope of this network capability description.

[2)] Prior to this point the OSS and Destination Nodes processing is as described for an OSS Terminating Connection.

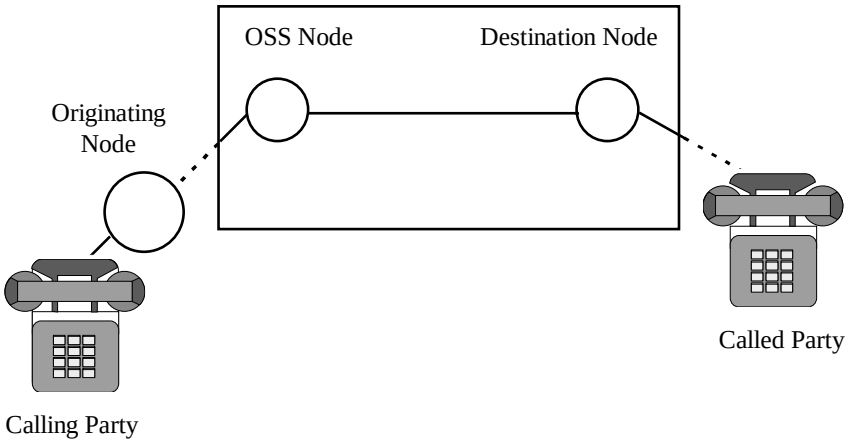


Figure A.1 - An Operator Services Related Call

A.4.2 Procedures

A.4.2.1 Provision/Withdrawal

An end user cannot directly subscribe to the Active Operator Service capability, but may invoke an end user service that may invoke the Active Operator Service capability.

A.4.2.2 Normal Procedures

A.4.2.2.1 Activation/Deactivation

Activation/Deactivation of the Active Operator Service may be done on a per switch basis.

A.4.2.2.2 Invocation and Operation

An operator service at the OSS Node determines that it should offer Active Operator Service processing for a specific operator services related call. (How the OSS Node makes this determination is beyond the scope of this description.) If an operator services related call is determined to be eligible for Active Operator Service processing, the OSS Node sends an active operator service indication to the Destination Node.

If user-network interaction is required prior to the continuation of the operator services related processing at the OSS Node, the Destination Node sends the start indication of the user-network interaction to the OSS Node. The OSS Node suspends its operator services related processing and connects the voice path between the Originating Node and the Destination Node. Upon completion of the user-network interaction, the Destination Node sends a resume indication to the OSS Node. When this indication is received or the call state changes, the OSS Node may resume its operator services related processing from the same point at which it had suspended, which may include interruption of the voice path from the Originating Node to the Destination Node.

The Destination Node may send a start indication for user-network interaction until the point in call handling that it has sent an indication that the called party has gone off-hook. After the off-hook indication has been sent, the OSS Node will ignore the request for user-network interaction and will continue the operator service.

A.4.2.3 Exceptional Procedures

A.4.2.3.1 Activation/Deactivation

None identified.

A.4.2.3.2 Invocation and Operation

If the OSS Node receives a resume indication prior to receiving a start indication of the user-network interaction, the OSS Node will ignore the resume indication and will process the call normally.

If the Destination Node receives an active operator service indication, but does not understand the indication associated with the operator services related call, the Destination Node will ignore the indication and will process the call normally.

A.4.2.4 Alternate Procedures

None identified.

A.4.2.4.1 Activation/Deactivation

None identified.

A.4.2.4.2 Invocation and Operation

None identified.

A.4.2.5 Interworking Considerations

The Active Operator Service capability will interwork with existing ISUP call set-up procedures. The Active Operator Service capability is not supported by inband signaling.

A.4.2.6 Network Capabilities for Charging

None identified.

A.4.2.7 Interactions with Supplementary Services

None identified.

A.5 Functional Capabilities and Information Flows

A.5.1 Functional Entity (FE) Model

This subclause describes a functional entity model for establishing and releasing a connection using the Active Operator Service network capability. A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. The functional entity model shown in Figure A.2 is an extension of the Establishing and Releasing a Terminating Connection for Operator Services network capability; see 5.1.

FE1 and FE2 represent Active Operator Service functional entities. FE1 may have a service functional entity co-residing with it, represented by O. The end user may or may not be directly connected to FE1. FE1 and O are contained in FE7 of the Operator Services Terminating Connection

functional entity model, see 5.1. FE2 is contained in FE9 of the Operator Services Terminating Connection functional entity model.

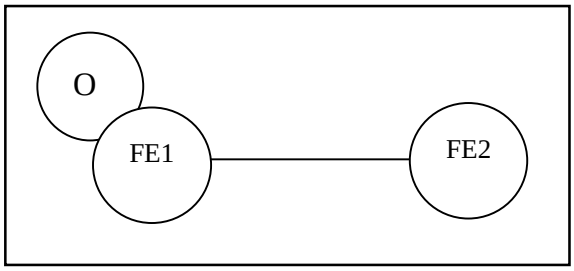


Figure A.2 - FE Model for Active Operator Service

A.5.1.1 Description of Functional Entity 1 (FE1)

FE1 can 1) send indication of the active operator service to FE2 and request O to suspend its operator services related processing, (2) connect the voice path (if the start indication of the user-network interaction is received from FE2) between the Originating Node and the Destination Node, and 3) after having received the resume indication from FE2 or when the call state changes, request O to resume operator services related processing at the same point at which O had suspended. FE1, if needed, may interrupt the voice path from the Originating Node to the Destination Node.

A.5.1.2 Description of Functional Entity 2 (FE2)

FE2, if needed, sends the start indication of the user-network interaction and the resume indication of active operator services capability to FE1.

A.5.2 Information Flow Model

Figure A.3 shows the information flow model between the functional entities for Active Operator Service capability. To invoke the Active Operator Service capability, FE1 (invoked by an operator service) sends Active Operator Service Information to FE2. Operator services related calls received at the node containing FE2 without Active Operator Service Information are not eligible for Active Operator Service capability, and normal call processing procedures will apply. After FE2 has sent an Answer Message, the call will not be eligible for Active Operator Service capability.

FE2, if needed, will send Start User-Network Information to FE1. When FE1 receives Start User-Network Information, it will suspend its operator services related processing until further notice and connect the voice path between the Originating Node and the Destination Node.

When FE1 receives the Resume Operator Services Information from FE2 or the call state changes (e.g., called party answers), it will request O to resume its operator services related processing from the same point at which O had suspended. FE1, if needed, may interrupt the voice path from the Originating Node to the Destination Node.

If FE1 or FE2 encounters an error in processing the call, standard call clearing procedures are followed.

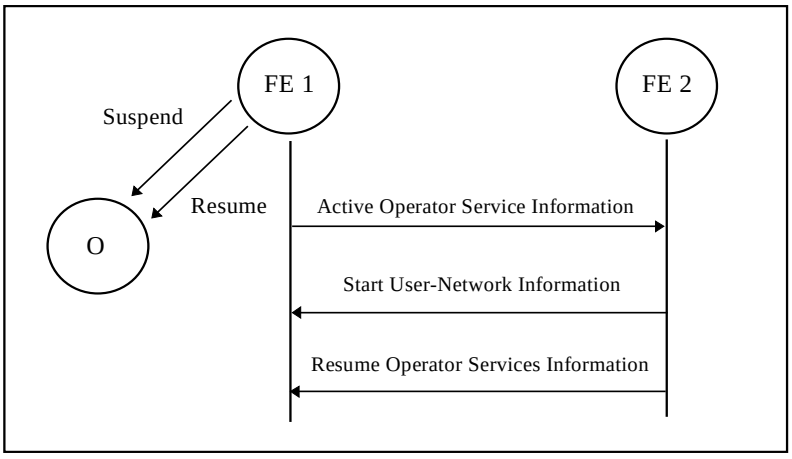


Figure A.3 - Active Operator Service Flow Diagram

A.5.2.1 Invoking Functional Entity 1

FE1 is invoked by an operator service.

A.5.2.2 Invoking Functional Entity 2

FE2 is invoked by receipt of Active Operator Service Information.

Services at the node containing FE2 may invoke FE2 functionality to send Start User-Network Information and Resume Operator Services Information.

A.5.2.3 Activation and Deactivation of Active Operator Service Network Capability

Activation and deactivation of Active Operator Service capability is done on a per node basis.

A.5.2.4 Exceptional Procedures

If FE1 receives a Resume Operator Services Information prior to receiving a Start User-Network Information, it should ignore the Resume Operator Services Information and process the call normally.

A.5.2.5 Allocation of Functions to Equipment

FE1 may reside at any OSS. FE2 may reside at any Destination Node.

A.6 Protocol and Procedures

A.6.1 Protocol and Procedural Assumptions

1. Active Operator Service may be invoked by an end user service or other network capability on a per call basis.

2. Active Operator Service involves only ISUP.

3. How an exchange makes the determination to offer Active Operator Service processing for a specific operator services related call is beyond the scope of this annex.

A.6.2 Formats of the ISUP Parameters Supporting Active Operator Service

A.6.2.1 Service Activation Parameter

The format of the Service Activation Parameter is shown in ANSI T1.113.3. The billing verification codepoint[3)] in the Service Activation Parameter is used for the Active Operator Service network capability. The coding of the billing verification and resume operator services in the Service Activation Parameter is shown below.

Feature code indicator

1000 0101 billing verification

1001 0011 resume operator services

A.6.3 Procedures for Establishing Active Operator Service

A.6.3.1 Actions at an Originating Exchange

When service processing at the OSS exchange invokes the Active Operator Service network capability, the exchange performs route selection and sends an Initial Address Message to the subsequent exchange. The Initial Address Message shall contain, in addition to existing ISUP optional parameters, the Service Activation Parameter coded to indicate the billing verification.

When an Address Complete Message or a Call Progress Message with a user-network interaction indication in the Optional Backward Call Indicators Parameter is received, the exchange shall suspend the Terminating Connection functionality and connect the transmission path in both directions.

If the billing verification has not been sent and the OSS exchange receives an Address Complete Message or a Call Progress Message with an user-network interaction indication in the Optional Backward Call Indicators Parameter, the exchange shall not suspend the Terminating Connection functionality.

When the OSS exchange receives a Call Progress Message with a resume operator services indication in the Service Activation Parameter, the exchange shall resume the Terminating Connection functionality and may interrupt the transmission path between the Originating and Terminating Connections.

When the OSS exchange receives an Answer Message or other message that changes call state, it follows the procedures specified for the originating exchange in 6.3.

A.6.3.2 Actions at an Intermediate Exchange

The procedures specified for an intermediate exchange in ANSI T1.113.4 shall apply.

A.6.3.3 Actions at the Destination Exchange

Upon receipt of the Initial Address Message, the destination exchange follows the procedures specified for a destination exchange in ANSI T1.113.4. In addition, if the Feature code indicator in the Service Activation Parameter is coded billing verification, the information is delivered to service processing at the destination exchange.

[3)] From the perspective of the Active Operator Service network capability, a separate codepoint is not required because indicating billing verification in the Service Activation Parameter is equivalent to indicating that there is an active operator service.

The destination exchange follows the procedures for returning an Address Complete Message and Call Progress Messages as specified for a destination exchange in ANSI T1.113.4. In particular, it may send a user-network interaction indication in the Optional Backward Call Indicators Parameter, if needed.

When service processing at the destination exchange determines that the user-network interaction has ended, it sends a Call Progress Message with a Service Activation Parameter coded to indicate the resume operator services.

The destination exchange follows normal ISUP procedures for signaling any change of call state.

The release procedures at the OSS exchange, intermediate exchange, and destination exchange are as specified for the originating exchange, intermediate exchange, and destination exchange in ANSI T1.113.4.

A.6.4 Specifications for Protocol Interworking

A.6.4.1 ISDN/Non-ISDN

None identified.

A.6.4.2 SS7/Non-SS7

Not supported.

A.6.4.3 SS7/DSS1

None identified.

A.6.5 Exceptional Procedures

In the event that the OSS exchange receives a resume operator services indication prior to receiving a user-network interaction indication, the exchange shall ignore the resume operator services indication.

