ATIS-1000104.1991(R2013)

Exchange-Interchange Carrier Interfaces – Individual Channel Signaling Protocols

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American National Standard
for Telecommunications –

Exchange-Interexchange Carrier Interfaces – Individual Channel Signaling Protocols

Secretariat

Exchange Carriers Standards Association

Approved July 26, 1991

American National Standards Institute, Inc.

Abstract

The purpose of this standard is to enable a wireline exchange carrier (EC) entity and an interexchange carrier (IC), international carrier (INC), or consolidated carrier entity to provide interconnecting equipment that operates compatibly. This standard gives individual-channel signaling protocol requirements for the interface located between a public-switched EC network within an access area and an IC, INC, or consolidated carrier network. The characteristics of the interface are (1) the connection between the first EC and IC switching systems interconnected at the interface is on a trunk-signaling basis, (2) the calling user provides the carrier access code (either explicitly or implicitly) and, in most cases, the called-line identification in one, noninteractive, dialing sequence, and (3) the EC sends the calling- and called-line information when required to the IC, INC, or consolidated carrier at the times and in the order specified by the signaling protocols given in this standard.

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Foreword (This foreword is not part of American National Standard T1.104-1991.)

The specification of interface compatibility requirements for carrier-to-carrier interfaces was initiated under the auspices of the Accredited Standards Committee on Telecommunications, T1.

The purpose of this standard is to enable separate telecommunications entities to provide compatible interconnecting equipment and signaling.

To accomplish this purpose, this standard provides signaling protocol requirements for an exchange-interexchange (E-I) interface that interconnects a switching system in an exchange carrier (EC) network with a switching system in an interexchange carrier (IC), international carrier (INC), or consolidated carrier network. The E-I interface is at a point of termination (POT) between the two switching systems.

It is expected that the telecommunications industry will combine protocols, or parts of protocols, from this standard to provide telecommunications services. At the time of this writing, some protocols are included in (1) EC-to-IC access services generally known as Feature Groups C and D Switched Access Services, and (2) IC-to-EC access services known as Feature Groups B, C, and D Switched Access Services.

There is one annex in this standard. Annex A is informative and is not considered part of this standard.

Suggestions for improvement of this standard will be welcome. They should be sent to: Exchange Carriers Standards Association, T1 Secretariat, 5430 Grosvenor Lane, Bethesda, MD 20814-2122.

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American National Standard for Telecommunications –

Exchange–Interexchange Carrier Interfaces – Individual Channel Signaling Protocols

1 Scope, purpose, and application

1.1 Scope

This standard is one of a series of interface compatibility specifications prepared by the Services, Architecture, and Signaling Technical Subcommittee of Committee T1. The series provides technical requirements for the interfacing of cellular mobile carriers (CMCs), wireline exchange carriers (ECs), interexchange carriers (ICs), international carriers (INCs), and consolidated carriers in paired interface combinations. In the remainder of this standard, unless otherwise noted, (1) the term IC connotes IC, INC, or consolidated carrier, and (2) INC connotes INC or consolidated carrier.

This standard provides technical requirements for an Exchange–Interexchange (E-I) Interface that interconnects a switching system in the EC network with a switching system in the IC network. The interface is at a point of termination (POT) between the two switching systems.

By arranging the E-I interface specifications in this standard into a number of individual signaling protocols, this standard provides the interconnecting ECs and ICs with a variety of compatible signaling to choose from to provide telecommunications services. The telecommunications services provided, and, therefore, the specific E-I interface signaling protocols available at the interface, are determined by EC and IC business decisions, mutual EC and IC interface agreements, and legal and regulatory requirements. These decisions, agreements, and requirements are beyond the scope of this technical interface signaling protocol standard.

1.2 Purpose

The purpose of this standard is to enable separate entities to provide interconnecting equipment that will operate compatibly. Quantitative descriptions are provided in this standard of the specific signaling characteristics of the interconnecting systems required to achieve this purpose.

Since this standard is a technical E-I interface specification intended to only specify standard E-I interface signaling capabilities, it is beyond the scope and purpose of this standard to describe or specify EC or IC telecommunications services; to specify the particular E-I interface signaling protocols that are used or not used with any EC or IC telecommunications service; or to specify the performance of the telecommunications services provided using the E-I interface signaling protocols specified in this standard. The telecommunications services performance aspects of call completion delay due to multiple operators and the outpulsing of the charge field (see 5.7 and 5.9) are for further study.

1.3 Application

1.3.1 Interface

This standard establishes the technical requirements of the interface that

- is located between a public-switched exchange network within an access area and an IC network;
- has the following characteristics:

– The connection between the first EC and IC switching systems interconnected at the interface is on a trunk-signaling basis;

– The calling user provides the carrier access code (either explicitly or implicitly) and, in most cases, the called line identification in one, noninteractive, dialing sequence;

– On EC-to-IC calls, the EC sends the calling-line, called-line, and charge-to information when applicable to the IC at the times and in the order specified by the signaling protocol;

– On IC-to-EC calls, the IC sends the called line information to the EC at the times and in the order specified by the signaling protocol.

1.3.2 Compliance

Compliance with these requirements is intended to assure minimum acceptable compatibility, where compatible operation is the ability of a calling user to establish, maintain, and disconnect a desired connection through the use of the two networks.

1.3.3 Interfaces not included

This standard does not specify all E-I interfaces. For example, this standard does not provide the technical requirements for E-I interfaces with either of the following sets of characteristics:

– An E-I switched access interface where trunk-type signaling is used between the first EC and IC switching systems interconnected at the interface and where the IC is accessed by dialing 950+XXXX;

– An E-I switched access interface where line-type signaling is used between the first EC and IC switching systems interconnected at the interface.

This standard does not include local interface specification exceptions that are mutually agreed to by the interfacing EC and IC in order to provide access with switching equipment that cannot practically be converted to conform with this standard.

This standard also does not specify E-I interfaces such as common channel signaling, network management, and switched 56-kbit/s digital interfaces, or exhaustive electrical signal and timing characteristics.

1.3.4 Illustrative calling user dialing

This standard identifies the E-I interface signaling sequences using illustrative calling-user-to-EC dialing. Other calling user dialing sequences, and signaling sequences from other EC interfaces, may also produce the specified E-I interface signaling. The dialing sequences and EC handling of the dialed information are, therefore, only illustrations and are not complete descriptions of dialing plans, EC services, or IC services. Furthermore, the inclusion of the calling user dialing in this standard does not standardize either the EC or IC dialing plans or the services associated with EC or IC call routing or handling of dialed information.

1.3.5 Illustrative numeric values

The assignment of specific numeric values to the codes within the various E-I interface signaling protocol fields is beyond the scope of this document. Some specific numeric codes are included in this document for illustrative purposes; however, no attempt has been made to include exhaustive lists.

1.3.6 Carrier access code and carrier identification code notations

In this standard, the CAC notation represents the digits of the carrier access code and the CIC notation represents the digits of the carrier identification code. When this standard was issued, the CAC digits were 10XXX, where XXX was the associated CIC digits of the 3-digit carrier identification code in use. Unless specifically indicated otherwise, the CAC and CIC notations shall also represent the new 101XXXX carrier access code, where XXXX is the associated CIC digits of the 4-digit carrier identification code, and any future, industry-adopted carrier access code and associated carrier identification code accessing an E-I interface that uses the signaling protocols specified in this standard. Specification of where and when a specific carrier access code and associated carrier identification code are used and who uses the codes is beyond the scope of this standard.

2 Definitions, abbreviations, and notations

2.1 Definitions

2.1.1 access service area: A geographic area established for the provision and administration of telecommunications service. An access service area encompasses one or more exchanges, where an exchange is a unit of the telecommunications network consisting of the distribution facilities within the area served by one or more end offices, together with the associated facilities used in furnishing telecommunications service within the area. An exchange is established by the local exchange carrier and usually embraces a city, town, or village, and its environs. Exchanges are grouped in access service areas to serve common social, economic, and other purposes.

2.1.2 ANI information digits: Two-digit codes (II) preceding the billing number in the identification field that either provides information about the type of line originating the call or indicates special characteristics of the billing number.

2.1.3 automatic number identification (ANI): Provides the billing number of the line or trunk that originated a call.

2.1.4 carrier access code: The digital code, represented by CAC, that is used to obtain access to the switched services of an IC. The notation CAC represents the digits of any of the one or more carrier access codes (see 1.3.6) used in this standard.

2.1.5 carrier identification code: The digital code, represented by CIC, that uniquely identifies each IC. A carrier identification code applies to an IC throughout the North American Numbering Plan area. Multiple carrier identification codes per carrier are not precluded. The notation CIC represents the digits of any of the one or more carrier access code lengths (see 1.3.6) used in this standard.

2.1.6 consolidated carrier: A carrier authorized to provide telecommunications services both within and outside World Zone 1 using the North American Numbering Plan and the international dialing plan, respectively.

2.1.7 country code: A unique 1-, 2-, or 3-digit code assigned to countries in the World Numbering Plan. For international dialing purposes, the world is divided into nine zones. The first digit of a country code is the world zone number.

2.1.8 disconnect-control office: The switching entity that performs disconnect timing and that decides when the connection is to be cleared. It is usually the calling end office; however, it may be another switching entity such as an office performing centralized automatic message accounting (CAMA) or an operator services system.

2.1.9 disconnect signal: An on-hook signal indicating the connection is being cleared. It is initiated by the disconnect-control office (except under maintenance conditions) and is repeated through the trunks composing an established connection. The signal responding to a disconnect signal, but applied in the direction opposite to the direction of propagation of the disconnect signal, may also be considered a disconnect signal.

2.1.10 disconnect timing: The timing of the period during which a hang-up signal is being received from the called end office and an off-hook signal is being received from the calling end office.

2.1.11 end office (EO): An EC switching system that terminates station loops and connects the loops to each other and to trunks.

2.1.12 exchange carrier (EC): A carrier authorized to provide telecommunication services within one or more access service areas.

2.1.13 facility code: A two-digit code (FC) used in the EC-to-IC Facility/Service Selective Signaling protocol and the IC-to-EC Facility/Service Selective Signaling protocol that identifies the type of facility requested.

2.1.14 glare: Glare is the simultaneous, or near-simultaneous, seizure of two-way trunks at both ends. The unguarded interval between seizure of the trunk at one end and the consequent making busy of the trunk at the other end allows glare to occur.

2.1.15 hang-up: Calling or called user placement of a telephone set or other unit of telecommunications equipment in the quiescent state.

2.1.16 hang-up signal: An on-hook signal sent from an end office toward the disconnect-control office indicating either calling or called user hang-up and requesting the connection be disconnected. The interface remains dedicated to the call until. the disconnect-control office responds to the hang-up signal.

2.1.17 interexchange carrier (IC): A carrier authorized to provide interexchange telecommunications services within World Zone 1 using the North American Numbering Plan.

2.1.18 international carrier (INC): A carrier authorized to provide telecommunications services outside World Zone 1 using the international dialing plan; however, the carrier has the option of providing service to World Zone 1 points outside the forty-eight contiguous states of the United States.