If the OSS exchange receives user-network interaction indication in the Optional Backward Call Indicators Parameter and resume operator services indication in the Service Activation Parameter within the same Call Progress Message, while the operator services are suspended, the exchange shall apply the procedures associated with Service Activation Parameter and ignore the user-network interaction indication in the Optional Backward Call Indicators Parameter.

Section 4
Connection Hold Network Capability

Table of Contents

1 Scope, Purpose, and Application

The Connection Hold (CH) network capability disables a calling user's ability to initiate release of a connection. CH also provides a mechanism for network entities to indicate that the calling user has requested disconnect (or reconnect) without initiating release procedures.

The CH network capability is invoked by operator services. Other services may also invoke the CH network capability as needed.

When the CH network capability is invoked, the procedures for call release presented herein take precedence over standard call release procedures.

The transmission of information elements and related procedures defined in this document involve appropriate agreements between transmitting and receiving networks. These agreements are beyond the scope of this document.

This standard applies to the Integrated Service Digital Network (ISDN) User Part (ISUP) and is intended to supplement the signaling functions and call procedures described in ANSI T1.113. This standard could be used in conjunction with other American National Standards related to supplementary services and network capabilities. For a more complete understanding of the interactions between the Connection Hold network capability and other ANSI services and network capabilities, the appropriate American National Standards should be consulted.

2 Normative References

The following documents contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.113-1995, *Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*

3 Abbreviations and Definitions

3.1 Abbreviations

The following abbreviations are used in this document.

ACM Address Complete Message
ANM Answer Message
CH Connection Hold
CH1 Connection Hold functions group 1
CH2 Connection Hold functions group 2
CH3 Connection Hold functions group 3
CH4 Connection Hold functions group 4
FAC Facility Message
FE functional entity
IAM Initial Address Message
ISDN Integrated Services Digital Network
LE local exchange
REL Release Message
SAP Service Activation Parameter

SCE Service Controlling Exchange
SIE Service Initiating Exchange
SS7 Signaling System No. 7

3.2 Definitions

The generic definitions in this section have been formulated for use within this document.

3.2.1 Disconnect Request Pending: The state entered following the receipt of a user disconnect request by the network while the call is in the Network Service in Progress state. The network expects additional information from the user or the network service.

3.2.2 Network Service Complete: The state entered following the release of the network service.

3.2.3 Network Service in Progress: The state during which the network capability is active and the calling user is off-hook, also referred to as “connection hold.”

3.2.4 Network Service: The service or network capability invoking the CH network capability.

4 Description of Network Capabilities

4.1 General Description

The Connection Hold network capability disables a calling user’s ability to initiate release of a connection. CH also provides a mechanism for network entities to indicate that the calling user has requested disconnect (or reconnect) without initiating release procedures.

CH is invoked during call establishment. The calling user may subsequently attempt to disconnect (e.g., the user may go on-hook) while maintaining the call. The network service receives notification of this attempt. The network service may cause alerting at the calling user station.

Prior to release by the network service, the user may subsequently reconnect (e.g., the user may go off-hook). This action returns the user-to-network service connection to the Network Service in Progress state.

The network service may initiate release procedures at any time. Standard release procedures apply when release is initiated by the network service.

If the network service does not release the connection for a long period of time after the user attempts disconnect, and the connection remains inactive (e.g., the calling user remains on-hook), other nodes in the network may release the connection.

The network service may request termination of the CH network capability while retaining the connection.

4.2 Procedures

4.2.1 Provision/Withdrawal

A user does not subscribe to the CH network capability. It is invoked by a service or network capability provided by the network.

4.2.2 Normal Procedures

4.2.2.1 Activation/Deactivation

The CH network capability is activated/deactivated on a per-network basis.

4.2.2.2 Invocation and Operation

A user makes a call request. The network receives the call request. If network is prepared to provide CH for that call, the network may, as an option, modify the call request to indicate that CH may be applied.

A network service receiving the call request may attempt to invoke the CH network capability during call establishment. In the invocation request, the network service may request acknowledgment of the invocation. Receipt of a positive acknowledgment indicates that CH has been invoked; receipt of no acknowledgment when one was requested indicates that CH has not been invoked.

Under normal procedures once CH is invoked, no action by the calling user can cause the release of the connection between user and network service, and no network entity in the connection between the user and network service may cause release of the connection, except for the network service which initiated CH. (See 4.2.3 for exceptions.) The network service's release capabilities are unaffected, allowing it to initiate standard release procedures at any time.

Invoking CH places the connection in the Network Services In Progress state. Before CH is invoked, the user may disconnect normally. Once CH is invoked, the user may send a disconnect request to the network (e.g., the user may go on-hook). This request can be forwarded through the network, but will not cause release procedures to be initiated. Initiating a user disconnect request places the connection in the Disconnect Request Pending state.

While in the Disconnect Request Pending state, the network service which invoked CH may cause alerting at the calling user station.

While in the Disconnect Request Pending state, the network service may initiate standard release procedures. The release causes the connection to exit the Disconnect Request Pending state, and ends CH procedures.

While in the Disconnect Request Pending state, the user may send a reconnect request to the network (e.g., the user may go off-hook). Initiating a user reconnect request returns the connection to the Network Service in Progress state.

While in the Network Service in Progress or Disconnect Request Pending states, the network service may send a request to relinquish Connection Hold from the existing connection. The connection should subsequently be treated as if Connection Hold had not been invoked.

4.2.3 Exceptional Procedures

4.2.3.1 Activation/Deactivation

None identified.

4.2.3.2 Invocation and Operation

If the user has sent a disconnect request, and the network service which invoked CH does not send any pursuant message for a specified period(s) of time, nodes in the connection between the user and the network service may initiate maintenance call clearing procedures.

To prevent maintenance call clearing procedures, the network service which invoked CH must periodically send reports that the connection is active (these reports are called *active connection reports*.)

The minimum interval prior to initiating maintenance call clearing, known as the *call clearing time*, is 52 seconds. It is recommended that the timer value at the network node supporting the user-network interface be greater than the timer values at other FEs, to facilitate the localization of network faults. The recommended frequency for sending active connection reports is one every 48 seconds, with a maximum of four every 48 seconds.

4.3 Interworking Considerations

None identified.

4.4 Network Capabilities for Charging

None identified.

4.5 Interactions with Other Supplementary Services

None identified.

5 Functional Capabilities and Information Flows

5.1 Functional Entity Model

This subclause describes a functional entity model for the Connection Hold network capability. A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. Figure 1 shows the functional entity model for the Connection Hold network capability. CH4 applies only to exceptional procedures.

FE1 - FE5 represent basic service functional entities. Additional functions for the Connection Hold network capability are provided as extensions to the basic service functional entity and are divided into four groups: Connection Hold functions group 1 (CH1), Connection Hold functions group 2 (CH2), Connection Hold functions group 3 (CH3), and Connection Hold functions group 4 (CH4) as described in this clause. The service invoking the Connection Hold network capability is depicted in Figure 1, but is not defined in this document.

Whenever an optional FE is not present in the connection, an adjacent FE assumes its function.

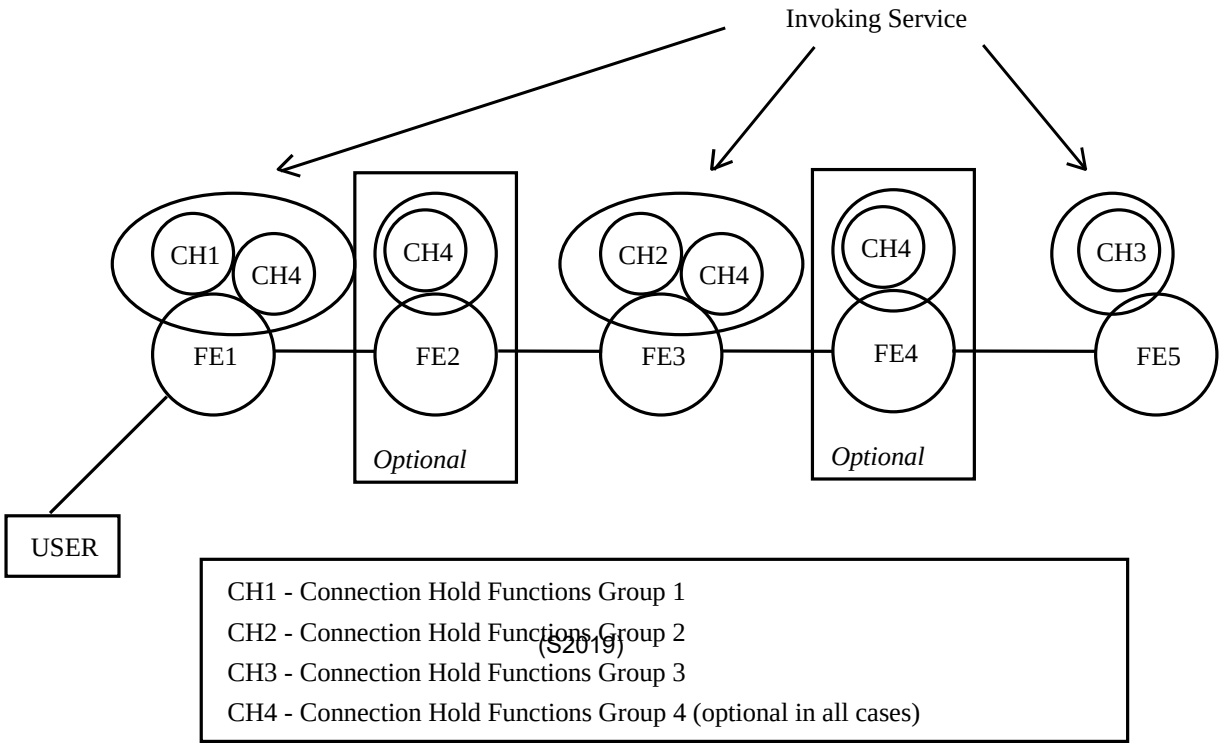


Figure 1 - Connection Hold Functional Entity Model

5.1.1 Description of Functional Entity 1 (FE1)

FE1 provides basic call control capabilities, and supports the physical termination of the user-network interface. FE1 interacts with CH1 functions: FE1 recognizes a Connection Hold request and informs CH1; FE1 recognizes disconnect and reconnect requests from the user and informs CH1. During the release of a connection, FE1 is able to initiate normal release procedures when a call disconnect request is received from the network. FE1 also recognizes a Connection Hold release request and passes this request to CH1.

FE1 also interacts with CH4 if CH4 is provided as an extension of basic service at FE1. FE1 recognizes an active connection report and informs CH4. FE1 recognizes reconnect requests or disconnect requests from the user and informs CH4. FE1 also recognizes and carries out a request from CH4 for exceptional release procedures.

5.1.2 Description of Connection Hold Functions Group 1 (CH1)

CH1 provides functions for the Connection Hold network capability as an extension of basic service. During the establishment of a connection, CH1 is able to:

- Receive a notification from FE1 that a call acknowledgment from the network contains a Connection Hold (CH) request.

- Discriminate between a CH request that expects a CH acknowledgment and a CH request that does not expect a CH acknowledgment.

- Verify that Connection Hold may be invoked on this call.

- Generate CH acknowledgment which is sent toward FE5, if a CH acknowledgment is expected.

- Receive a notification from FE1 that the user has sent a disconnect request, and when in the Network Service In Progress state, forward that request toward FE5 without initiating release procedures and enter the Disconnect Request Pending state.

- Receive a notification from FE1 that the user has sent a reconnect request, and when in the Disconnect Request Pending state, forward that request toward FE5 and return to the Network Service In Progress state.

- Receive a notification from FE1 that the network has sent a ringback request, and when in the Disconnect Request Pending state, cause alerting on the user-network interface.

- Receive a notification from FE1 that the network has sent a Connection Hold release request or Connection Hold release request, acknowledgment required, and terminate Connection Hold treatment for the applicable connection.

- Generate a CH hold release acknowledgment toward FE5 if CH release acknowledgment has been requested.

5.1.3 Description of Functional Entity 2 (FE2) and Functional Entity 4 (FE4)

The Connection Hold functional entity model builds upon basic call control functions. Basic call control functions provided by FE2 and FE4 include the ability to transfer information elements defined for the Connection Hold network capability.

FE2 and/or FE4 also interact with CH4 if CH4 is provided at the same node as either FE. FE2/FE4 recognizes that an active connection report has been received from the network, forwards that report toward FE1 and informs CH4. FE2/FE4 recognizes that a disconnect request or a reconnect request has been received from the user, forwards that request toward FE5 and informs CH4. FE2/FE4 also recognizes and carries out a request from CH4 for exceptional release procedures.

5.1.4 Description of Functional Entity 3 (FE3)

FE3 provides basic call control capabilities, and interacts with CH2 functions. FE3 recognizes that a call request from the user may result in a network request for Connection Hold, and informs CH2 of that request.

FE3 also interacts with CH4 if CH4 is provided at the same node as FE3. FE3 recognizes an active connection report from the network, forwards that report toward FE1 and informs CH4. FE3 recognizes a disconnect request or reconnect request from the user, forwards that request toward FE5 and informs CH4. FE3 also recognizes and carries out a request from CH4 for exceptional release procedures.

5.1.5 Description of Connection Hold Functions Group 2 (CH2)

CH2 provides additional functions for the Connection Hold network capability as an extension of basic service. CH2 is able to:

- Receive a notification from FE3 that a user call request which may result in a network request for Connection Hold has been received.
- Verify that Connection Hold may be invoked on this call.
- Generate Connection Hold availability information which is included in the outgoing call set-up request.

5.1.6 Description of Functional Entity 5 (FE5)

Functional Entity 5 provides basic call control capabilities and interacts with CH3. FE5 is able to:

- recognize a call request which may require that Connection Hold be invoked and inform CH3.
- send Connection Hold requests when instructed to do so by CH3.
- recognize a Connection Hold acknowledgment report and inform CH3.
- recognize a user disconnect request and inform CH3.
- send active connection reports or ringback requests when instructed to do so by CH3.
- recognize a user reconnect request and inform CH3.
- initiate standard release procedures, when instructed to do so by CH3.
- recognize a Connection Hold release request or Connection Hold release request, acknowledgment required, from CH3 and send the request toward FE1.

5.1.7 Description of Connection Hold Functions Group 3 (CH3)

CH3 provides additional functions for the Connection Hold network capability as an extension of basic service. CH3 is able to:

- Receive a notification from FE5 that a call request which may require that Connection Hold be invoked has been received.
- Determine if Connection Hold is required, and determine if an acknowledgment to that Connection Hold request is required.
- Generate a Connection Hold request, which indicates whether a Connection Hold acknowledgment is required, and which is included in the outgoing Call Acknowledgment.
- Start a timer when a Connection Hold request requiring acknowledgment is sent.
- Receive a notification from FE5 that a Connection Hold acknowledgment has been received, and recognize this notification as a successful invocation of Connection Hold.
- Recognize the expiration of the timer as an unsuccessful invocation of Connection Hold.
- Notify FE5 to initiate standard release procedures at any time in the call.

- Receive a notification from FE5 that a user disconnect request has been received and enter the Disconnect Request Pending state.[4)]

- Periodically notify FE5 to send an active connection report toward FE1 when in the Disconnect Request Pending state to maintain the connection.

- Notify FE5 to send a ringback request toward FE1 when in the Disconnect Request Pending state to cause alerting on the user-network interface.

- Receive a notification from FE5 that a user reconnect request has been received and return to the Network Service In Progress state.

- Generate a Connection Hold release request or Connection Hold release request, acknowledgment required, which indicates that a previously invoked Connection Hold state may now be released and the connection be returned to standard, non-connection hold release procedures.

- Receive a Connection Hold release acknowledgment from FE5.

5.1.8 Description of Connection Hold Functions Group 4 (CH4)

CH4 provides additional functions for the Connection Hold network capability. CH4 may support any of FE1, FE2, FE3 or FE4. CH4 is able to:

- Receive a notification from the supported FE that a disconnect request has been received from the user, and start a timer.

- Receive a notification from the supported FE that an active connection report has been received from the network, and reset and restart the timer.

- Recognize when the timer reaches a threshold value (defined in 4.2.3.2), and instruct the supported FE to begin exceptional release procedures by sending call disconnect requests in both directions on the connection.

5.1.9 Limiting Assumptions

None identified.

5.2 Information Flow Model

5.2.1 Information Flow for Invocation of CH

5.2.1.1 General

The procedures described in this subclause are depicted in Figure 2. Milestones in information flows are indicated in both the text and the figure by the "Δ" symbol.

[4)] The reaction of the invoking service or network capability to the receipt of this request is beyond the scope of this document.

5.2.1.1.1 Ascertaining CH Availability

The user generates a call request which is forwarded to FE3 (Δ1). FE3 informs CH2 of the call request.

As an option, CH2 determines whether connection hold is available (Δ2) for this call and includes CH availability information in the call request which is forwarded by FE3 toward FE5.

FE5 receives the call request and informs CH3. CH3 (under guidance of an invoked network service) determines a need for connection hold (Δ3). Connection hold procedures continue along one of the following three possible paths:

- If the Call Request contains CH availability information which indicates that CH is not available, CH3 does not request CH, and procedures related to CH end at Δ2. Subsequent procedures by CH3 are not defined in CH text.

- If the Call Request contains CH availability information which indicates that CH is available, CH3 formulates a CH request which does not request CH acknowledgment. CH3 assumes that the CH request will be honored. CH procedures continue as described in 5.2.1.1.2.

- If the Call Request does not contain CH availability information, CH3 determines whether it requires CH acknowledgment. If CH acknowledgment is required, CH3 formulates a CH Request which requests CH acknowledgment. If CH acknowledgment is not required, CH3 formulates a CH request which does not request CH acknowledgment. CH procedures continue as described in 5.2.1.1.2.

5.2.1.1.2 Requesting CH

CH3 instructs FE5 to include the formulated CH Request in the Call Acknowledgment (Δ4) which is forwarded toward FE1.

FE1 receives the CH Request and informs CH1. CH1 determines if connection hold is available.

- If connection hold is available, CH1 invokes connection hold and places the call in the Network Service in Progress state. If the CH Request indicates that a CH Acknowledgment is requested, CH1 formulates a CH Acknowledgment, and instructs FE1 to forward that CH Acknowledgment in a Report toward FE5 (Δ5).

- If connection hold is not available, CH1 does not invoke connection hold (Δ5). Procedures related to connection hold end at (Δ5). Subsequent procedures of the invoked network service are not defined in this text.

The information elements supporting CH Availability, CH Request and CH Acknowledgment are shown in 5.2.1.2, Tables 1, 2 and 3.

If CH has been invoked (i.e., if the connection has entered the Network Service in Progress state), CH release procedures should be followed as described in 5.2.2, while connection release procedures should be followed as described in 5.2.3.

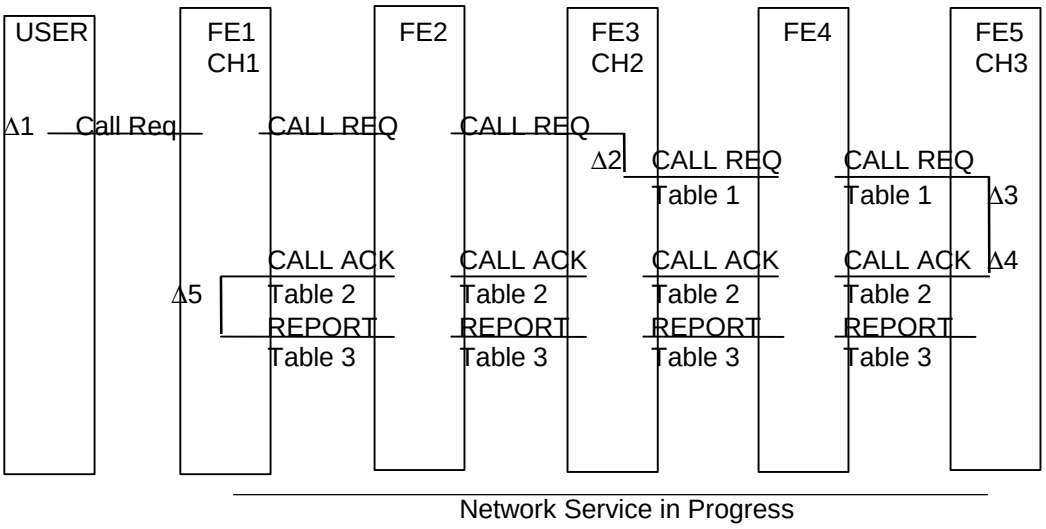


Figure 2 - Information Flow for the Invocation of Connection Hold

5.2.1.2 Information Elements

Information elements marked Required (R) are necessary for the CH network capability to operate. If the information element is not included, the Call Acknowledgment will operate as it works under basic call control.

Table 1 - Call Request Information Elements

Information Element	
CH Availability Information	O

Key:
O Optional

Table 2 - Call Acknowledgment Information Elements

Information Element	
CH Request Information	R

Key:
R Required

Table 3 - Report Information Elements

Information Element	
CH Acknowledgment Information	O

Key:
O Optional

5.2.1.2.1 CH Availability Information. Information element which indicates that connection hold is available on this connection, and will be invoked if a CH Request is received.

5.2.1.2.2 CH Request Information. Information element which indicates that connection hold has been requested on this connection, and which indicates whether an acknowledgment is expected.

5.2.1.2.3 CH Acknowledgment Information. Information element that, when requested and used, indicates that connection hold has been successfully invoked. (NOTE: no information element is sent upon unsuccessful invocation.)

5.2.2 Information Flow for Release of CH

5.2.2.1 General

The procedures described in 5.2.2.1.1 are depicted in Figure 3. In the figure, one instance of CH4 is added to FE2. The same procedures would apply in a similar manner if CH4 were added to FE1, FE3, or FE4 instead.

The network service initiates the release of CH described in 5.2.2.1.1.

5.2.2.1.1 Releasing CH

Following the successful invocation of CH (i.e., the connection has entered the Network Service in Progress state), CH3 determines that CH should be released, and also whether or not an acknowledgment is required (Δ1). If a CH release acknowledgment is required, CH3 then formulates a CH release request which requests CH release acknowledgment. If CH release acknowledgment is not required, CH3 then formulates a CH release request which does not request CH release acknowledgment.

CH3 instructs FE5 to include the formulated CH release request in a Report which is forwarded towards FE1(Δ2).

FE1 receives the CH release request and informs CH1. CH1 then determines whether or not CH is currently invoked on the connection. (Δ3).

- If CH is invoked on the connection, CH1 releases CH and places the call in the Network Service Complete state (Δ4). Optionally, if the CH release indicates that CH release acknowledgment is requested, CH1 formulates a CH release acknowledgment, and instructs FE1 to forward that CH release acknowledgment toward FE5 (Δ5). Procedures related to connection hold end at this point. Subsequent procedures of the invoked network service are not defined in this text.

- If CH is not invoked on the connection, CH1 ignores the CH disconnect request received for the connection.

See Figure 3. The information elements supporting CH release, are shown in 5.2.2.2, Table 4.