2.1.19 international routing code: A 3-digit code within the North American Numbering Plan, beginning with 1, that classifies international calls as requiring either regular or special handling.

2.1.20 maintenance timing: The timing of the period during which a hang-up signal is being sent by a switching entity to the disconnect-control office before receiving a disconnect signal from the disconnect-control office.

2.1.21 multifrequency (MF) pulsing: Tone bursts of two out of six voice-band frequencies that transmit ten numeric and five control signals.

2.1.22 national number: The number identifying a calling user line within an area designated by a country code.

2.1.23 North American Numbering Plan (NANP): A plan for the allocation of unique 10-digit address numbers. The numbers consist of a 3-digit area (numbering plan area) code, a 3-digit office code, and a 4-digit line number. The plan also extends to format variations (e.g., 3-digit and 7-digit address), prefixes (e.g., 1, 0, 01, and 011), and special code applications (e.g., Service Access Codes). See Bellcore "Numbering Plan and Dialing Procedures" in *BOC Notes on the LEC Networks – 1990.*

2.1.24 overlap pulsing: An arrangement for EC-to-IC outpulsing that allows seizure of the EC-to-IC trunk and initiation of outpulsing prior to completion of dialing by the calling user.

2.1.25 point of termination (POT): The point of demarcation between carriers that establishes the technical interface and division of operational responsibility.

2.1.26 predesignation: An EC service provided by suitably equipped end-office switching systems that provides a carrier identification code for a calling user's calls outside the access service area when they are dialed without a CAC.

2.1.27 service access code: The 3-digit codes (SACs) in the NPA (N 0/1 X) format, which are used as the first three digits of a 10-digit address in a North American Numbering Plan dialing sequence. Although NPA codes are normally used for the purpose of identifying specific geographical areas, certain of these NPA codes have been allocated to identify generic services or to provide access capability, and these are known as SACs. The common trait, which is in contrast to an NPA code, is that SACs are nongeographic.

One of the key requirements associated with an address containing a SAC is the ability to discern the appropriate carrier. To satisfy this requirement and to alleviate confusion, the term SAC is subdivided into categories that characterize their carrier identification. requirements. The following identify and describe those subdivisions:

- **ancillary carrier identification (10-digit translation).** This SAC category is accessed by the calling user dialing (1)+SAC+NXX+XXXX. For the present, 0+SAC+NXX+XXXX is not permitted; however, future application may allow this procedure. A CAC is not permitted. The full 10-digits (SAC+NXX+XXXX) are translated to determine the carrier;

- **embodied carrier identification (6-digit translation).** This SAC category is accessed by the calling user dialing (1)+SAC+NXX+XXXX. For the present, 0+SAC+NXXX+XXXX is not permitted; however, future applications may allow this procedure. A CAC is not permitted. A 6-digit translation (SAC+NXXX) is performed to determine the carrier;

– ***external carrier identification;*** This SAC category is accessed by the calling user dialing (CAC)+(0/1)+SAC+NXX+XXXX. The CAC or equivalent (predesignation) is directly associated with this SAC. The carrier is determined by analysis of the CAC or by predesignation.

2.1.28 service code: A two-digit code (SC) used in the EC-to-IC Facility/Service Selective Signaling protocol and the IC-to-EC Facility/Service Selective Signaling protocol that identifies the type of service requested.

2.1.29 World Numbering Plan: A plan created by the International Telegraph and Telephone Consultative Committee (CCITT) that provides each telephone subscriber with a unique number. Each world telephone number consists of a country code followed by the national number. By international agreement, the number of digits in the country code plus national number is limited to a total of 12 digits currently, with a recommendation to increase the maximum length to 15 digits at the end of 1996. (See CCITT E.163, E.164, and E.165.)

2.1.30 World Zone 1 (WZ1): The group of countries in the World Numbering Plan that are identified by the single-digit country code "1." World numbering Zone 1 is defined in CCITT Recommendations E.163 and E.164 and includes the following countries:

Canada; United States of America, including Puerto Rico and the Virgin Islands; Jamaica; Antigua and Barbuda; Cayman Islands; British Virgin Islands; Bermuda; Bahamas (Commonwealth of the); Dominican Republic; Granada; Montserrat; St. Kitts; St. Lucia; and Saint Vincent and the Grenadines

2.1.31 World Zone 1 region codes: A set of 3-digit codes, beginning with 01, that identify countries and regions in World Zone 1. The codes occupy the country code position in the country address fields of calls from within the forty-eight contiguous states of the United States to destinations in World Zone 1 but outside the forty-eight contiguous states of the United States.

2.1.32 950+XXX: A carrier access code for obtaining switched access to interexchange carriers where (1) the calling user accesses the IC and passes the address information, if any, in two distinct operations; (2) the calling user usually uses in-band signals to pass the address, if any, to the IC; and (3) the EC does not repeat the address information. The XXXX digits are the carrier identification code for the IC.

2.2 Abbreviations

CAMA	centralized automatic message accounting
CCITT	International Telegraph and Telephone Consultative Committee
CMC	cellular mobile carrier
EANAOS	exchange access North American operator services
EAIOS	exchange access international operator services
EC	exchange carrier
E-I	exchange–interexchange
EO	end office
IC	interexchange carrier
INC	international carrier
LERG	Local Exchange Routing Guide
MF	multifrequency
NAPA	North American Numbering Plan
OS	operator system
OSS	operator services system
POT	point of termination
WZ1	world zone 1

2.3 Notations

The notations used for symbols, digits, and codes in the text, tables, and figures of this standard are given in table 1.

3 E-I interface

3.1 Description

3.1.1 Location

The interface is located in a trunk between an EC switching system in an access service area and an IC switching system; hence, an E-I interface provides IC access on a trunk-signaling basis to the EC switching system.

3.1.2 Characteristics

The interface has the following characteristics:

- Except for some exchange access signaling protocols for operator services, the calling user indicates the carrier network that will be accessed by one of the following:
  - Dialing a carrier access code;
  - Not dialing a carrier access code and, thereby, using the predesignated carrier;
  - Dialing some type of Service Access Code (SAC) and associated digits that indicate the carrier.

  For some exchange access signaling protocols for operator services, additional information, such as the preferred carrier of the number to be charged for the call may also be used (see 1.1, third paragraph);
- Individual-channel signaling is employed across the interface;
- With signaling protocols for interface seizures in the IC-to-EC direction, answer supervision is provided;
- With signaling protocols for interface seizures in the EC-to-IC direction, answer supervision is provided except when the connect/hold signal is specified in the signaling protocol specification (clause 4) for some calls using some of the exchange access signaling protocols for operator services;
- Test-line access is provided in both the IC-to-EC direction and the EC-to-IC direction.

3.2 Interface protocols

3.2.1 General

3.2.1.1 Signals

The following signals establish, maintain, and disconnect a connection through the interface:

- Seizure;
- Winks;
- 2-out-of-6 multifrequency (MF) pulses;
- ANI request;
- Call progress information;
- Answer;
- Disconnect;
- Interoffice flash;
- Ringback;
- Reverse make busy;
- Coin control (collect, return, operator attached, and operator released);
- Connect/hold.

3.2.1.2 Protocols

The set of rules that govern the sequence and separation in time of the signals is the signaling protocol. Since different protocols are needed to establish different types of connections, there are several signaling protocols. This standard specifies the following protocols:

- *Exchange Access North American Signaling:* The following are the prominent characteristics of the protocol:
  - Carrier access code is CAC digits;
  - Identification field is before address field;
  - Address conforms with North American Numbering Plan;
- *Exchange Access International Signaling:* The following are the prominent characteristics of the protocol:
  - Carrier access code is CAC digits;
  - Two pulsing stages are used;
  - Address conforms with International Dialing Plan;
- *Exchange Access Cut-Through Signaling:* The following are the prominent characteristics of the protocol:
  - Carrier access code is CAC digits;
  - EC does not forward an address field;
  - Any IC-required calling-user-to-IC signaling is accomplished through the EC's voiceband channel.
- *EC-to-IC Facility/Service Selective Signaling:* The following are the prominent characteristics of the protocol:
  - Carrier access code is CAC digits;
  - Identification field is before address field;

- Address information need not conform with North American Numbering Plan;

- Address field contains a Service Code (SC), a Facility Code (FC), or both;

– *Operator Services Signaling:* The following are the prominent characteristics of the protocol:

- Carrier access code is CAC digits;

- Requires separate trunk group from those using other protocols;

- Address field is before identification field;

- Signaling includes ANI-request, coin-control, ringback, and reverse-make-busy signals;

– *Exchange Access North American Operator Services with Basic Information (EANAOS/Basic) Signaling:* The following are the prominent characteristics of the protocol:

- Carrier access code is CAC digits;

- Identification field is before address field;

- Address conforms with North American Numbering Plan or F/SSS address formats;

- Additional signaling, such as connect/hold, coin-control, and ringback signaling, is provided.

– *Exchange Access North American Operator Services with Expanded Information (EANAOS/Expanded) Signaling:* The following are the prominent characteristics of the protocol:

- Carrier access code is CAC digits;

- Field order is identification field, address field, and charge field;

- Address conforms with North American Numbering Plan or F/SSS address formats;

- Additional signaling, such as connect/hold. coin-control, and ringback signaling, is provided;

– *Exchange Access International Operator Services with Basic Information (EAIOS/Basic) Signaling*: The following are the prominent characteristics of the protocol:

- Carrier access code is CAC digits;

- Two pulsing stages are used;

- Address conforms with International Numbering Plan;

- In the second stage, the identification field is before address field;

- Additional signaling, such as connect/hold, coin-control, and ringback signaling, is provided.

– *Exchange Access International Operator Services with Expanded Information (EAIOS/Expanded) Signaling:* The following are the prominent characteristics of the protocol:

- Carrier access code is CAC digits;

- Two pulsing stages are used;

- Address conforms with International Numbering Plan;

- In the second stage, the field order is identification field, address field, and charge field;

- Additional signaling, such as connect/hold, coin-control, and ringback signaling, is provided.

– *IC-to-EC Access Signaling:* The following are the prominent characteristics of the protocol:

- Similar call progress information as preceding EC-to-IC protocols except for reversal of direction and, possibly, the carrier responsible for providing call progress information;

- Answer supervision provided from the EC to the IC.

– *IC-to-EC Facility/Service Selective Signaling:* The following are the prominent characteristics of the protocol:

- Similar call progress information as preceding EC-to-IC protocols except for the reversal of direction and, possibly, the carrier responsible for providing call progress information;

- Answer supervision provided from the EC to IC;

– Address field contains an SC, FC, or both;

– Address information need not conform to the North American Numbering Plan for some SCs.

3.2.2 Protocol combinations

The interface protocols identified in 3.2.1.2 specify the sequence of interactions for establishing an individual connection. The protocols identified allow the use and identification of different protocols for successive calls on the same trunk. Thus, a trunk group may carry a number of protocols. When this occurs, the switching systems must be capable of identifying and accommodating the protocol being used on each individual call.[1)]

The identification of which protocol or protocols are used on a specific trunk group, on specific trunk group types, or in specific geographic areas is not contained in this standard

The protocols may be used on a trunk or trunk group individually or in combinations with the following exceptions:

– The Operator Services Signaling protocol (specified in 4.5) shall be placed on a separate trunk group;

– A type of call (e.g., a 0+ call type with CAC dialed before the 0, a 10-digit North American address, and placed from a coin station) that has an EC-to-IC signaling sequence specified in more than one protocol shall use only one of the protocols. For these trunks or trunk groups, mutual EC and IC agreements shall specify which signaling protocol shall be used for the particular type of call. The EC shall indicate to the IC the type of call, and the IC shall detect the type of call, by using one or more of the following signals that are contained in the signaling protocols:

– The number of digits in each field but especially the first field;

– The first two digits in the first field of calls using the North American Numbering Plan address, and the second field of calls using the International Numbering Plan address;

– The presence or absence of a 0-prefix digit in the address field;

– Whether a SAC code is present in the NPA position of a 10-digit address in the address field.

– The international signaling protocols (4.2, 4.3, 4.8 and 4.9) with a country-address field containing a 3-digit INC carrier identification code subfield and those with a country-address field containing a 4-digit INC carrier identification code subfield shall not be used on the same trunk or trunk group. Mutual EC and IC agreements shall specify which type of international signaling protocol shall be used for all the international signaling protocols carried on a trunk or trunk group.

3.2.3 Notations within protocol specifications

Table 1 gives the notation conventions used in this standard.

4 Protocols

4.1 Exchange Access North American Signaling

4.1.1 Base specifications

4.1.1.1 General Description

In the Exchange Access North American Signaling protocol, IC connotes IC or consolidated carrier, and not INC. The Exchange Access North American Signaling protocol shall use a pulsing stream that consists of two fields of MF pulses. The first field transmitted shall contain the calling user's identification number, which is used for billing purposes. This first field is the identification field. The second MF-pulse field shall contain the called telephone number. This field is the address field. This protocol shall have the identification field pulsed forward to the IC before the called number.

[1)] When the EC and IC switching equipment are capable and the EC and IC mutually agree, the different call types specified in a protocol may also he placed on separate trunk groups and the trunk group used to identify the call types.

These two fields may be presented to the IC as follows:

- In an overlap pulsing format [2];
- In a non-overlap pulsing format.[3]

For the disconnect sequence, the disconnect-control office shall be on the EC side of the E-I interface.

4.1.1.2 Nominal sequence

The nominal EC-to-IC call signaling sequence, assuming overlap pulsing, shall be as follows:

a) After receipt from the calling user of all but the last 4 digits of the called number, the EC shall initiate actions to seize a trunk to the IC;

b) The IC shall respond to the trunk seizure with a wink-start signal when it is ready to receive pulsing;

c) Upon receipt of the wink-start signal from the IC, the EC shall start outpulsing the identification field. MF pulsing shall be used;

d) When the calling user completes dialing and upon completion of outpulsing of the identification field, the EC shall outpulse the address field;

e) When the IC has received all of the pulsing information, it shall respond with an acknowledgment-wink signal;

f) After outpulsing, or upon receipt of the acknowledgment-wink signal, the EC shall connect the talking path from the calling user to the IC;

g) The IC shall provide call progress tones and announcements;

h) When the called user answers, the answer off-hook signal shall be sent from the IC to the originating EC;

i) Depending on whether the EC or the IC initiates call clearing, one of the following two sequences shall occur:

1) If the EC is the first to be finished with the call (e.g., because of calling user hang-up), the following shall occur:

i) The EC shall terminate use of the talking path through the interface, should clear the EC connection, and shall send an EC disconnect signal (on-hook) to the IC;

ii) When the IC detects the EC disconnect signal, the IC shall send the IC disconnect signal (on-hook) to the EC and should clear the IC connection.

2) If the IC is the first to be finished with the call (e.g., because of called user hang-up), the following shall occur:

i) The IC shall send a hang-up signal (on-hook) to the EC. The interface shall remain dedicated to the call, but the IC may interrupt the talking path through the interface to the EC;

ii) When the EC receives the IC hang-up signal and determines that disconnect should occur (e.g., when the disconnect-control office either receives the calling user hang-up signal or the EC disconnect timing interval expires), the EC (a) shall send the EC disconnect signal (on-hook) to the IC, (b) shall terminate use of the interface for the call, and (c) should clear the EC connection.

3) Upon receipt of the EC disconnect signal, the IC shall terminate use of the interface for the call and should clear the IC connection.

4.1.2 Distinguishing characteristics

The following are the distinguishing characteristics of the Exchange Access North American Signaling protocol determined from comparing the signaling protocols in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the IC;
- The protocol can appear on trunks that also use other EC-to-IC exchange access protocols;

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[2] Call setup time is minimized through the use of overlap pulsing, which permits the initiation of pulsing to the IC before the calling user has completed dialing.

[3] Where locally allowed and offered.

– Either 0, 5, or 12 digits are between the KPV and ST signals in the first MF-pulsing field (identification field);

– The ST signal (no primes) ends the identification field;

– The KP signal (no primes) starts the address field.

4.1.3 Specific example

A specific example of a call using the Exchange Access North American Signaling protocol is shown in figure 1.

4.1.4 Variations

4.1.4.1 Call types

The Exchange Access North American Signaling protocol shall accommodate the following call types in the EC-to-IC direction:

– For completion in a distant access service area of World Zone 1;

– To service access codes;

– For assistance by the IC;

– For completion in home access service area;

– For test calls.

Depending upon the connection requested by the calling user, there are small variations in the MF-pulse fields crossing the interface. These variations are summarized in table 2.

4.1.4.2 1+ Dialing

Table 2 shows that it may, or may not, be necessary for the calling user to dial the 1 prefix. The North American Numbering Plan (see Bellcore "Numbering Plan and Dialing Procedures" in *BOC Notes on the LEC Networks–1990*) provides for the use of the prefix 1 in the following situations:

– To route calls to Centralized Automatic Message Accounting (CAMA) for the recording of billing information for the call when appropriate facilities do not exist in the end office;

– To achieve dialing uniformity from the calling user's perspective over a geographic area with high community of interest;

– To indicate that the called number is located in a different Numbering Plan Area (NPA) than the calling line.

The EC establishes the dialing plan for the access service area and determines whether or not the prefix 1 is to be dialed.

4.1.4.3 Call characteristic indicators

The KPV signals in table 2 shall be used for call characteristic indicator signaling. The following are illustrative examples of uses:

– The type of calling user station dial signaling (i.e., dial pulse or DTMF) used on the call;

– Whether the accessed IC is the same as the billing number's predesignated IC (i.e., accessed IC matches billed number's predesignated IC or not).

Table 3 gives illustrative examples of the assignment of KPV signals.

4.1.4.4 Interexchange assistance

The following routing is used for assistance:

– The 0+ call types route to the predesignated IC without the calling user dialing the CAC carrier access code only for destination codes outside the access service area;

– 0 dialed calls route to an EC operator;

– 00 dialed calls route to the predesignated IC without the calling user dialing the CAC carrier access code.

4.1.4.5 Calls to home access service area

Calls destined for completion to lines in the same access service area as the calling user are typically not forwarded to the IC unless the calling user dials the IC's access code.

4.1.4.6 Service access codes

Except for external carrier identification SACs, the calling user does not dial the carrier access code to reach the SAC.

4.1.4.7 Test calls

On test calls, the IC shall respond to the address field with only the answer signal, rather than the signal sequence acknowledgment-wink signal followed by answer.

4.1.4.8 Disconnect sequence

The IC may send a request to cancel the IC-initiated call clearing sequence and to reestablish the talking path through the interface to the EC by removing the IC hang-up signal. The EC shall honor the request if the signal

arrives before the EC initiates the EC disconnect sequence.

4.1.5 Options

4.1.5.1 Call characteristic indicators

By mutual EC and IC agreement, none, one, or both of the call characteristic indicators shall be provided.

4.1.5.2 Automatic number identification (ANI)

It shall be optional whether or not ANI is provided.[4)]

If ANI is provided, the identification field shall contain two subfields: (1) the II code, and (2) the billing number of the calling line. Example assignments of II codes are given in table 4. With II codes of 01 or 02, the identification field shall be KPV+01+NPA+ST or KPV+02+NPA+ST, respectively.

If the without-ANI option is selected, the identification field shall be KPV+ST.

4.1.6 Time limits

4.1.6.1 Wink-start signal

The IC shall complete the wink-start signal within 3.5 seconds of the trunk seizure.

4.1.6.2 Wink-start signal guard

The end of the wink-start signal shall occur no sooner than 210 milliseconds after receipt of the incoming seizure signal. The IC shall be prepared to receive MF pulses 35 milliseconds after the end of the wink-start signal. The EC shall begin MF pulsing no sooner than 50 milliseconds after the end of the wink-start signal.

4.1.6.3 Interval between identification and address fields

This interval shall be a minimum of 58 milliseconds. It may be much longer when the EC is providing overlap pulsing because the EC may have to wait for the calling user to finish dialing.

4.1.6.4 Acknowledgment-wink signal

The IC shall respond with the acknowledgment-wink signal between 200 milliseconds and 3.5 seconds after receipt of the complete address field. The IC should not attempt to use the talking path for communication with the calling user prior to returning the acknowledgment-wink signal.[5)]

4.1.6.5 Answer

The IC shall provide an on-hook state continuing for at least 250 milliseconds between the acknowledgment-wink signal and the steady off-hook signal indicating called party answer.

4.1.6.6 Disconnect timing interval

After receiving the IC hang-up signal, the EC disconnect-control office shall initiate a disconnect timing interval that shall be between 10 and 12 seconds in length.

4.1.6.7 Maintenance timing interval

After sending the IC hang-up signal in an IC-initiated call clearing sequence, the IC may initiate a maintenance timing interval that shall be a minimum of 30 seconds.

4.1.6.8 Trunk guard interval

On IC-initiated call clearing sequences, the EC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the EC sends the EC disconnect signal (on-hook). On EC-initiated call clearing sequences, the EC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the EC disconnect signal (on-hook). On an EC-initiated call clearing sequence on a two-way trunk, the IC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the IC returns the IC disconnect signal (on-hook).

4.1.7 Incomplete calls and irregularities

4.1.7.1 Invalid code

If an invalid code is received by the IC from the EC, the IC shall wait until all stages of signaling are received from the EC and shall return an acknowledgment-wink signal. The IC shall then return an announcement or tone.

4.1.7.2 All trunks busy

If a trunk from the EC to the IC cannot be seized because all trunks to the IC are busy, the EC shall return an announcement or tone to the calling user.

[4)] Receipt of ANI is currently an IC option.

[5)] For Feature Group D Switched Access Service, the EC establishes the talking path within 1.2 seconds following receipt of the acknowledgment-wink signal.

4.1.7.3 No acknowledgment-wink signal

If the acknowledgment-wink signal from the IC is not received within 4 seconds after completion of outpulsing the address field, the trunk to the IC may be restored to on-hook and an announcement or tone returned to the calling user.