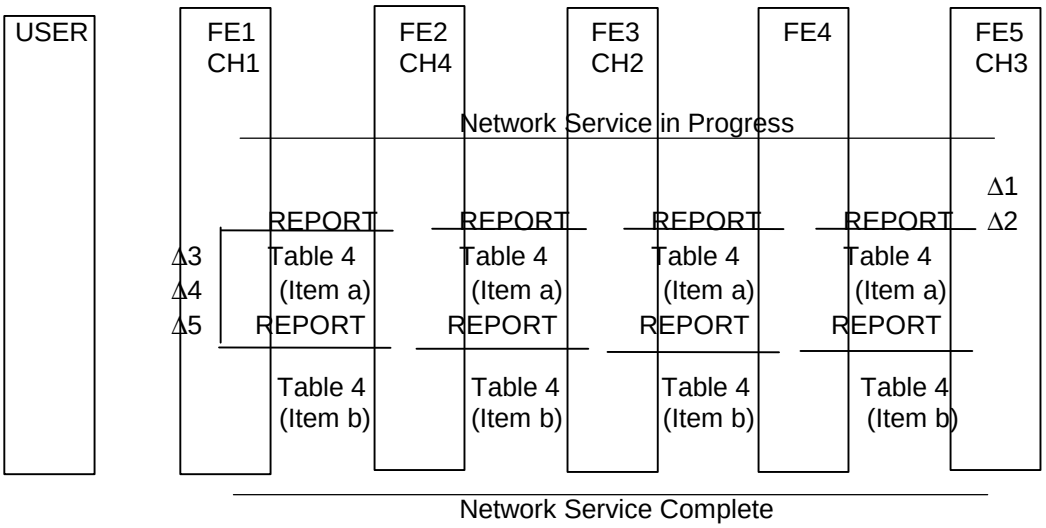


Figure 3 - Information Flow for the CH Release Request

5.2.2.2 Information Elements

Information elements marked Required (R) are necessary for the network capability to operate as described in clause 6. A Report message for this network capability should include one of the elements listed in Table 4. A Report message without any of these elements, or a Report message with more than one element, is meaningless to this network capability and will be ignored by the receiving FE.

Table 4 - Report Information Elements

Item	Information Element	
a	CH Release Information	R
b	CH Release Acknowledge Information	O

Key:
R Required
O Optional

5.2.2.2.1 CH Release Information. Information element which indicates that the network service has requested that CH be released, and which indicates whether an acknowledgment is expected.

5.2.2.2.2 CH Release Acknowledge Information. Information element which, when requested and used, indicates that CH has been released on the connection.

5.2.3 Information Flow for Release of Call Under Connection Hold

5.2.3.1 General

The procedures described in 5.2.3.1.2 are depicted in Figures 4 through 7. In each of these figures, one instance of CH4 is added to FE2. The same procedures would apply in a similar manner if CH4 were added to any of FE1, FE3, or FE4.

Either the network service or the calling user may request disconnect of the originating connection. The procedures related to each are described in 5.2.3.1.1 and 5.2.3.1.2, respectively.

5.2.3.1.1 Network Initiated Disconnect

The invoked network service requests disconnect by instructing FE5 to send a call disconnect request toward FE1. The request is always honored; standard release procedures are followed. Standard release procedures are not described in this text.

5.2.3.1.2 Calling User Initiated Disconnect

The calling user requests disconnect by sending a user disconnect request across the user-network interface to FE1.

FE1 recognizes the user disconnect request (e.g., recognizes that the user has gone on-hook) and informs CH1. If connection hold has been invoked, CH1 instructs FE1 to send a Report toward FE5 which conveys the user request (Δ1). See Figure 4. The information element appears as item a in Table 5, in 5.2.3.2. The message is forwarded to FE5. Every FE in the connection which is supported by a CH4 informs its CH4 of the user disconnect request as that request is forwarded to the next FE. CH4 starts a Call Clearing Timer when it receives notification of the user disconnect request (Δ2). Each FE enters the Disconnect Request Pending state as it forwards the request.

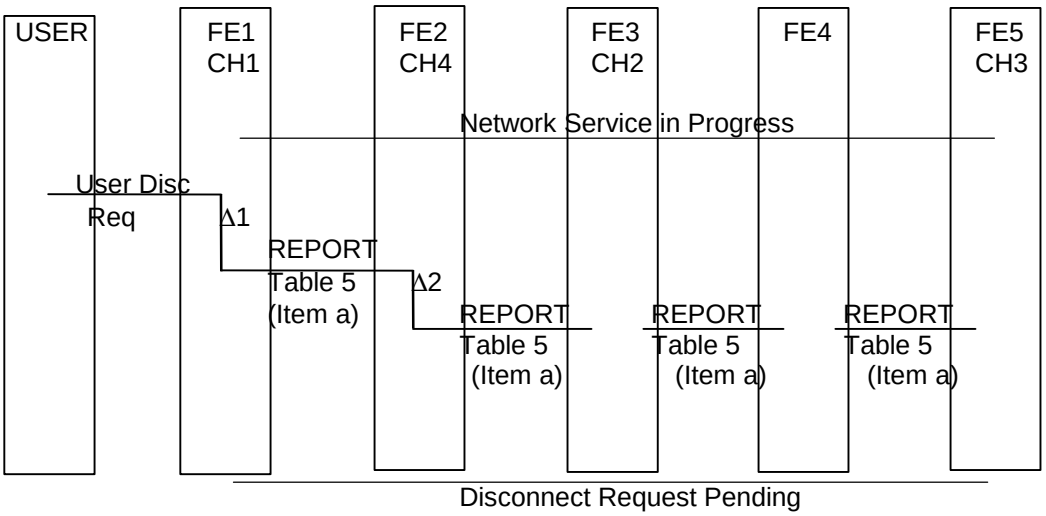


Figure 4 - Information Flow for the User Disconnect Request

CH3 may take either of the following two actions:

- Instruct FE5 to return a call disconnect request and proceed with standard call disconnect procedures for the user-to-network service connection. The network service may maintain other connections associated with the call or initiate release of the other connections, if any exist. Every FE in the connection which is supported by a CH4 informs its CH4 of the call disconnect request as that request is forwarded to the next FE, and initiates standard release procedures. CH4 cancels the Call Clearing Timer when it receives notification of the call disconnect request.

- Invoke station control network capabilities (e.g., Coin, Emergency, etc.), or formulate an active connection report which is sent by FE5 toward FE1 in a Report (Δ1). See Figure 5. The active connection report maintains the user-to-network service connection. The information element for the Report appears in 5.2.3.2, Table 5, Item b. CH3 must send the active connection report periodically to prevent the maintenance call clearing function of CH4. The timing aspects of maintenance call clearing are specified in 4.2.3.2. The network service may maintain other connections associated with the call or initiate release of the other connections, if any exist. Every FE in the connection which is supported by a CH4 informs its CH4 of the active connection report as that report is forwarded to the next FE. CH4 restarts the Call Clearing Timer when it receives notification of the active connection report (Δ2).

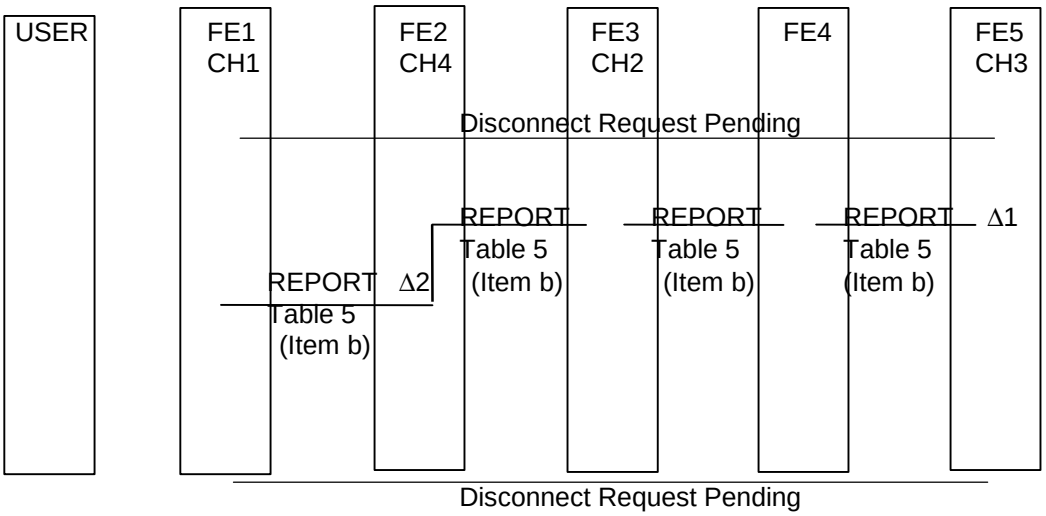


Figure 5 - Information Flow for the Active Connection Report

When in the Disconnect Request Pending state, CH3 may take either of the following two actions:

- Based on network service needs, CH3 formulates a ringback request which is included in a Report and forwarded to FE1. FE1 receives the request and informs CH1. CH1 causes alerting on the user-network interface. The connection remains in the Disconnect Request Pending state. See Figure 6. The information element for the Report appears in 5.2.3.2, Table 5, Item c.
- FE1 recognizes the user reconnect request (e.g., recognizes that the user has gone off-hook) and informs CH1. If connection hold has been invoked, CH1 instructs FE1 to send a Report toward FE5 which conveys the user request (Δ1). See Figure 7. The information element appears in Table 5, Item d of 5.2.3.2. The request is forwarded to FE5. Every FE in the connection which is supported by a CH4 informs its CH4 of the user request as that request is forwarded to the next FE. CH4 cancels the Call Clearing Timer when it receives notification of the user reconnect request (Δ2). Each FE enters the Network Service In Progress state as it forwards the request.

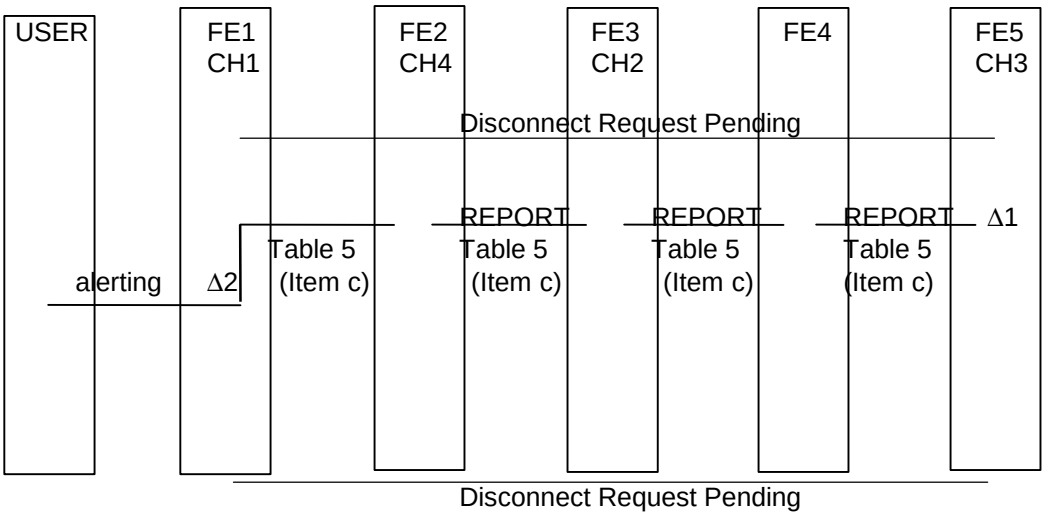


Figure 6 - Information Flow for the Ringback Request

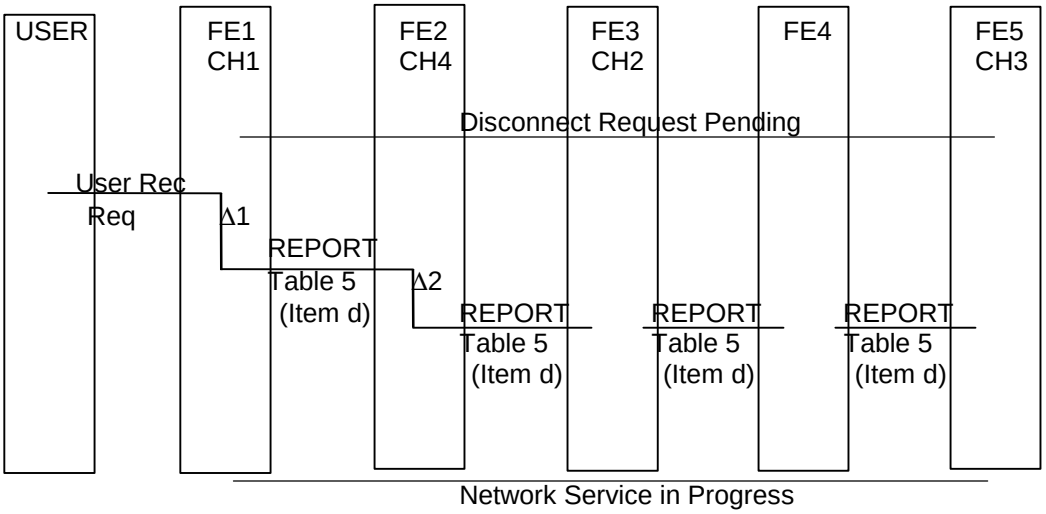


Figure 7 - Information Flow for the User Reconnect Request

5.2.3.2 Information Elements

Information elements marked Required (R) are necessary for the network capability to operate as described in the Procedures text. A Report for this network capability should include exactly one of the elements listed. A Report without any of these elements, or a Report with more than one element, is meaningless to this network capability and will be ignored by the receiving FE.