4.1.7.4 False answer

If the IC responds to seizure on one-way trunks with an off-hook longer than 350 milliseconds instead of a wink-start signal, the EC shall release the connection to the IC and shall return an announcement or tone to the calling user.

4.1.7.5 Glare

With wink-start signal operation, a switching system expects another switching system to respond to a seizure by returning an off-hook wink-start signal. If the returned off-hook signal on a two-way trunk lasts beyond 350 milliseconds, a glare condition shall be interpreted.

The glare convention applicable at the E-I interface shall be that IC-to-EC calls are given preference over EC-to-IC calls. This convention gives IC-to-EC calls preference because they have usually traversed another exchange network plus the IC's network and are nearing completion.

When the EC detects glare, the EC shall abandon the request and retry the call on another trunk. When the IC detects glare, the IC shall wait for the incoming off-hook to change to on-hook, then it shall proceed with the call protocol in the normal manner.

4.1.7.6 Maintenance call clearing

If the IC does not receive an EC disconnect signal before an IC maintenance timing interval expires, the IC may terminate use of the interface for the call, clear the IC connection, and, on two-way trunks, make the interface unavailable for IC-to-EC interface seizures until the EC disconnect is received.

4.2 Exchange Access International Signaling

4.2.1 Base specifications

4.2.1.1 General description

The Exchange Access International Signaling protocol shall use two-stage pulsing to handle more numerical information than Exchange Access North American Signaling protocol. Pulsing stages shall require an INC response between the stages. A pulsing stage may contain two fields of pulses. In effect, Exchange Access International Signaling adds a pulsing stage that contains the country address field ahead of a pulsing stage roughly corresponding to Exchange Access North American Signaling. The country address field in the first MF-pulsing stage shall contain the country code and carrier identification code.

For the disconnect sequence, the disconnect-control office shall be on the EC side of the E-I interface.

4.2.1.2 Nominal sequence

The nominal EC-to-INC call signaling sequence, assuming overlap pulsing, shall be as follows:

a) After the calling user has dialed the desired country code, the EC shall initiate action leading to seizure of a trunk to the INC;

b) The INC shall respond to the trunk seizure with a wink-start signal when it is ready to receive pulsing;

c) Upon receipt of the wink-start signal from the INC, the EC shall outpulse the country address field to the INC;

d) The INC shall respond to receipt of this first stage of pulsing with a second-wink signal;

e) Upon receipt of the second-wink signal from the INC, the EC shall outpulse the identification field. The identification field shall be the same as for exchange access North American signaling;

f) If the calling user has completed dialing by the end of the identification field, the identification field shall be immediately followed by the address field. If, however, the calling user has not finished dialing, there shall be a delay (until dialing is completed) before outpulsing the address field.

g) When the INC has received all three fields of MF pulses, it shall respond with an acknowledgment-wink signal;

h) After outpulsing, or upon receipt of the acknowledgment-wink signal, the EC shall

connect the talking path from the calling user to the INC;

i) The INC shall provide call progress tones and announcements;

j) When the called user answers, the answer off-hook signal shall be sent from the INC to the originating EC;

k) Depending on whether the EC or the INC initiates call clearing, one of the following two sequences shall occur:

1) If the EC is the first to be finished with the call (e.g., because of calling user hang-up), the following shall occur:

i) The EC shall terminate use of the talking path through the interface, should clear the EC connection, and shall send an EC disconnect signal (on-hook) to the INC;

ii) When the INC detects the EC disconnect signal, the INC shall send the INC disconnect signal (on-hook) to the EC and should clear the INC connection.

2) If the INC is the first to be finished with the call (e.g., because of called user hang-up), the following shall occur:

i) The INC shall send a hang-up signal (on-hook) to the EC. The interface remains dedicated to the call, but the INC may interrupt the talking path through the interface to the EC;

ii) When the EC receives the INC hang-up signal and determines that disconnect should occur (e.g., when the disconnect-control office either receives the calling user hang-up signal or the EC disconnect timing interval expires), the EC (a) shall send the EC disconnect signal (on-hook) to the INC, (b) shall terminate use of the interface for the call, and c) should clear the EC connection;

iii) Upon receipt of the EC disconnect signal, the INC shall terminate use of the interface for the call and should clear the INC connection.

4.2.2 Distinguishing characteristics

The following are the distinguishing characteristics of the Exchange Access International Signaling protocol determined from comparing the signaling protocols in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the INC;
- The protocol can appear on trunks that also use other EC-to-INC exchange access protocols;
- There are either 9 or 10 digits between the KP and ST signals in the first MF-pulsing field (country address field);
- The ST signal (no primes) ends the identification field;
- The KP signal (no primes) starts the address field.

4.2.3 Specific example

A specific example of a call using the Exchange Access International Signaling protocol is shown in figure 2.

4.2.4 Variations

4.2.4.1 Call types

The Exchange Access International Signaling protocol shall be used for the following call types:

- EC-to-INC calls for completion outside World Zone 1;
- INC-assisted EC-to-INC calls for completion outside World Zone 1;
- EC-to-INC calls for completion inside World Zone 1 but outside the contiguous forty-eight states;
- INC-assisted EC-to-INC calls for completion in World Zone 1;
- EC-to-INC calls to Service Access Codes.

Depending upon the connection requested by the calling user, there are small variations in the MF-pulse fields crossing the interface. These variations are summarized in table 5.

4.2.4.2 International system routing codes

The three 1NX digits in the country address field are used to classify the call as requiring either regular or special handling.

4.2.4.3 Carrier Identifier

The 3- or 4-digit CIC in the country address field shall designate the INC.

4.2.4.4 Country code

The three CCC digits in the country address field shall be the country code for the destination country, padded as necessary to 3 digits by leading zeros.

4.2.4.5 National number

The NN digits in the address field shall be the National Number. The CC country code plus the NN National Number shall be limited to a maximum of 12 digits in length.

4.2.4.6 World Zone 1

An international-only INC may serve portions of World Zone 1 that are outside the forty-eight contiguous states of the United States. For those calls to be completed in World Zone 1, the digits in the country code position shall be 01R. The 01R term shall be interpreted as follows: The "1" is the country code for World Zone 1, and is padded with a leading zero. The "R" distinguishes among calls to various regions (based on NPAs) outside the forty-eight contiguous states of the United States, but in World Zone 1.

4.2.4.7 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol except reference is table 5 and INC replaces IC.

4.2.4.8 INC assistance

The following routing is used for assistance:

- The 0+ call types route to the predesignated INC without the calling user dialing the CAC carrier access code only for destination codes outside the access service area;
- 0 dialed calls route to an EC operator;
- 00 dialed calls route to the predesignated INC without the calling user dialing the CAC carrier access code;
- CAC+0- or 00 call routed to a consolidated carrier shall use Exchange Access North American Signaling (see table 2), rather than International Signaling.

4.2.4.9 Disconnect sequence

The INC may send a request to cancel the INC-initiated call-clearing sequence and to reestablish the talking path through the interface to the EC by removing the INC hang-up signal. The EC shall honor the request if the signal arrives before the EC initiates the EC disconnect sequence.

4.2.5 Options

4.2.5.1 Carrier class

For international-only INCs, the Exchange Access International Signaling protocol shall apply as described. For consolidated carriers, the Exchange Access International Signaling protocol shall apply only to calls destined for completion outside World Zone 1. Calls for handling by consolidated carriers destined for completion within World Zone 1 shall use the Exchange Access North American Signaling protocol.

4.2.5.2 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.2.5.3 Automatic number identification

Same as corresponding subsection in EANA Signaling protocol except INC replaces IC.

4.2.6 Time limits

4.2.6.1 Wink-start signal

When the INC is ready to receive the first stage of outpulsing for an international call from the EC, it shall return a wink-start signal to the EC. The INC shall complete the wink-start signal within 3.5 seconds from the time of seizure of the trunk.

4.2.6.2 Second-wink signal

After receiving the wink-start signal, the EC shall send the first-stage pulsing (the country address field) to the INC. In response, the INC shall return a second-wink signal to the EC. As delivered to the EC, this second-wink signal may be of nonstandard length. It shall be between 140 milliseconds and 1 second. The 1-second upper bound is to provide appropriate margin when the second-wink signal will be repeated through successive switches. This (response to first-stage pulsing) second-wink signal shall be returned by the INC after a delay of no less than 700 milliseconds and no greater than 11.5 seconds. If this second-wink signal is not returned within 11.5 seconds to the EC, a time-out may occur. If time-out occurs, the EC shall release the trunk, and return an announcement or tone to the calling user.

4.2.6.3 Pulsing

After receiving the second-wink signal from the INC, the EC shall transmit the identification field and the address field to the INC. The transmission of the identification field should be almost immediately followed by the outpulsing of the address (called number) field unless overlap outpulsing is being used and the calling user hasn't finished dialing. In the latter case, outpulsing of the address field shall be delayed until the calling user finishes dialing .

4.2.6.4 Acknowledgment-wink signal

After receiving the address field, the INC shall return an acknowledgment-wink signal to the EC.[5] The acknowledgment-wink signal duration, as delivered to the EC, shall be between 140 milliseconds and 1 second. The INC shall return the acknowledgment-wink signal to the interface within 7.5 seconds.

4.2.6.5 Answer

If answer is not received within 5 minutes after the acknowledgment-wink signal, the connection to the INC shall be released.

4.2.6.6 Disconnect timing interval

After receiving the INC hang-up signal, the EC disconnect-control office shall initiate a disconnect timing interval that shall be between 10 and 12 seconds in length.

4.2.6.7 Maintenance timing interval

After sending the INC hang-up signal in an INC-initiated call clearing sequence, the INC may initiate. a maintenance timing interval that shall be a minimum of 30 seconds.

4.2.6.8 Trunk guard interval

On INC-initiated call clearing sequences, the EC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the EC sends the EC disconnect signal (on-hook). On EC-initiated call clearing sequences, the EC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the EC disconnect signal (on-hook). On an EC-initiated call clearing sequence on a two-way trunk, the INC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the INC returns the INC disconnect signal (on-hook).

4.2.7 Incomplete calls and irregularities

4.2.7.1 Invalid code

If an invalid code is received by the INC from the EC, the INC shall wait until all stages of signaling are received from the EC and shall return an acknowledgment-wink signal. The INC shall then return an announcement or tone.

4.2.7.2 False answer

If the INC responds to seizure on one-way trunks with an off-hook longer than 350 milliseconds instead of a wink-start signal, the EC shall release the connection to the INC and shall return an announcement or tone to the calling user.

4.2.7.3 All trunks busy

If a trunk from the EC to the INC cannot be seized because all trunks to the INC are busy, the EC shall return an announcement or tone to the calling user.

4.2.7.4 Maintenance call clearing

If the INC does not receive an EC disconnect signal before an INC maintenance timing interval expires, the INC may terminate use of the interface for the call, clear the INC connection, and, on two-way trunks, make the interface unavailable for INC-to-EC interface seizures until the EC disconnect is received.

4.3 Exchange Access Cut-Through Signaling

4.3.1 Base specifications

4.3.1.1 General description

The Exchange Access Cut-Through Signaling protocol provides a simple procedure for calling users to establish a direct voiceband communications channel to an IC. Calling users dialing CAC+# are "cut through" the EC network to an IC's POT. The IC shall receive an identification field from the EC. All other information shall be obtained directly from the calling user over the voiceband channel.

For the disconnect sequence, the disconnect-control office shall be on the EC side of the E-I interface.

4.3.1.2 Nominal sequence

The nominal originating sequence shall be as follows:

a) After receipt from the calling user of CAC+#, the EC shall start action to seize a trunk to the IC;

b) The IC shall respond with a wink-start signal ;

c) Upon receipt of the wink-start signal, the EC shall MF pulse the identification field (KPV+II+ANI+ST1P), if ANI option is requested by the IC;

d) The IC shall respond with an acknowledgment-wink signal;

e) Upon receipt of the acknowledgment-wink signal, the EC shall cut through the connection and the IC may converse with the calling user. The IC should not attempt to use the connection for transmission of dial tone or other voiceband communication until after the acknowledgment-wink signal is returned;

f) When the request for service is answered, the IC shall return answer supervision;

g) Depending on whether the EC or the IC initiates call clearing, one or the following two sequences shall occur:

1) If the EC is the first to be finished with the call (e.g., because of calling user hang-up), the following shall occur:

i) The EC shall terminate use of the talking path through the interface, should clear the EC connection, and shall send an EC disconnect signal (on-hook) to the IC;

ii) When the IC detects the EC disconnect signal, the IC shall send the IC disconnect signal (on-hook) to the EC and should clear the IC connection.

2) If the IC is the first to be finished with the call (e.g., because of called user hang-up), the following shall occur:

i) The IC shall send a hang-up signal (on-hook) to the EC. The interface remains dedicated to the call, but the IC may interrupt the talking path through the interface to the EC;

ii) When the EC receives the IC hang-up signal and determines that disconnect should occur (e.g., when the disconnect-control office either receives the calling user hang-up signal or the EC disconnect timing interval expires), the EC (a) shall send the EC disconnect signal (on-hook) to the IC, (b) shall terminate use of the interface for the call, and (c) should clear the EC connection;

iii) Upon receipt of the EC disconnect signal, the IC shall terminate use of the interface for the call and should clear the IC connection.

4.3.2 Distinguishing characteristics

The following are the distinguishing characteristics of the Exchange Access Cut-Through Signaling protocol determined from comparing the signaling protocols in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the IC;
- The protocol can appear on trunks that also use other EC-to-IC exchange access protocols;
- The ST1P signal ends the identification field.

4.3.3 Specific example

A specific example of a call using the Exchange Access Cut-Through Signaling protocol is shown in figure 3.

4.3.4 Variations

4.3.4.1 Call types

The Exchange Access Cut-Through Signaling protocol shall accommodate the following call types:

- Cut-Through originating calls to interexchange carriers;
- Cut-Through originating calls to international carriers.

The variations in the MF-pulse field based on the receiving carrier classification are summarized in table 6.

4.3.4.2 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol except reference is table 6.

4.3.4.3 Disconnect sequence

The IC may send a request to cancel the IC-initiated call clearing sequence and to reestablish the talking path through the interface to the EC by removing the IC hang-up signal. The EC shall honor the request if the signal arrives before the EC initiates the EC disconnect sequence.

4.3.5 Options

4.3.5.1 Carrier class

The pulsing output from the EC shall take one or the other of the two forms shown in table 6 depending upon whether the carrier indicated by the carrier identification code is an interexchange (or consolidated) carrier or an international-only carrier.

4.3.5.2 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol.

4.3.5.3 Automatic number identification

It shall be optional whether or not ANI is provided. If ANI is provided, the identification field shall be the same as the corresponding subclause in the EANA Signaling protocol except the identification field shall end with a ST1P. If ANI is not provided, the identification field shall be KPV+ST1P.

4.3.6 Time limits

For calls to an interexchange or consolidated carrier, the time limits are the same as the corresponding subclause in the EANA Signaling protocol. For calls to an international-only carrier, the time limits are the same as the corresponding subclause in the EAI Signaling protocol.

4.3.7 Incomplete calls and irregularities

Same as corresponding subclause in EANA Signaling protocol except for INC calls, INC replaces IC.

4.4 EC-to-IC Facility/Service Selective Signaling

4.4.1 Base specifications

4.4.1.1 General description

The EC-to-IC Facility/Service Selective Signaling protocol is similar t.o the Exchange Access North American Signaling protocol. The identification field shall be the same. The address field shall contain the Service Code (SC), the Facility Code (FC), or both. To identify the address field content, KP-primed signals[6] shall be used. The KP-primed signals shall indicate the presence of service and facility codes in the address field as shown in table 7.

For the disconnect sequence, the disconnect-control office shall be on the EC side of the E-I interface.

4.4.1.2 Nominal sequence

The nominal EC-to-IC Facility/Service Selective Signaling protocol call sequence shall be as follows:

a) At the appropriate time in the call processing, the EC shall initiate actions to seize a trunk that gives IC access consistent with the facility type specified;

b) The IC shall respond to the trunk seizure with a wink-start signal when it is ready to receive pulsing;

c) Upon receipt of the wink-start signal from the IC, the EC shall start outpulsing the identification field using MF pulsing;

d) When the calling user completes a valid end-of-dialing (5.4.4.7 or 5.4.4.8) and the EC has completed outpulsing the identification field, the EC shall outpulse the address field;

e) When the IC has received all of the pulsing information, it shall respond with an acknowledgment-wink signal;

f) After outpulsing, or upon receipt of the acknowledgment-wink signal, the EC shall connect the talking path from the calling user to the IC;

g) The IC shall provide call progress tones and announcements;

h) When the called user answers, the answer signal (off-hook) shall be sent from the IC to the EC;

i) Depending on whether the EC or the IC initiates call clearing, one of the following two sequences shall occur:

1) If the EC is the first to be finished with

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[6] In MF signaling, KP1P, KP2P, and KP3P signals have the same frequency combination as the ST1P, ST2P, and ST3P signals. The relative positions in the field differentiate the KP-primed signals from the ST-primed signals.

the call (e.g., because of calling user hang-up), the following shall occur:

i) The EC shall terminate use of the talking path through the interface, should clear the EC connection, and shall send an EC disconnect signal (on-hook) to the IC;

ii) When the IC detects the EC disconnect signal, the IC shall send the IC disconnect signal (on-hook) to the EC and should clear the IC connection.

2) If the IC is the first to be finished with the call (e.g., because of called user hang-up), the following shall occur:

i) The IC shall send a hang-up signal (on-hook) to the EC. The interface remains dedicated to the call, but the IC may interrupt the talking path through the interface to the EC;

ii) When the EC receives the IC hang-up signal and determines that disconnect should occur (e.g., when the disconnect-control office either receives the calling user hang-up signal or the EC disconnect timing interval expires), the EC (a) shall send the EC disconnect signal (on-hook) to the IC, (b) shall terminate use of the interface for the call, and (c) should clear the EC connection;

iii) Upon receipt of the EC disconnect signal, the IC shall terminate use of the interface for the call and should clear the IC connection.

4.4.2 Distinguishing characteristics

The following are the distinguishing characteristics of the EC-to-IC Facility/Service Selective Signaling determined from comparing the signaling protocols in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the IC;
- The protocol can appear on trunks that also use other EC-to-IC exchange access protocols;
- The ST signal (no primes) ends the identification field;
- Either the KP1P, KP2P, or KP3P signal starts the address field.

4.4.3 Specific example

A specific example of a call using the EC-to-IC Facility/Service Selective Signaling protocol is shown in figure 4.

4.4.4 Variations

4.4.4.1 Call types

The EC-to-IC Facility/Service Selective Signaling protocol shall accommodate calls that request a specific facility type as well as those that do not. The three variations are presented in table 8.

4.4.4.2 Call characteristic indicators

Same as corresoponding subclause in EANA Signaling protocol except reference is table 8.

4.4.4.3 EC-to-IC Facility/Service Selective Signaling Dialing

The nominal calling user dialing consists of four distinct segments:

a) Facility-request of the form #FC;

b) IC-designation segment of the form CAC;

c) Service-request segment of the form *SC;

d) Address digits including any prefix.

When all segments are dialed, the dialing sequence is

#FC+CAC+*SC Address Digits(#).

The calling user may omit a dialing segment if the information carried by that segment is not required.

4.4.4.4 Facility code dialing

Facility code dialing is as follows:

- When a specific facility type is required, the calling user enters the facility code by dialing #FC, where # is the DTMF # signal;
- When the facility request code is dialed, it is the first segment of the dialing sequence;
- If the EC provides class-marked lines for a specific facility type, this segment is not required to indicate the facility request when originating a call from these lines;
- These codes apply industry wide in that a facility code identifies the same facility type for all service providers.

4.4.4.5 Service code dialing

Service code dialing is as follows:

- To request a specific service type, the calling user enters the service code by dialing *SC, where * is the DTMF * signal;
- If an EC provides class-marked lines for a specific service type, the calling user may not need to dial the code. However, to request another service type provided by the same IC, the calling user will dial the appropriate *SC code;
- A given service code uniquely specifies the address-digit format (i.e., open or fixed format). The service determined by the service code is specified by each IC;
- Service codes apply industry wide in that a code identifies the same format type for all service providers.

4.4.4.6 Service code and address digits

The address digits associated with a service code shall have either (1) a Fixed format or (2) an Open format.

4.4.4.7 Fixed format

For service codes indicating fixed format addresses, the address digits shall conform with either the North American Numbering Plan or the World Numbering Plan. The North American Number Plan is described in Bellcore "Numbering Plan and Dialing Procedures" in *BOC Notes on the LEC Networks – 1990*. The World Numbering Plan is described in the CCITT Recommendations E.163 and E.164.

The dialing of a prefix (e.g., 0, 01, 011, and 1) before the address digits may be required by local dialing practice. These prefixes are outside the requirements on the address digits.

4.4.4.8 Open format

Open format is a sequence of 0 to 15 digits. The end of dialing is indicated as follows:

The EC switch uses partial-dial timing (generally between 16 and 24 seconds) up to the first 7 digits. After 7 digits have been received, the switch uses critical timing of 4 seconds. Calls dialed with less than 7 digits and ending without the number sign (#) are given partial-dial treatment. Calls dialed with a number sign (even if less than 7 digits are dialed) or with 7 or more digits are routed to the requested IC.

4.4.4.9 Disconnect sequence

The IC may send a request to cancel the IC-initiated call clearing sequence and to reestablish the talking path through the interface to the EC by removing the IC hang-up signal. The EC shall honor the request if the signal arrives before the EC initiates the EC disconnect sequence.

4.4.5 Options

4.4.5.1 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol.