Table 5 - Report Information Elements

Item	Information Element	
a	User Disconnect Request	R
b	Active Connection Report	R
c	Ringback Request	R
d	User Reconnect Request	R

Key:
R Required

5.2.3.2.1 User Disconnect Request. Information element indicating that the user has requested disconnect (e.g., the user has gone on-hook).

5.2.3.2.2 Active Connection Report. Information element indicating that the network service invoking connection hold is maintaining that connection.

5.2.3.2.3 Ringback Request. Information element sent from the network service to the user-network interface requesting that the calling user be alerted, typically by audible ringing.

5.2.3.2.4 User Reconnect Request. Information element indicating that the user has requested reconnect (e.g., the user has gone off-hook in the Disconnect Request Pending state).

5.2.4 Exceptional Procedure Information Flow: Maintenance Call Clearing

While in the Disconnect Request Pending state, any instance of CH4 in the connection may recognize that the Maintenance Call Clearing Timer has expired (Δ1). See Figure 8. That instance of CH4 instructs the FE it supports to initiate special release procedures, by sending a call disconnect request in both directions (or in the only direction that exists) on the connection (Δ2). Upon receipt of the call disconnect request, each FE initiates standard call clearing procedures (Δ3). Figure 8 shows one instance of CH4, which is added to FE2. The same procedures would apply if CH4 were added to any or all of FE1, FE3 or FE4.

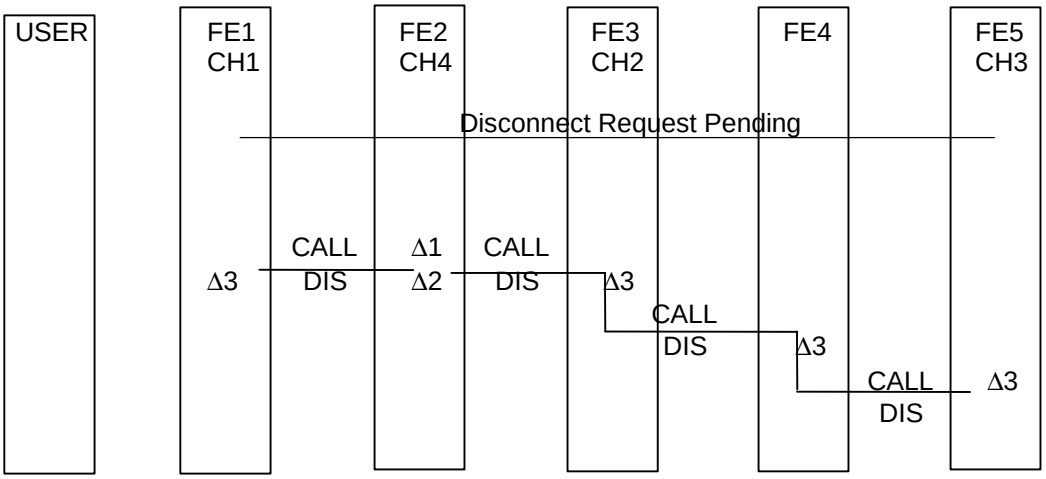


Figure 8 - Information Flow for Maintenance Call Clearing

5.3 Allocation of Functions to Equipment

Table 6 - Allocation of Functions to Equipment

FE Scenario	FE1/ CH1/ CH4	FE2/ CH4	FE3/ CH2/ CH4	FE4/ CH4	FE5/ CH3
Scenario 1	LE	-	LE	-	TR1
Scenario 2	LE	-	LE	TR1	TR2
Scenario 3	LE	TR1	TR2	-	TR3
Scenario 4	LE	TR1	TR2	TR3	TR4
Scenario 5	LE	-	LE	-	LE

KEY:
LE - Local Exchange
TR*n* - Transit Exchange *n*

6 Protocols and Procedures

6.1 Formats and codes

6.1.1 Service Activation Parameter

The format of the Service Activation parameter is shown in ANSI T1.113.3. The coding used for this service is shown below:

(1) Feature Code Indicator

10000110 hold available

10000111 hold not available

10001000 hold request

10001001	hold acknowledgment
10001010	hold release request
10001011	hold release acknowledgment
10001100	hold continuation request
10001101	disconnect request
10001110	reconnect request
10010001	hold request, acknowledgment required
10010010	hold release request, acknowledgment required
10010101	ringback request

6.2 ISDN-UP Procedures for Connection Hold

6.2.1 Indication of Connection Hold Availability

When the service initiating exchange (SIE) has received call setup information from its originating access and has determined that the call is to be routed to another exchange, the exchange selects a suitable outgoing circuit and sends an Initial Address Message to the succeeding exchange.

If the SIE determines that the Connection Hold capability may be requested from a remote exchange,[5)] and that the Connection Hold capability can be supported at the exchange for the selected outgoing circuit, the Feature Code Indicator in the Service Activation parameter (SAP) in the outgoing IAM should be coded “hold available.”

If the SIE determines that the Connection Hold capability may be requested for a service, but cannot be supported for the selected outgoing circuit, then the Feature Code Indicator in the Service Activation parameter (SAP) in the outgoing IAM should be coded “hold not available.”

If the SIE determines that the Connection Hold capability will not be requested from a remote exchange, or that the Connection Hold capability cannot be supported at the exchange for the selected outgoing circuit, then no information on connection hold availability should be included in the outgoing IAM.

If the SIE is not the originating exchange for the call connection, then Connection Hold can only be supported if the incoming circuit is in the “connection hold” state. The Feature Code Indicator of the SAP parameter is coded “hold available” if the incoming connection is in the “connection hold” state, and “hold not available” if the incoming connection is not in the “connection hold” state.

6.2.2 Establishment of Connection Hold

6.2.2.1 Request for Connection Hold at the Service Controlling Exchange

When the service controlling exchange (SCE) receives the IAM, it may invoke one or more applications that may require the Connection Hold capability. If Connection Hold is required for the call, the SAP received in the incoming IAM is examined. Unless the Feature Code Indicator of the SAP received is coded “hold not available,” the SCE may request Connection Hold for the incoming

———

[5)] Such calls that may subsequently require hold include, but are not limited to, operator services calls (see ANSI T1.666.1) and emergency calls.

connection.[6] If the SAP with the Feature Code Indicator coded “hold not available” has been received in the IAM, then the SCE should not request Connection Hold.

If the application requesting Connection Hold requires an acknowledgment, then the Service Activation parameter coded “hold request, acknowledgment required” is included in the Address Complete Message (ACM) if no ACM has previously been sent, or the FACility Message (FAC) if an ACM has already been sent for the incoming circuit. If the application does not require an acknowledgment, then the Service Activation parameter coded “hold request” is included in the ACM if no ACM has previously been sent, or the FAC if an ACM has already been sent for the incoming circuit.

If Connection Hold with acknowledgment is requested, the SCE should then initiate timer T_{hold} and wait for the acknowledgment from the SIE. If a FAC with Service Activation parameter indicating “hold acknowledgment” is received before the expiration of T_{hold}, the SCE should place the incoming circuit in the “connection hold” state and cancel timer T_{hold}. If T_{hold} expires before the receipt of “hold acknowledgment”, then the request should be regarded as unsuccessful.[7)] If Connection Hold with no acknowledgment is requested, the SCE should place the incoming circuit in the “connection hold” state immediately after sending the connection hold request.

6.2.2.2 Receipt of Connection Hold Request at the Service Initiating Exchange

After an IAM is sent to the succeeding exchange, if the SIE receives the Service Activation parameter coded “hold request, acknowledgment required” or “hold request” in the ACM or the FAC, the SIE should determine whether Connection Hold can be established for the call. Connection Hold can be established if:[8)]

– the SIE is capable of supporting Connection Hold for the call

– the SIE had not previously sent a SAP with the Feature Code Indicator coded “hold not available” in the IAM of the current service request, and

– if the SIE is not the originating exchange for the call connection, the incoming circuit is already in the “connection hold” state

If Connection Hold can be established for the call, the exchange should place the outgoing circuit in the “connection hold” state. In addition, if the Service Activation parameter coded “hold request, acknowledgment required” was received, the SIE should send a FAC with the Service Activation parameter coded “hold acknowledgment.”

[6)] Subsequent procedures taken by the SCE are a function of the service using Connection Hold, and are outside the scope of the description for this capability.

[7)] Subsequent procedures taken by the SCE are a function of the service requesting Connection Hold, and are outside the scope of the description for this capability.

[8)] For internetwork calls, agreements among interconnecting networks may be required to establish the Connection Hold Capability across an internetwork interface.

6.2.2.3 Request for Release of Connection Hold at the Service Controlling Exchange

If the incoming circuit for the call connection at the SCE is in the “connection hold” state, and if the service at the SCE determines that the Connection Hold should be released, then the SCE sends the Service Activation parameter coded “hold release request,” or “hold release request, acknowledgment required.” The Service Activation parameter should be carried in a call control message if one is available (e.g., ANM), or in the FAC, if one is not available.

6.2.2.4 Acknowledgment of Connection Hold Release Request at the Service Initiating Exchange

If the outgoing circuit for the call connection at the SIE is in the “connection hold” state, if the SIE receives the Service Activation parameter coded “hold release request” or “hold release request, acknowledgment required,” in a call control message or an FAC, then the exchange should remove the outgoing circuit from the “connection hold” state. In addition, the SIE may optionally send an FAC with the Service Activation parameter coded “hold release acknowledgment.”

If the SIE is not the originating exchange for the call connection, the SIE should also initiate the release of Connection Hold for the incoming circuit as specified in 6.2.3.

6.2.3 Release of Call Connection with Connection Hold

Release of the connection between an SIE and the SCE begins when either: (a) the SIE detects a user disconnect request over the originating access (e.g., on-hook); or (b) the SCE, based on the applications’ needs, sends a Release Message (REL) toward the preceding exchange.

6.2.3.1 Release Initiated by the Calling Party

6.2.3.1.1 Action at the Service Initiating Exchange

When the SIE recognizes a user disconnect request over the originating access (e.g., on-hook from the calling party or FAC with Service Activation parameter coded “disconnect request” from the preceding exchange), while in the “connection hold” state for the outgoing circuit connection, the SIE sends an FAC with the Service Activation parameter coded “disconnect request” to the succeeding exchange, places the outgoing circuit in the Disconnect Request Pending state, and starts timer T_{dis}. Neither the originating access connection nor the outgoing circuit connection are released at the SIE upon the receipt of a user disconnect request when in the “connection hold” state.

After sending the FAC for the outgoing circuit, the SIE waits for the FAC or REL for the outgoing circuit, the expiration of the timer T_{dis}, or a reconnect request from the originating access.

1. If the SIE receives an REL for the outgoing circuit, then the exchange should release both the outgoing circuit and the originating access, cancel timer T_{dis}, and send an RLC for the outgoing circuit.

2. If the SIE receives an FAC for the outgoing circuit, then the exchange should examine its contents. If the FAC received contains a Service Activation parameter coded “hold continuation request,” then the timer T_{dis} should be reset and restarted.

   If the SIE is an intermediate exchange for the call, the SIE should also propagate the FAC with the Service Activation parameter coded “hold continuation request” to maintain the incoming connection.

3. If a reconnect request is received from the originating access (e.g., off-hook from the calling party or FAC with Service Activation parameter coded “reconnect request” from the preceding exchange), then the SIE should send an FAC with Service Activation parameter coded “reconnect request” to the succeeding exchange. Timer T_{dis} should be canceled. The outgoing circuit is placed in the “connection hold” state.

   If the SIE is an intermediate exchange for the call, the SIE should also place the incoming connection in the “connection hold” state.