4.4.5.2 Automatic number identification

The provision of ANI shall be optional in EC-to-IC Facility/Service Selective Signaling. When ANI is being provided to an IC but the ANI information is not available to the EC switch (e.g., a multiparty line), the EC shall provide a treatment that has been mutually agreed upon between the EC and the IC, such as returning a tone or an announcement to the calling user or passing the call to the IC without ANI. When ANI information is not available, II codes of 01 or 02 shall be used and the identification field shall be KPV+01+NPA+ST and KPV+02+NPA+ST, respectively.

If the without-ANI option is selected, the identification field shall be KPV+ST.

4.4.6 Time limits

Same as corresponding subclause in EANA Signaling protocol.

4.4.7 Incomplete calls and irregularities

Same as corresponding subclause in EANA Signaling protocol.

4.5 Operator Services Signaling

4.5.1 Base specifications

4.5.1.1 General description

The Operator Services Signaling protocol shall be characterized by two stages of pulsing, each consisting of one MF-pulse field. These two MF-pulse fields for Operator Services Signaling shall be reversed in comparison with the fields in the Exchange Access Signaling. That is, for Operator Services Signaling, the

address field (called number) shall always be first, and the identification field shall be last. In addition, the signaling repertoire for Operator Services Signaling is larger than for Exchange Access Signaling. The capabilities of Operator Services Signaling shall include connection hold and reverse make busy. The connection-hold capabilities permits interoffice flash, ring-back, and coin-control signals.

For the disconnect sequence, the disconnect-control office shall be on the IC side of the E-I interface.

4.5.1.2 Nominal sequence

The nominal EC-to-IC call signaling sequence shall be as follows:

a) Upon receipt from the calling user of all digits of the called number, the EC shall seize a trunk to the IC;

b) The IC shall respond to the trunk seizure with a wink-start signal;

c) Upon receipt of the wink-start signal, the EC shall outpulse the address field to the IC;

d) When the IC has received the called number, it shall return the ANI-request signal (a steady off-hook) to the EC;

e) Upon receipt of the ANI-request signal from the IC, the EC shall outpulse the identification field to the IC. The ANI-request signal (off-hook) shall also place the connection in a connection-hold state. In this state, the EC cannot disconnect the call unless the operator services facility releases the trunk;

f) When the IC receives the identification field from the EC, the operator services facility may send various queries or instructions, or both, to the calling user via a circuit path through the EC network. This information may be divided into three classes: information requests from the operator, tones in the voice band, and automatically generated announcements;

g) In a similar manner, the calling user generates responses. These responses can consist of voice-band signals or switch-hook flashes;

h) Called user answer shall not generate any signaling from the operator services facility to the originating EC. The operator services facility itself handles all call supervision;

i) Depending on whether the IC or the EC initiates call clearing, one of the following two sequences shall occur:

1) If the IC is the first to be finished with the call (e.g., because of called user hang-up and the calling user is still off-hook), the following shall occur:

i) The IC shall terminate use of the talking path through the interface to the EC and shall send the disconnect signal (on-hook) to the EC;

ii) When the EC detects the IC disconnect signal, the EC shall send the EC disconnect signal (on-hook) to the IC and shall terminate use of the interface for the call.

2) If the EC is the first to be finished with the call (e.g., because of calling user hang-up), the following shall occur:

i) The EC shall send the hang-up signal (on-hook) to the IC. The interface remains dedicated to the call;

ii) When the IC determines that the interface is no longer needed for the call, the IC (a) shall send the IC disconnect signal (on-hook) to the EC, (b) shall terminate use of the interface for the call, and (c) should clear the IC connection;

iii) Upon receipt of the IC disconnect, the EC shall terminate use of the interface for the call and should clear the EC connection.

4.5.2 Distinguishing characteristics

The following are the distinguishing characteristics of the Operator Services Signaling protocol determined from comparing the signaling protocols in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the IC;

- The protocol can only appear on EC-to-IC trunks dedicated to the Operator Services Signaling protocol.

4.5.3 Specific example

A specific example of a call using the Operator Services Signaling protocol is shown in figure 5.

4.5.4 Variations

4.5.4.1 Call types

The Operator Services Signaling protocol shall accommodate the following call types:

- Operator services calls for completion in World Zone 1 by IC;
- Operator services calls for completion in World Zone 1 by INC;
- Operator services calls for completion outside World Zone 1;
- EC operator services calls using an IC operator system.

The variations in the MF-pulse fields introduced by the different carrier classifications and destinations are summarized in table 9 and table 10. These tables also show the difference in the MF-pulse fields when the call originates from a coin line.

4.5.4.2 Supercombined trunk group

For the Operator Services Signaling shown in tables 9 and 10, only one trunk group is necessary from the EC end office to the IC operator services facility. All operator services calls can be placed on this supercombined trunk group.

4.5.4.3 Coin lines

If the call originates from a coin line, this information shall be passed to the operator services facility by the ST signals associated with the address field.

4.5.4.4 Call classification

The call classification shall be indicated as follows:

- The 0– call type (e.g., CAC+0, 00, or 0 dialed) shall be indicated to the operator services facility by an address field consisting of only KP+ST1P or KP+ST3P;
- The 0+ call type shall be indicated to the operator services facility by the ST pulse associated with the address field;
- The 1+ call types originating from lines with certain classes of service route to an operator services facility on the basis of the class of service of the originating line. These calls may originate at coinless public telephones or in hospitals, dormitories, or hotels/motels. The 1+ call type shall be indicated to the operator services facility by the ST pulse associated with the address field;
- When an operator system belonging to an IC provides operator services for EC traffic, the EC shall indicate whether each call is an EC or IC call. For this purpose, an ST1P signal (rather than an ST signal) shall be sent to end the identification field to indicate that a call is an EC call.

4.5.5 Option

4.5.5.1 Automatic number identification

ANI is not an option with this protocol. ANI shall always be provided. However, the ANI that is provided differs slightly from the ANI offered with the protocols in the Exchange Access Signaling group. Only a 7-digit billing number shall be provided.

Example assignments of II codes for Operator Services Signaling are provided in table 11. With II codes of 01 or 02, the identification field shall be KP+01+ST or KP+02+ST, respectively.

4.5.6 Time limits

4.5.6.1 Wink-start signal

From the time the EC seizes a trunk to the IC, the EC shall wait from 5 to 40 seconds for the IC to respond with the wink-start signal. This time interval depends on the end office type and call load.

4.5.6.2 ANI-request signal

The IC shall send the ANI-request signal (a steady off-hook) within 16 seconds of receipt of the address field.

4.5.6.3 Identification field

The EC shall start sending the identification field within 18 seconds of receipt of the ANI-request signal.

4.5.7 Incomplete calls and irregularities

4.5.7.1 Time out

If a time-out occurs while the EC is waiting for the start pulsing wink-start signal or the ANI-request signal from the IC, the EC shall connect the calling user to an announcement or tone.

4.5.7.2 All trunks busy

In all trunks to the IC are busy, the EC shall connect the calling user to an announcement or tone. If a trunk to the IC cannot be seized for any other reason, the EC shall return an announcement or tone to the calling user.

4.6 EANAOS/Basic Signaling

4.6.1 Base specifications

4.6.1.1 General description

In the EANAOS/Basic Signaling protocol, IC connotes either an IC or a consolidated carrier handling a WZ1 call.

The protocol has the capability to provide connection-hold capabilities or not. The connection-hold capabilities provide IC control of the connection disconnect, IC-to-EC supplementary OS signaling, and EC-to-IC OS-recall signaling. The availability of connection-hold capabilities is indicated by fixed relationships between call information types (indicated by information in the identification field) and the availability of connection-hold capabilities.[7)]

For the interface disconnect sequences used by the protocol, the disconnect-control office is

- on the IC side of the E-I interface when the connection-hold capabilities are available and selected;
- on the EC side when they are either not available or not selected.

4.6.1.2 Nominal sequences

There are two different nominal sequences depending on whether connection-hold capabilities are (1) both available and selected on the call or (2) not available or not selected.

4.6.1.2.1 Connection-hold capabilities available and selected

The nominal EC-to-IC call signaling sequence (see also 1.1, third paragraph) when connection-hold capabilities and all signaling fields are used shall be as follows:

a) After receipt of sufficient information from the calling user to determine the IC to be accessed, the EC shall initiate action to seize a trunk to the IC;

b) The IC shall respond to the trunk seizure with a wink-start signal;

c) Upon receipt of the wink-start signal, the EC shall outpulse the identification and address fields;

d) When the last signaling field is received. the IC shall assume disconnect control of the connection and send a connect/hold signal (off-hook) to the EC;

e) When the connect/hold signal is received by the EC, the EC shall disable the disconnect control in the EC disconnect control office and complete the voice-band connection through the EC network; [8)]

f) After the EC establishes the voice-band connection through the EC network, the IC may use the interface connection for voice-band communications.[9)] (With the connection-hold capabilities enabled, the IC operator system (OS) handles all call supervision with the called user and the IC shall not generate an answer signal on the E-I interface, even if the IC establishes a connection from the IC to a called user.);

g) When required for additional actions controlled by the IC OS system, supplementary OS signaling may be sent by the IC to the EC, and the OS-recall signal may be sent by the EC to the IC.

h) Depending on whether the IC or the EC initiates call clearing, one of the following two sequences shall occur:

1) If the IC is the first to be finished with the call (e.g., because of called user hang-up while the calling user is still off-hook), the following shall occur:

i) The IC shall terminate use of the talking path through the interface and

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7) For example, in the service definition, the identification field II code can indicate both (1) the identification field format and contents and (2) the availability of connection-hold capabilities.

8) The EC is expected to establish the talking path promptly upon receipt of the connection/hold signal. Under normal operation, this will occur within 1.2 seconds.

9) An example of possible usage is the IC prompting the calling user for additionai information (e.g., type of special handling desired or credit card number) and the calling user responding (e.g., spoken special handling request or DTMF entry of additional numbers).

shall send an IC disconnect signal (on-hook) to the EC;

ii) When the EC detects the IC disconnect signal, the EC shall send the EC disconnect signal (on-hook) to the IC and shall terminate use of the interface.

2) If the EC is the first to be finished with the call (e.g., because of calling user hang-up), the following shall occur:

i) The EC shall send a hang-up signal (on-hook) to the IC. The interface shall remain dedicated to the call;

ii) When the IC determines that the interface is no longer needed for the call, the IC (a) shall send the IC disconnect signal (on-hook) to the EC, (b) shall terminate use of the interface for the call, and (c) should clear the IC connection;

iii) Upon receipt of the IC disconnect signal, the EC shall terminate use of the interface for the call and should clear the EC connection.

4.6.1.2.2 Connection-hold capabilities not available or not selected

The nominal EC-to-IC call signaling sequence (see also 1.1, third paragraph) when all signaling fields are used but connection-hold capabilities are either not available or not selected shall be as follows:

a) After receipt of sufficient information from the calling user to determine the IC to be accessed, the EC shall initiate action to seize a trunk to the IC;

b) The IC shall respond to the trunk seizure with a wink-start signal;

c) Upon receipt of the wink-start signal, the EC shall outpulse the identification and address fields;

d) When the last signaling field is received, the IC shall send an acknowledgment-wink signal to the EC;

e) After outpulsing, or upon receipt of the acknowledgment-wink signal, the EC shall connect the talking path from the calling user to the IC; [10)]

f) The IC shall provide call progress tones and announcements;

g) When the called user answers, the IC shall send the answer signal (off-hook) to the EC;

h) Depending on whether the IC or the EC initiates call clearing, one of the two disconnect sequences given in the Nominal Sequences subclause of the EANA Signaling protocol shall occur.

4.6.2 Distinguishing characteristics

The following are the distinguishing characteristics of the signaling protocol determined from comparing the signaling protocol standards in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the IC;
- The protocol usage exceptions given in the Protocol combination subclause, 3.2.2, distinguish between signaling protocols that contain pulsing that is the same in more than one signaling protocol and that are used on trunks using other EC-to-IC or EC-to-INC exchange access signaling protocols;
- Either 0, 2, 5, or 12 digits are between the KPV and ST signals in the first MF-pulse field (identification field);
- The first 2 digits of the identification field are assigned II codes associated with call types handled by this protocol; [11)]
- The ST signal (no primes) ends the identification field.

4.6.3 Specific example

A specific example of a call using the signaling protocol with the connection-hold capabilities available and selected is shown in figure 6. A specific example of a call using the signaling protocol where connection-hold capabilities

[10)] The EC is expected to establish the talking path promptly upon receipt of the acknowledgment-wink signal. Under normal operation, this will occur within 1.2 seconds.

[11)] Valid II codes are defined in the LERG. The relationship between II codes and the protocols are agreed to by the service providers.

are either not available or available and not selected is shown in figure 7.

4.6.4 Variations

4.6.4.1 Call types

The signaling protocol shall accommodate call types that require special handling and that are intended for call completion within WZI.

4.6.4.2 MF pulse field

Table 12 gives the variations in the fields that may appear at the E-I interface. Also included for illustrative purposes only are example calling user-to-EC dialing sequences that might produce the MF-pulse field contents shown. The pulse field contents that are, and are not, present on each E-I interface depend on the call types that the EC is allowed or required to provide at the E-I interface location, the EC switching system capabilities, the IC switching system capabilities, and the EC and IC agreements. These same services, capabilities, and agreements will determine the EC handling of particular calling user-to-EC dialing sequences. (See 1.1, third paragraph.)

For call types where the calling user is not identified in the identification field, the EC shall prefix the called user NPA to a 7-digit calling user dialed address to create the 10-digit address that is sent to the IC in the address field.

4.6.4.3 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol except reference is table 12.

4.6.4.4 IC-to-EC supplementary OS signals

4.6.4.4.1 Signals

When connection-hold capabilities are available and have been selected, the IC shall be permitted to send supplementary OS signals to the EC. The following signals shall be permitted:

- Operator-system-attached;
- Operator-system-released;
- Coin-collect;
- Coin-return;
- Ringback;
- Combined coin-collect/operator-system-released.

The IC shall only send the supplementary OS signals during the interval between the connect/hold signal and the IC disconnect signal. A supplementary OS signal shall be a wink-alert signal followed by a single MF pulse.[12)]

4.6.4.4.2 Requests

The supplementary OS signals sent by the IC to the EC shall request the EC to either send appropriate signals to the EC-to-calling user interface when one exists to cause actions at the calling user station equipment, or cause the actions to occur at the calling user coin station equipment when it is part of the EC network.

The individual supplementary signals request the following:

- The operator-system-attached signal requests the EC to place the calling-user coin station in the mode that (a) enables the coin-totalizer to transmit coin-deposit signals to the IC as coin deposits are made and (b) enables coin-signal security procedures. In this mode, the user's voice-band communications channel in the coin station may be degraded;
- The operator-system-released signal requests the EC to place the calling user coin station in the mode where the user voice-band communications channel and coin totalizer are placed in the user communication mode. Any coin-deposit signaling security procedures that may affect the voice-band communications channel are disabled in this mode;
- The coin-collect signal requests that the coins be collected;
- The coin-return signal requests that any coins deposited, but not collected, be returned;

[12)] The wink-alert and MF-pulse signals in the supplementary OS signals have similar characteristics as other winks and MF pulses except that the durations of the wink-alert signal and MF-pulse signals are generally longer and the wink-alert signal is an off-hook to on-hook to off-hook wink. (See Bellcore "Signaling" in *BOC Notes on the LEC Networks – 1990.*)

– The ringback signal requests that the calling user be alerted (typically a ringing signal) and a call progress signal (typically audible ring) be returned to the IC;

– The combined coin-collect/operator-system-released signal requests that any coins deposited be collected and the user communication mode of the calling user coin station equipment be enabled.

4.6.4.5 EC-to-IC OS-recall signal

When connection-hold capabilities are available and have been selected, the EC shall be permitted to send an OS-recall signal to the IC during the interval between the connect/hold signal and the IC disconnect signal.

The OS-recall signal sent by the EC to the IC shall request the IC to respond to the calling user and prepare to receive further OS service requests from the calling user.[13)]

4.6.4.6 Connection-hold capabilities not available or not selected

When (1) connection-hold capabilities are available but the IC has made the decision to not select them for this call or (2) connection-hold capabilities are not available, the IC shall return the acknowledgment-wink signal as the IC response to receiving the EC identification-field and address-field sequence (i.e., the acknowledgment-wink signal is returned instead of a connect/hold signal). The IC will also return the answer signal if the called user answers the call. When the connection-hold capabilities are either not selected or not available, the IC shall not send supplementary OS signals and the EC shall not send OS-recall signals.

4.6.4.7 Disconnect sequence

On a call with connection-hold capabilities available and selected, the EC may send a request to cancel an EC-initiated call clearing sequence by removing the EC hang-up signal. The IC shall honor the request if the signal arrives before the IC initiates the IC disconnect sequence.

On a call without connection-hold capabilities, the disconnect sequence shall be the same as the EANA Signaling protocol.

4.6.4.8 Test calls

Same as corresponding subclause in EANA Signaling protocol.

4.6.5 Options

4.6.5.1 Digits in identification field

For call types and information signaling types that convey a calling-line billing number type of information in the call identification number (CIN) subfield, it shall be optional whether the II+CIN digits are sent or not as specified in the Automatic Number Identification option subclause of the EANA Signaling protocol.

For call types and information signaling types that convey charge-to type of information (e.g., a 10-digit telecommunications credit card number or a third-number billing number) in the CIN subfield, the CIN digits shall be optional but not the II digits (which indicate that the charge-to number has been determined and is in the CIN subfield when present).

4.6.5.2 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol.

4.6.6 Time limits

4.6.6.1 Wink-start signal

Same as corresponding subclause in EANA Signaling protocol.

4.6.6.2 Wink-start signal guard

Same as corresponding subclause in EANA Signaling protocol.

4.6.6.3 Interval between identification and address fields

Same as corresponding subclause in EANA Signaling protocol.

4.6.6.4 Connect/hold signal and acknowledgment-wink signal

A connect/hold signal or an acknowledgment-wink signal shall be returned between 200 milliseconds and 3.5 seconds after receipt of the complete address field. The IC should not attempt to use the talking path for communication with the calling user prior to returning either a connect/hold signal or an acknowledgment-wink signal.

[13)] Depending on the OS service, the IC will, typically, respond with in-band tones, announcements, or a spoken communication from either an OS system operator or automated-response unit; and the calling user will, typically, respond with spoken communications or DTMF signals.

4.6.6.5 Answer signal

When the IC sends an answer signal to the EC, the IC shall provide an on-hook state continuing for at least 250 milliseconds between the acknowledgment-wink signal and the answer signal (off-hook).

4.6.6.6 Supplementary OS signals

For any supplementary OS signal, the time between the end of the wink-alert signal and start of the MF pulse shall be between 770 and 850 milliseconds. The minimum time between the end of one supplementary OS signal and the start of another supplementary OS signal shall be (1) 600 milliseconds after either an operator-system-released signal or an operator-system-attached signal, and (2) 2 seconds after any of the other supplementary OS signals. The IC shall not send a disconnect signal until at least 300 milliseconds after the completion of any supplementary OS signal.

4.6.6.7 Maintenance call clearing

On a call with both connection-hold capabilities and an EC-initiated disconnect sequence (e.g., calling user hang-up), the EC shall begin maintenance time-out timing except when the EC and IC have mutually agreed to not use maintenance call clearing on an EC-initiated disconnect on the E-I interface. The minimum EC maintenance call clearing time-out duration shall be 52 seconds. The EC shall stop maintenance call clearing timing if an IC disconnect signal is received. The EC shall reset and restart the time-out timing if an operator-system-attached supplementary OS signal is received from the IC before the time-out occurs. For the IC to continue to hold the connection when (1) the IC has disconnect control, (2) maintenance call clearing is used, and (3) the EC has sent the disconnect signal, the IC shall send at least one, but no more than four, operator system-attached supplementary signals every 48 seconds.

4.6.6.8 Disconnect timing interval

On a call without connection-hold capabilities and with an IC hang-up signal, the EC disconnect timing interval shall be the same as the EANA Signaling protocol.

4.6.6.9 Maintenance timing interval

On a call without connection-hold capabilities, maintenance timing shall be the same as EANA Signaling protocol.

4.6.6.10 Trunk guard interval

The trunk guard interval shall be one of the following:

- On a call without connection-hold capabilities, the trunk guard interval shall be the same as EANA Signaling protocol;
- On a call with both connection-hold capabilities and an IC-initiated disconnect sequence, the trunk guard interval shall be the same as EANA Signaling protocol;
- On a call with both connection-hold capabilities and an EC-initiated disconnect sequence, the trunk guard interval shall be the same as EANA Signaling protocol except that the connection-hold IC disconnect signaling sequence and, if provided, maintenance call clearing shall be satisfied first.

4.6.7 Incomplete calls and irregularities

4.6.7.1 Wink-start signal time out

If an EC wink-start time out occurs while the EC is waiting for the IC wink-start signal, the EC shall terminate use of the interface for the call and return an announcement or tone to the calling user.

4.6.7.2 All trunks busy and seizure failure

If all trunks to the IC are busy or if a trunk to the IC cannot be seized for any other reason, the EC shall return an announcement or tone to the calling user.

4.6.7.3 No connect/hold signal or acknowledgment-wink signal

If the EC does not receive either a connect/hold signal or an acknowledgment-wink signal from the IC within the specified time limit for these signals, the EC may restore the interface to the IC to on-hook and return an announcement or tone to the calling user.

4.6.7.4 Invalid code

Same as corresponding subclause in EANA Signaling protocol.

4.6.7.5 False answer

Same as corresponding subclause in the EANA Signaling protocol.

4.6.7.6 Glare

Same as corresponding subclause in EANA Signaling protocol.