4. If timer T_{dis} expires, an REL is sent for the outgoing circuit. The REL contains the cause value “normal -unspecified.” Both the originating access and the outgoing circuits are released.

6.2.3.1.2 Action at the Service Controlling Exchange

If the SCE receives an FAC with the Service Activation parameter coded “disconnect request,” while the incoming circuit connection is in the Connection Hold state, then the SCE should place the incoming circuit in the Disconnect Request Pending state. One of the following procedures is selected, based on the applications’ needs:

1. The SCE sends an REL for the incoming circuit and waits for an RLC. The REL should contain the cause value “normal clearing.”

2. The SCE sends an FAC with the Service Activation parameter coded “hold continuation request” to maintain the incoming connection. If the SCE receives an FAC with the Service Activation parameter coded “reconnect request” after receiving the user disconnect request but before sending an REL for the incoming circuit, then the incoming circuit at the SCE should be placed back in the “Connection Hold” state. If the “reconnect request” is received after sending an REL for the incoming circuit, the reconnect request should be discarded.

If the SCE receives an REL for the incoming circuit, it should follow the normal call release procedures specified in ANSI T1.113.4 for the incoming connection.

6.2.3.2 Release Initiated by the Service Controlling Exchange

If the SCE determines that the incoming connection should be released, it should initiate the normal call release procedures specified in ANSI T1.113.4 for the incoming connection.

6.2.4 Ringback Capability

6.2.4.1 Request for Ringback Capability at the Service Controlling Exchange

While in the Disconnect Request Pending state, the SCE may request ringback procedures to be invoked at the originating exchange. If the application determines that ringback procedures should be invoked, then the SCE should send a Service Activation parameter coded “ringback request” in the FAC towards the SIE. The incoming circuit should remain in the Disconnect Request Pending state. No acknowledgment procedures are defined for the ringback capability.

6.2.4.2 Receipt of Ringback Request at the Service Initiating Exchange

If the SIE receives an FAC with Service Activation parameter coded “ringback request” for the outgoing circuit during the Disconnect Request Pending state and if the SIE is the originating exchange for the call connection, then the SIE should invoke the ringback procedures for the originating access. If the SIE is not the originating exchange for the call connection, then the SIE should relay the ringback request to the incoming circuit.

Both the incoming and outgoing circuit should remain in the Disconnect Request Pending state. No acknowledgment procedures are defined for the ringback capability.

6.2.5 Error Handling Procedures

None identified.

Section 5
Coin Station Control Network Capability

Table of Contents

1 Scope, Purpose, and Application

The coin station control network capability enables network services to request actions related to the collection and return of coins and to the activation and deactivation of fraud prevention mechanisms.

The coin station control network capability is invoked by operator services. Other services may also invoke the capability as needed.

The transmission of information elements and related procedures defined in this document involve appropriate agreements between transmitting and receiving networks. These agreements are beyond the scope of this document.

This standard applies to the Integrated Service Digital Network (ISDN) User Part (ISUP) and is intended to supplement the signaling functions and call procedures described in ANSI T1.113. This standard could be used in conjunction with other American National Standards related to supplementary services and network capabilities. For a more complete understanding of the interactions between the Coin Station Control network capability and other American National Standards services and network capabilities, the appropriate ANSI Standards should be consulted.

2 Normative References

The following documents contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.113-1995, *Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*

3 Abbreviations and Definitions

3.1 Abbreviations

The following abbreviations are used in this document.

ACM Address Complete Message
ANM Answer Message
CC coin collect
CR coin return
CFE coin station control functional entities
FAC Facility Message
FE functional entity
IAM Initial Address Message
ISDN Integrated Services Digital Network
LE local exchange
NSA network service attached
NSR network service released
NT network termination
REL Release Message
SAP Service Activation Parameter
SCE Service Controlling Exchange
SIE Service Initiating Exchange

SS7 Signaling System No. 7

3.2 Definitions

The generic definitions in this subclause have been formulated for use within this document.

3.2.1 Coin Station: A user station from which a calling user can pay for a call using coins. Coin stations can accept network requests to collect and return coins, and to apply and remove coin deposit tone security procedures. Coin stations can also transmit inband tones to indicate coin deposit amounts. Stations that accept coins but are not controlled by coin control signals from the network are not covered by this capability.

3.2.2 Operator Services: A set of services including toll and assistance services, listing services and intercept services which makes use of the coin station control network capability.

3.2.3 User: A “person” who interacts with an operator service in the network.

3.2.4 User Station: Equipment with which a user accesses the network.

4 Description of Network Capabilities

4.1 General Description

The coin station control network capability is used in conjunction with coin line-class-of-service to control actions at the coin station.

4.2 Procedures

4.2.1 Provision/withdrawal

A user does not subscribe to the coin station control network capability. The coin station control network capability is invokable on calls identified by the network as originating from a coin station. Detailed procedures to determine whether a call has originated from a coin station are outside the scope of this document.

4.2.2 Normal Procedures

4.2.2.1 Activation/Deactivation

The coin station control network capability is activated/deactivated on a per-network basis.

4.2.2.2 Invocation and Operation

The coin station control network capability may be invoked during any phase of the call. Depending on information received from a network service, the coin control network capability initiates the transfer of the appropriate coin station control request(s) (see 5.2.1.2) toward the coin station. These requests may be sent independent of, or in association with, other call control information.

4.2.3 Exceptional Procedures

4.2.3.1 Activation/Deactivation

None identified.

4.2.3.2 Invocation and Operation

None identified.

4.2.4 Alternate Procedures

None identified.

4.3 Interworking Considerations

None identified.

4.4 Network Capabilities for Charging

None identified.

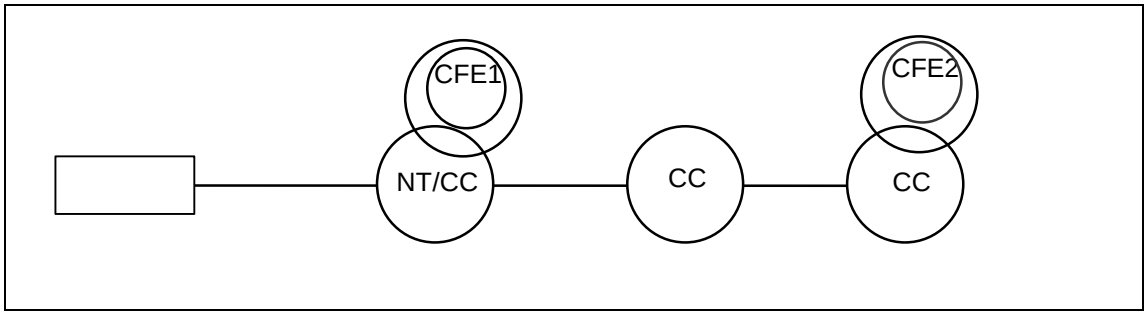
4.5 Interactions with Supplementary Services and Other Network Capabilities

None identified.

5 Functional Capabilities and Information Flows

5.1 Functional Entity Model

This subclause describes a functional entity model for the coin station control network capability. A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. Figure 1 depicts the FE model for the Coin Station Control network capability, which includes Coin Station Control Functional Entities (CFEs), basic Call Control functional entities (CC), and a Network Termination/Call Control functional entity (NT/CC). CFEs are provided as an extension to the basic call control functional entities (CC and NT/CC) and are divided into two groups: CFE1 and CFE2 as described in this subclause.



KEY:
CC - Call Control (see 5.1.1)
NT - Network Termination (see 5.1.2)
CFE - Coin Station Control FEs (see 5.1.3 - 5.1.4 for CFE1-CFE2, respectively.

Figure 1 - Functional Call Model

5.1.1 Description of Call Control Functional Entities (CC)

The CFE model builds upon basic call control (CC) functions. It is assumed that CC functions include the ability to transfer the information elements defined for the CFE model.

5.1.2 Description of Network Termination Functional Entity (NT/CC)

NT/CC terminates the user-network interface and provides basic call control functions.

5.1.3 Description of Coin Station Control Functional Entity 1 (CFE1)

CFE1 is co-located with the termination of the served station's user-network interface. CFE1 is able to recognize a coin station control request (based on service needs) and transfer that request across the user-network interface. However, the detailed procedures for the user-network interface are outside the scope of this network capability.

5.1.4 Description of Coin Station Control Functional Entity 2 (CFE2)

CFE2 is co-located with the network access to a service invoking coin station control. CFE2 is able to:

- During and after call establishment, formulate coin station control requests based on network service needs, and forward those requests to CFE1.
- Maintain information on the current state of the coin station.

5.1.5 Limiting Assumptions

None identified.

5.2 Information Flow Model

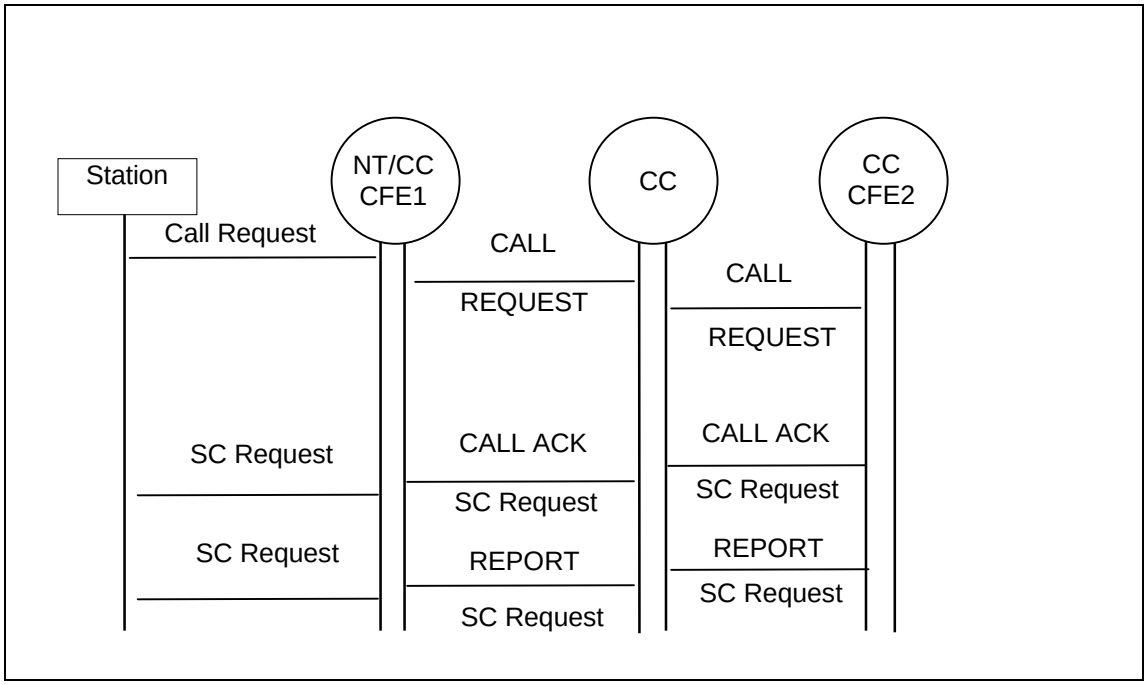
5.2.1 Coin Station Control Information Flows

5.2.1.1 General

A call request from the user is forwarded to a network service access point co-located with CFE2. That network service recognizes the call request and formulates a call acknowledgment to the call request.

If the call request was received across a user-network interface with a coin line-class-of-service, CFE2 may send coin station control requests to CFE1. CFE1 receives these requests and either invokes the requests or transmits the requests to the coin station. The requests are performed in the order they are received.

Coin station control requests may be included in a Call Acknowledment message. The requests may also be sent in a Report message at any point in the call. The information elements for Coin Station Control Requests are described in 5.2.1.2. See Figure 2.



Key:
SC - Station Control

Figure 2 - Information Flow for Station Control Requests within Call Model

5.2.1.2 Information Elements

The information element in Table 1 is necessary for the network capability to operate as described in clause 6. A report message for this network capability should include the element listed in Table 1. A report message without this element, or a report message with more than one element, is meaningless to this network capability and will be ignored by the receiving FE. The information element may contain multiple values for coin station control requests.

Table 1 - Call Acknowledgment/Report Information Element

Information Element	
Coin Station Control Request Info	R

Key:
R Required

5.2.1.2.1 Coin Station Control Request Information. Information element containing one or more of the requests listed in Table 2 and described in 5.2.1.2.1.1 through 5.2.1.2.1.4.

Table 2 - Values for the Coin Station Control Request Info Element

Value
Network-Service-Attached
Coin-Collect
Coin-Return
Network-Service-Released

5.2.1.2.1.1 Network-Service-Attached (NSA). Information sent from the network to the user-network interface requesting that the calling user's coin station enter a mode that (a) enables the coin totalizer (i.e., the coin detection unit) to transmit coin deposit signals to the operator services exchange as coin deposits are made and (b) enables coin-signal security procedures.

5.2.1.2.1.2 Coin Collect. Information sent from the network to the user-network interface requesting that the calling user's coin station collect coins.

5.2.1.2.1.3 Coin-Return. Information sent from the network to the user-network interface requesting that the calling user's coin station return coins.

5.2.1.2.1.4 Network-Service-Released (NSR). Information sent from the network to the user-network interface, requesting that the calling user's coin station place the user voice-band communications channel and the coin totalizer in the user communication mode (i.e., to remove coin-signal security procedures).

5.3 Allocation of Functions to Equipment

Table 3 - Allocation of Functions to Equipment

FE Scenario	(NT/CC)/CFE1	CC	CC/ CFE2
Scenario 1	LE	-	LE
Scenario 2	LE	LE	TR1
Scenario 3	LE	TR1	TR2

KEY:
LE - Local Exchange
TR*n* - Transit Exchange *n*

5.4 Example of Coin Control Functional Entity Procedures

This subclause provides a generalized example of the procedures used between CFE2 and CFE1 to provide coin services. This example is provided for illustrative purposes only.

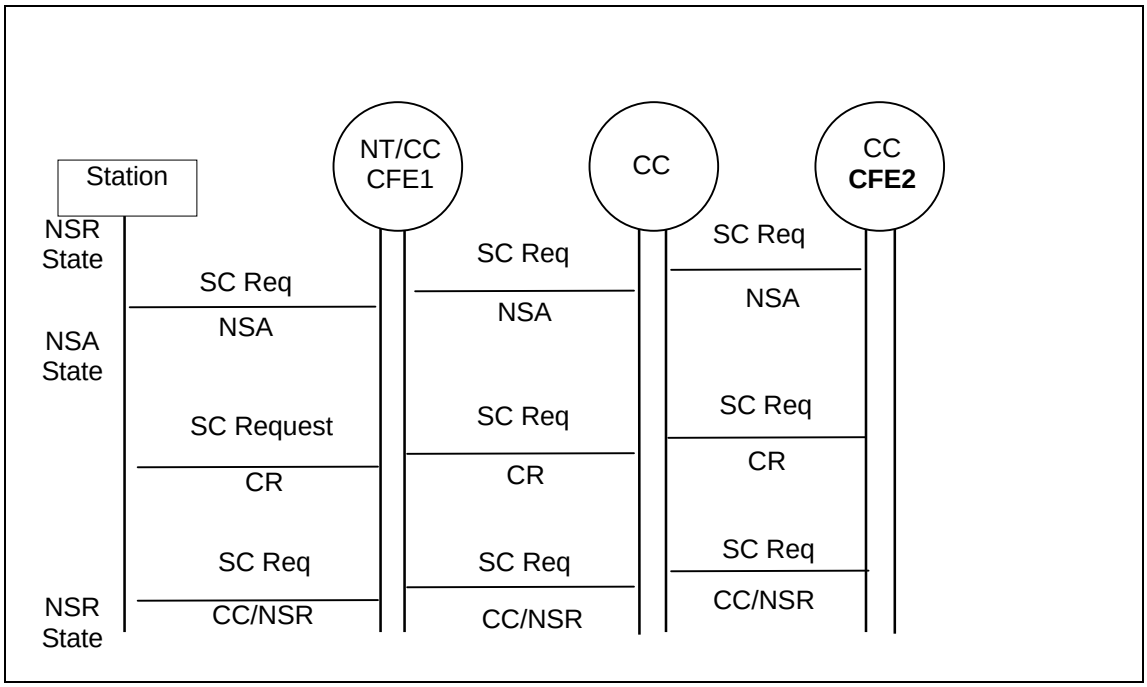
When the call is first established, CFE2 may or may not request an initial deposit. If CFE2 is not initially requesting a deposit, CFE2 sends the Coin-Return Request, followed by the Network-Service-Released Request as its first two Station Control requests. At any time later in the call, the network service may initiate a billing transaction, as described in the next paragraph. If CFE2 is initially requesting a deposit, CFE2 sends a Coin-Return Request, followed by a billing transaction.

Figure 3 is an example of a billing transaction, which is made up of Coin Station Control Requests.

- CFE2 sends a Network-Service-Attached request to place the coin station in the NSA state.
- When the coin station enters the NSA state, it invokes deposit tone fraud prevention procedures. Once the coin station is in the NSA state, CFE2 may transmit Coin-Collect, or Coin Return, Network-Service-Released, or Coin-Return/Network-Service-Released requests, without causing a change in call state. The coin station may transmit coin deposit tones in the transmission channel to CFE2. If CFE2 sends the Network-Service-Attached request when the coin station is in the NSA state, the request has no effect.
- CFE2 ends a transaction with the calling user by sending either a Network-Service-Released, Coin Return/Network-Service-Released, or Coin-Collect/Network-Service-Released request. Any of these requests places the coin station in the NSR state. If the coin station is in the NSR state, CFE2 may send a Network-Service-Attached request to begin another billing transaction with the calling party. In the NSR state, the coin station does not transmit coin deposit tones, and disables deposit tone fraud prevention procedures, allowing the user to signal using the dual-tone multifrequency keypad, if one exists. In the NSR state, NSR has no effect, and the effect of other Coin Station Requests is implementation dependent.

At the end of a call which contained no billing transactions, CFE2 sends a Coin-Return request.

Table 4 summarizes the actions taken by CFE1 on receipt of these requests.



KEY:
NSA - Network-Service-Attached
CC - Coin- Collect
CR - Coin-Return
CC/NSR - Coin-Collect and Network-Service-Released

Figure 3 - Example Information Flow for a Billing Transaction

Table 4 - Actions taken by CFE1 on Receipt of Coin Station Control Requests

Request	**Places CFE1 in:**	**Actions when CFE1 receives request in NSA state:**	**Action when CFE1 receives request in NSR state:**
Network Service Attached (NSA)	NSA State	None	NT/CC/station disable DTMF pad, enable transmission of coin deposit tones
Coin Collect (CC)	-	NT/CC causes station to collect coins from hopper into coin box	Implementation dependent
Coin Return (CR)	-	NT/CC causes station to return coins from hopper	Implementation dependent
Network Service Released (NSR)	NSR State	NT/CC/station enable DTMF pad, disable transmission of coin deposit tones	None

6 Protocols and Procedures

6.1 Formats and codes

6.1.1 Parameters for the Coin Station Control Network Capability

Table 5 - Parameters Corresponding to Elements Found in Table 1

Information Element	Parameter (/Indicator)	Msg	Coding	Include.	Trigger
Station Control Request	Service Activation	ACM, FAC	6.2	R	OS

Key:
NC - No Changes
OS - Operator Services Call Identified, as described in State 1 and 2 text
R - Required for proper service operation.

6.1.2 Coding of Service Activation Parameter

The following SAP Feature Code Indicators are assigned :

1000 0000 Network Service Attached
1000 0001 Network Service Released
1000 0010 Coin Collect
1000 0011 Coin Return

6.2 ISDN-UP Procedures for the Coin Station Control Network Capability

The Coin Station Control network capability allows a Service Controlling Exchange to change the state of the Call Originating Exchange and/or cause actions to occur at a calling party's coin station.

6.2.1 Conditions for Operation

The Coin Station Control Network Capability operates over a connection between a Service Initiating Exchange (SIE) and a Service Controlling Exchange (SCE). The connection hold network capability will typically be invoked on the connection between the SIE and SCE before coin station control requests will be honored by the SIE. The calling party's user-network interface must have a coin line-class-of-service.

6.2.2 Procedures for Coin Station Control Requests

6.2.2.1 Actions at the Service Controlling Exchange

As needed by the service at the SCE, the SCE will encode coin station control requests in the Service Activation Parameter (SAP) (see 6.1.2). The SAP may be included in the Address Complete Message (ACM) or in a FACility (FAC) message. More than one coin station control request may be included in a given message. The SCE will encode multiple coin station control requests in one SAP in the order they are to be executed, with the first request to be executed appearing in the lowest-numbered octet.

6.2.2.2 Actions at the Service Initiating Exchange

The SIE will execute the coin station control requests in the order they are received, starting with the request appearing in the lowest-numbered octet. An example of the execution of coin station control requests appears in 5.4.

Section 6
Network Service Recall Network Capability

Table of Contents

1 Scope, Purpose, and Application

The Network Service Recall network capability allows the calling user to send a request for the attention of an active network service (generally by flashing the switch-hook).

The Network Service Recall network capability is invoked by users on operator services calls. Other services may also make use of the capability as needed.

The transmission of information elements and related procedures defined in this document involve appropriate agreements between transmitting and receiving networks. These agreements are beyond the scope of this document.

This standard applies to the Integrated Service Digital Network (ISDN) User Part (ISUP) and is intended to supplement the signaling functions and call procedures described in ANSI T1.113. This standard could be used in conjunction with other American National Standards related to supplementary services and network capabilities. For a more complete understanding of the interactions between the Network Service Recall network capability and other American National Standards and network capabilities, the appropriate American National Standards should be consulted.

2 Normative References

The following documents contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.113-1995, *Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part*

3 Abbreviations and Definitions

3.1 Abbreviations

The following abbreviations are used in this document.

ACM Address Complete Message
ANM Answer Message
CC call control
FAC Facility Message
FE functional entity
IAM Initial Address Message
ISDN Integrated Services Digital Network
LE local exchange
NSRR network service recall request
NT network termination
REL Release Message
RFE network recall functional entity
SAP Service Activation Parameter
SCE Service Controlling Exchange
SIE Service Initiating Exchange
SS7 Signalling System No. 7

3.2 Definitions

The generic definitions in this subclause have been formulated for use within this document.

3.3.1 Network Service in Progress state: The state during which the network capability is active.

3.2.2 Operator Services: A set of services including toll and assistance services, listing services and intercept services which makes use of the network service recall network capability.

3.3.3 User: A person who interacts with an operator service.

4 Description of Network Capabilities

4.1 General Description

On a connection between a user and a network service, the user may send network service recall, or an equivalent indication across the user-network interface. The network receives the indication, determines the network service to which the calling user recall applies, and forwards an indication of the recall to the network service.

On a connection between two network services, one service may forward network service recall to the other service in the connection.

Reaction to the network service recall request is dictated by the needs of the network service receiving the request.

4.2 Procedures

4.2.1 Provision/Withdrawal

A user does not subscribe to the network service recall network capability. The network service recall network capability is invokable on calls having made use of a network service.

4.2.2 Normal Procedures

4.2.2.1 Activation/Deactivation

The network service recall network capability is activated/deactivated on a per-network basis.

4.2.2.2 Invocation and Operation

After call establishment, the calling user sends the network a network service recall request. The network receives the request, determines the network service to which the recall applies, and forwards the request to the network service.

Reaction to the network service recall request is dictated by the needs of the network service.

4.2.3 Exceptional Procedures

None identified.

4.3 Interworking Considerations

None identified.

4.4 Network Capabilities for Charging

None identified.

4.5 Interactions with Other Supplementary Services

None identified.

5 Functional Capabilities and Information Flows

5.1 Functional Entity Model

This subclause describes a functional entity model for the network service recall network capability. A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. Figures 1a and 1b depict the FE model for the Network Service Recall network capability (the RFE model). Network Recall Functional Entities (RFEs) are provided as an extension to the basic call control functional entities (CC and NT/CC) and are divided into two groups: RFE1 and RFE2 as described in this subclause.

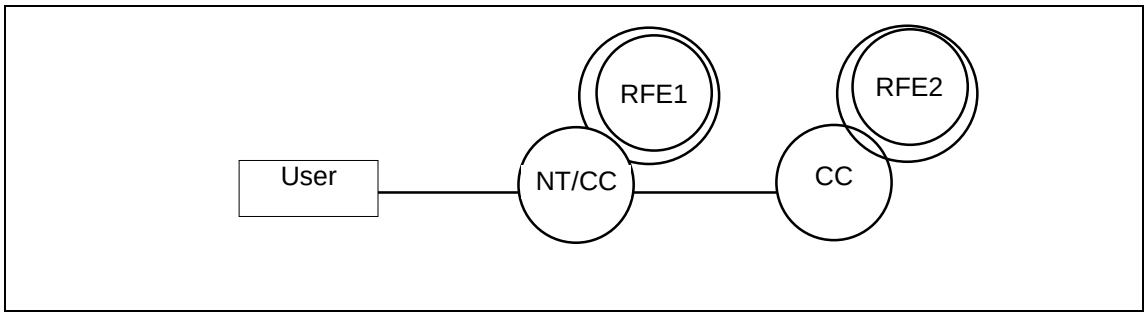


Figure 1a - Recall Functional Entity Model (User-Initiated Recall)

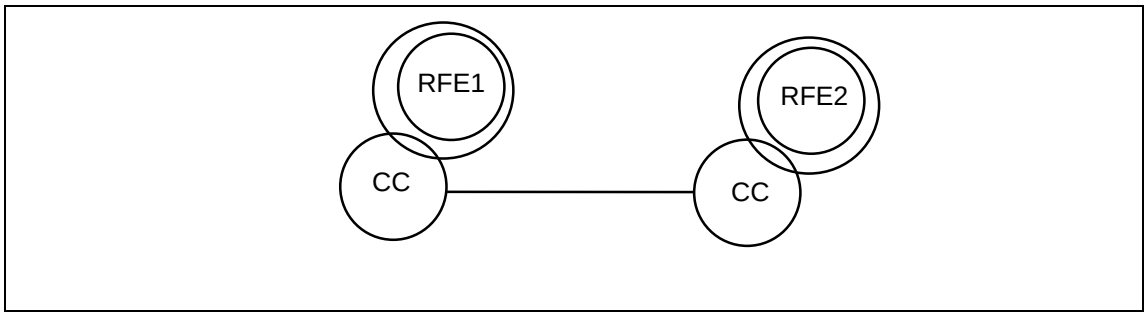


Figure 1b - Recall Functional Entity Model (Service-Initiated Recall)

KEY:
CC - Call Control (see 5.1.1)
NT - Network Termination (see 5.1.2)
RFE - Network Service Recall FEs (see 5.1.3 - 5.1.4 for RFE1-RFE2, respectively).

5.1.1 Description of Call Control Functional Entities (CC)

The RFE model builds upon basic call control (CC) functions. It is assumed that CC functions include the ability to transfer the information elements defined for the RFE model.

5.1.2 Description of Network Termination Functional Entity (NT/CC)

NT/CC terminates the user-network interface and provides basic call control functions.

5.1.3 Description of Network Service Recall Functional Entity 1 (RFE1)

RFE1 is co-located with the termination of the served user's user-network interface, or with a network service. RFE1 is able to:

- Recognize a network service recall request received from the user or the network service, after a connection to a network service has been established
- Forward that network service recall request in a Report message to RFE2.

5.1.4 Description of Network Service Recall Functional Entity 2 (RFE2)

RFE2 is co-located with the network access to a network service capable of receiving a network service recall request. RFE2 is able to:

- Recognize a network service recall request received via CC from RFE1.

5.1.5 Limiting Assumptions

None identified.

5.2 Information Flow Model

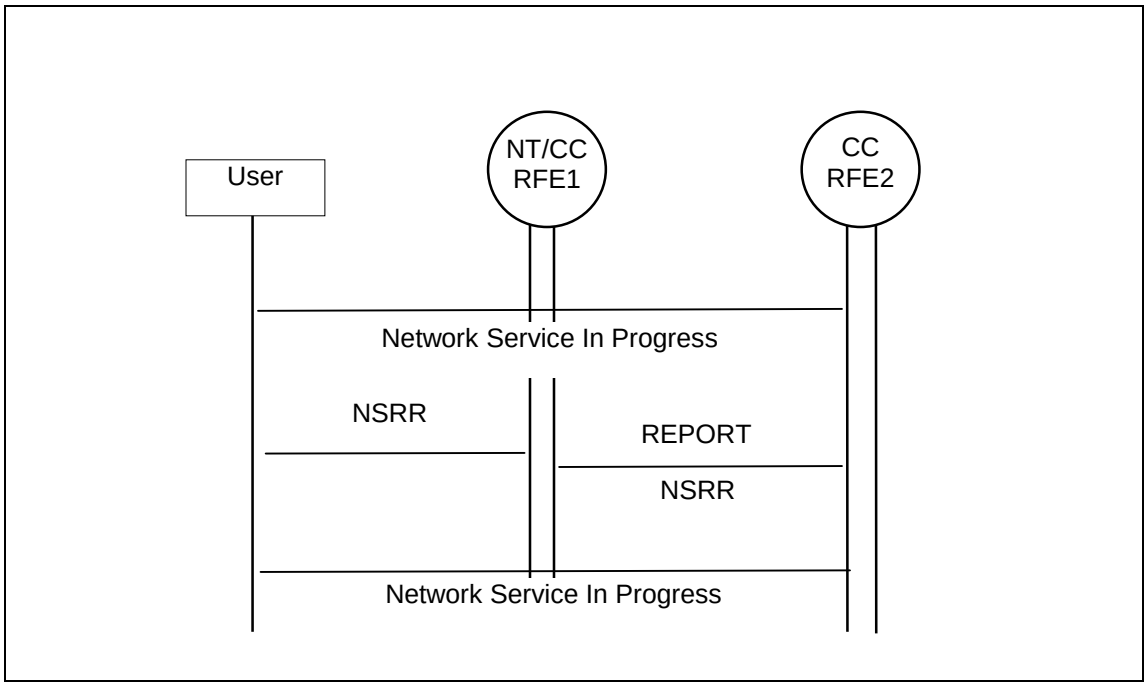
5.2.1 Network Service Recall Information Flows

5.2.1.1 General

5.2.1.1.1 User-Initiated Recall

After the user establishes a connection to a network service, the connection enters the Network Service In Progress State.

In this state, the user transmits a network service recall request to NT. RFE1 recognizes the request received by NT, and forwards the request in a Report message. See Figure 2. The information element associated with the Report appears in 5.2.1.2, Table 1.



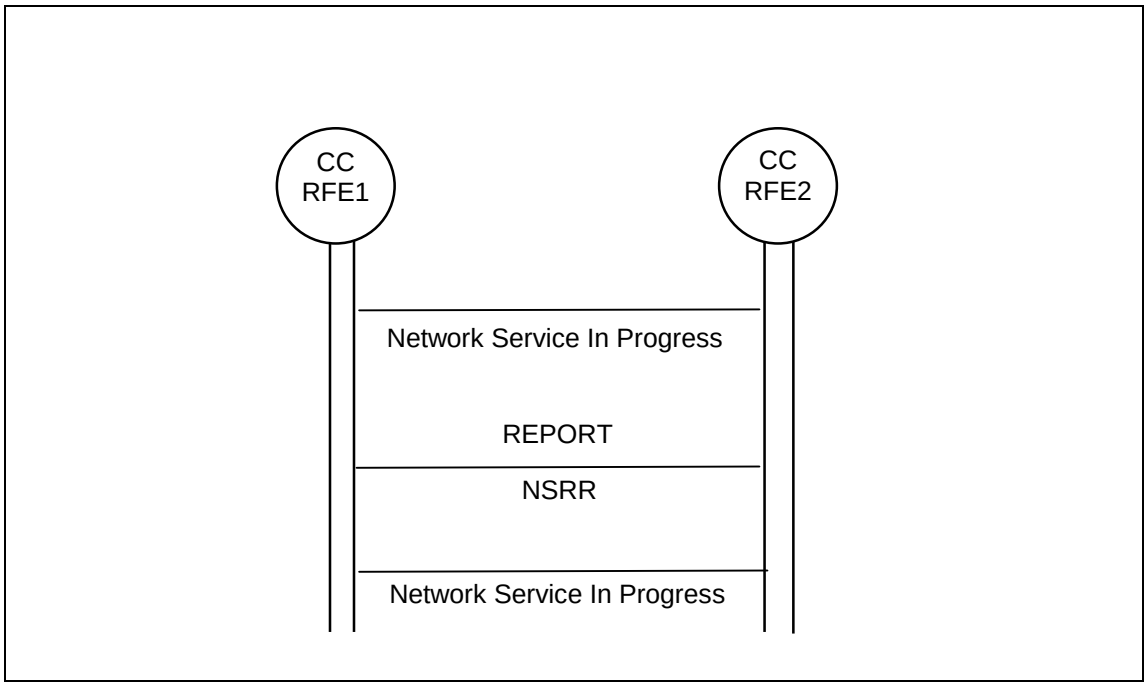
Key:
NSRR - Network Service Recall Request.

Figure 2 - Network Service Recall Information Flow

5.2.1.1.2 Service-Initiated Recall

After one service establishes a connection to another service, the connection enters the Network Service In Progress State.

In this state, the first service requests network recall. RFE1 recognizes the request and forwards the request in a Report message. See Figure 3. The information element associated with the Report appears in 5.2.1.2, Table 1.



Key:
NSRR - Network Service Recall Request.

Figure 3 - Network Service Recall Information Flow

5.2.1.2 Information Elements

Information elements marked Required (R) in Table 1 are necessary for the network capability to operate as described in Procedures text. A report message for this network capability should include exactly one of the elements listed. A report message without any of these elements, or a report message with more than one element, is meaningless to this network capability and will be ignored by the receiving FE.

Table 1 - Report Information Element

Information Element	
Network Service Recall Request	R

Key:
R Required

5.2.1.2.1 Network Service Recall Request

Information element sent from the user-network interface to the network or one service to another service, to indicate that the calling user has requested the attention of an active network service.

5.3 Allocation of Functions to Equipment

Table 2 - Allocation of Functions to Equipment

FE Scenario	(NT/CC)/RFE1	CC	CC/ RFE2
Scenario 1	LE	-	LE
Scenario 2	LE	LE	TR1
Scenario 3	LE	TR1	TR2
Scenario 4*	TR1	-	TR2
Scenario 5*	TR1	TR2	TR3

KEY:
LE - Local Exchange
TR*n* - Transit Exchange *n*
* - When RFE1 co-located with CC Functional Entity

6 Protocols and Procedures

6.1 Formats and codes

6.1.1 Parameters for Network Service Recall Network Capability

Table 3 - Parameters Corresponding to Elements Found in Table 1

Information Element	Parameter (/Indicator)	Msg	Coding	Include.	Trigger
Network Recall Indication	Service Activation	FAC	6.2	R	User/ Service

Key:

User - Equivalent indication received from User across User-Network Interface.
R - Required for proper service operation.

6.1.2 Coding of Service Activation Parameter

The following SAP Feature Code Indicator is assigned:

1000 0100 Network Service Recall

6.2 ISDN-UP Procedures for Network Service Recall

The Network Service Recall network capability allows the network to transport a calling party's or a service's request for the attention, or "recall", of a network service.

6.2.1 Procedures for Network Service Recall Requests

6.2.1.1 Actions at the Service Initiating Exchange

As needed by the service at the Service Initiating Exchange (SIE), the SIE will encode a Service Activation Parameter (SAP) containing a Network Service Recall request. (See 6.1.2) The SIE will include that SAP in a FACility message (FAC) and forward the FAC to the Service Controlling Exchange (SCE).

6.2.1.2 Actions at the Intermediate Exchange

No change to the procedures defined in ANSI T1.113.4 is required.

6.2.1.3 Actions at the Service Controlling Exchange

Upon receipt of the FAC containing the network service recall request, the Service Controlling Exchange (SCE) will pass the request to service logic.