4.6.7.7 Maintenance call clearing

When maintenance call clearing is provided, one of the following shall occur when the EC disconnect signal is sent before the IC disconnect signal:

– On a call (a) with connection-hold capabilities available and selected and (b) where the EC does not receive the IC disconnect signal or an operator-attached supplementary OS signal before the EC maintenance-call-clearing timing interval expires, the EC may terminate use of the interface for the call, clear the EC connection, and make the interface unavailable for EC-to-IC interface seizures until the IC disconnect is received;

– On a call without connection-hold capabilities, the signaling is the same as EANA Signaling protocol.

4.7 EANAOS/Expanded Signaling

4.7.1 Base specifications

4.7.1.1 General description

In the EANAOS/Expanded Signaling protocol, IC connotes either an IC or a consolidated carrier handling a WZ1 call.

The protocol provides connection-hold capability signals. The connection-hold capabilities signaling provides IC control of the connection disconnect, IC-to-EC supplementary OS signaling, and EC-to-IC OS-recall signaling.

For the interface disconnect sequences used by the protocol, the disconnect-control office is (1) on the IC side of the E-I interface when the connection-hold capabilities are requested and (2) on the EC side when they are not.

4.7.1.2 Nominal sequence

The nominal EC-to-IC call signaling sequence, assuming connection-hold capabilities and all signaling fields are required, shall be the same as the EANAOS/Basic Signaling protocol nominal sequence with connection-hold capabilities except the step where the EC outpulses the identification and address fields (Step C) is changed to outpulse the identification, address and charge fields.

4.7.2 Distinguishing characteristics

The following are the distinguishing characteristics of the signaling protocol determined from comparing the signaling protocol standards in clause 4 of this standard:

– The interface seizure signal is sent from the EC to the IC;

– The protocol usage exceptions given in the Protocol Combination subclause, 3.2.2, distinguish between signaling protocols that contain pulsing that is the same in more than one signaling protocol and that are used on trunks using other EC-to-IC or EC-to-INC exchange access signaling protocols;

– The ST signal (no primes) ends the first field (identification field);

– An ST1P ends the second field (address field);

– Either 5, 15, 19, or 22 through 28 digits are between the KP and ST signals in the third MF-pulse field (charge field).

4.7.3 Specific example

A specific example of a call using the signaling protocol is shown in Figure 8.

4.7.4 Variations

4.7.4.1 Call types

The signaling protocol shall accommodate call types that require special handling and that are intended for call completion within WZ1.

4.7.4.2 MF pulse field

Table 13 gives the variations in the fields that may appear at the E-I interface. Also included for illustrative purposes only are example calling user-to-EC dialing sequences that might produce the MF-pulse field contents shown. The pulse field contents that are, and are not, present on each E-I interface depend on the call types that the EC is allowed or required to provide at the E-I interface location, the EC switching system capabilities, the IC switching system capabilities, and the EC and IC agreements. These same services, capabilities, and agreements will determine the EC handling of particular calling user-to-EC dialing sequences. (See 1.1, third paragraph.)

Table 14 gives the subdivision structure and the information categories contained in the INF code, which transfers special-handling call information from the EC to the IC. Also included for illustrative purposes only are example individual information items contained in the

information categories in the INF code.[14] Even though an illustrative example in the same or another signaling protocol specification indicates that an INF-code information item might also be conveyed by another part of the signaling protocol, only the INF code illustrative example shall apply and only the INF code shall convey the call information. For example, even though conveying IC-access-determination information is an illustrative example usage of the identification-field KPV of another protocol and of the INF code of this protocol, only the INF code shall convey the information in this protocol.

Identification of different CHG-number types shall be made using one or more of the following types of information:

- Number of digits in CHG number;
- Telecommunications numbering plans or credit card standards that the EC and IC have mutually agreed to use for the CHG numbers;
- When desired or necessary to resolve ambiguities, CHG-number-type identification codes in the INF field.

When the CHG number in the charge field would be the same as the called user number in the address field (e.g., for a collect call), the CHG number in the charge field shall not be sent. When the CHG number in the charge field would be the same as the calling user billing number (e.g., for a person-to-person sent-paid call), the CHG number in the charge field shall not be sent. The charge-to type information in the INF code identifies these cases and indicates which number is the same as the CHG number.

4.7.4.3 Call characteristic indicators

The KPV signals in table 13 shall be used for call characteristic indicator signaling. An illustrative example of use is the type of calling use station dial signaling (i.e., dial pulse or DTMF) used on the call.

4.7.4.4 IC-to-EC supplementary OS signals

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.4.5 EC-to-IC OS-recall signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.4.6 Connection-hold capabilities not available or not selected

Same as corresponding subclause in EANAOS/Basic Signaling protocol except signals follow identification-field, address-field, and charge-field sequence.

4.7.4.7 Disconnect sequence

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.4.8 Test calls

Same as corresponding subclause in EANA Signaling protocol.

4.7.5 Options

4.7.5.1 Digits in identification field

It shall be optional whether the II+CIN digits are sent or not as specified in the Automatic Number Identification option clause of the EANA Signaling protocol.

4.7.5.2 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol.

4.7.5.3 Connection-hold capabilities

It shall be optional whether connection-hold capabilities are (1) available on all calls and are requested or not on each call by per-call IC-to-EC signaling or (2) not available on any calls. When the not-available option is selected, the EC and IC signaling shall be the same as the Connection-hold capabilities not available or not selected subclause of the EANAOS/Basic Signaling protocol except the signaling protocol shall have an identification-field, address-field, and charge-field sequence.

4.7.6 Time limits

4.7.6.1 Wink-start signal

Same as corresponding subclause in EANA Signaling protocol.

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[14] Contingent upon successful negotiations between the T1 Secretariat and a maintenance agent (administrator), an agent (administrator) will be appointed to administer (1) the list of information items in the information categories and (2) the decimal numbers that are assigned to the information items to form the INF code. (See Committee T1-Telecommunications, INF Code Assignment and Administration.)

4.7.6.2 Wink-start signal guard

Same as corresponding subclause in EANA signaling protocol.

4.7.6.3 Interval between identification, address, and charge fields

Same as corresponding subclause in EANA Signaling protocol.

4.7.6.4 Connect/hold signal and acknowledgment-wink signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.6.5 Answer signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.6.6 Supplementary OS signals

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.6.7 Maintenance call clearing

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.6.8 Disconnect timing interval

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.6.9 Maintenance timing interval

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.6.10 Trunk guard interval

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.7 Incomplete calls and irregularities

4.7.7.1 Wink-start signal time out

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.7.2 All trunks busy and seizure failure

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.7.3 No connect/hold signal or acknowledgment-wink signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.7.7.4 Invalid code

Same as corresponding subclause in EANA Signaling protocol.

4.7.7.5 False answer

Same as corresponding subclause in the EANA Signaling protocol.

4.7.7.6 Glare

Same as corresponding subclause in EANA Signaling protocol.

4.7.7.7 Maintenance call clearing

Same as corresponding subclause in EANAOS/Basic Signaling protocol.

4.8 EAIOS/Basic Signaling

4.8.1 Base specifications

4.8.1.1 General description

In the EAIOS/Basic Signaling protocol, INC connotes either an INC or a consolidated carrier handling a call outside WZ1.

The protocol has the capability to provide connection-hold capabilities or not. The connection-hold capabilities provide INC control of the connection disconnect, INC-to-EC supplementary OS signaling, and EC-to-INC OS-recall signaling. The availability of connection-hold capabilities is indicated by fixed relationships between call information types (indicated by information in the identification field) and the availability of connection-hold capabilities.[7)]

For the interface disconnect sequences used by the protocol, the disconnect-control office is (1) on the INC side of the E-I interface when the connection-hold capabilities are available and selected and (2) on the EC side when they are either not available or not selected.

4.8.1.2 Nominal sequences

There are two different nominal sequences depending on whether connection-hold capabilities are (1) both available and selected on the call or (2) not available or not selected.

4.8.1.2.1 Connection-hold capabilities available and selected

The nominal EC-to-INC call signaling sequence (see also 1.1, third paragraph) when connection-hold capabilities and all signaling fields are used shall be as follows:

a) After receipt of sufficient information from the calling user to determine the INC to be accessed, the EC shall initiate action to seize a trunk to the INC;

b) The INC shall respond to the trunk seizure with a wink-start signal;

c) After receiving the wink-start signal, the EC shall send the country address field to the INC;

d) When the country-address field is received, the INC shall return the second-wink signal to the EC;

e) Upon receipt of the second-wink signal, the EC shall outpulse the identification and address fields;

f) Except that INC replaces IC, the remainder of the nominal sequence is the same as the steps following the EC outpulsing of the identification and address field in the EANAOS/Basic Signaling protocol when connection-hold capabilities are used.

4.8.1.2.2 Connection-hold capabilities not available or not selected

The nominal EC-to-INC call signaling sequence (see also 1.1, third paragraph) when all signaling fields are used but connection-hold capabilities are either not available or not selected shall be as follows:

a) After receipt of sufficient information from the calling user to determine the INC to be accessed, the EC shall initiate action to seize a trunk to the INC;

b) The INC shall respond to the trunk seizure with a wink-start signal;

c) After receiving the wink-start signal, the EC shall send the country address field to the INC;

d) When the country-address field is received, the INC shall return the second-wink signal to the EC;

e) Upon receipt of the second-wink signal, the EC shall outpulse the identification and address fields;

f) Except that INC replaces IC, the remainder of the nominal sequence is the same as the steps following the EC outpulsing of the identification and address field in the EANAOS/Basic Signaling protocol when connection-hold capabilities are not used.

4.8.2 Distinguishing characteristics

The following are the distinguishing characteristics of the signaling protocol determined from comparing the signaling protocol standards in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the INC;
- The protocol usage exceptions given in the Protocol Combination subclause, 3.2.2, distinguish between signaling protocols that contain pulsing that is the same in more than one signaling protocol and that are used on trunks using other EC-to-INC and, for consolidated carriers, other EC-to-IC exchange access signaling protocols;
- There are either 9 or 10 digits between the KP and ST signals in the first MF-pulse field (country address field);
- Either 2 or 12 digits are between the KPV and ST signals in the second MF-pulse field (identification field);
- The first 2 digits of the identification field are assigned II codes associated with call types handled by this protocol; [11]
- The ST signal (no primes) ends the identification field.

4.8.3 Specific example

A specific example of a call using the signaling protocol with the connection-hold capabilities available and selected is shown in figure 9. A specific example of a call using the signaling protocol where connection-hold capabilities are either not available or available and not selected is shown in figure 10.

4.8.4 Variations

4.8.4.1 Call types

The signaling protocol shall accommodate the following call types:

- Call types that require special handling and that are intended for call completion within WZ1 but outside the forty-eight contiguous states of the United States;
- Call types that require special handling and that are intended for call completion outside WZ1.

4.8.4.2 MF pulse field

Table 15 gives the variations in the fields that may appear at the E-I interface. Also included for illustrative purposes only are example calling user-to-EC dialing sequences that might produce the MF-pulse field contents shown.

The pulse field contents that are, and are not, present on each E-I interface depend on the call types that the EC is allowed or required to provide at the E-I interface location, the EC switching system capabilities, the INC switching system capabilities, and the EC and INC agreements. These same services, capabilities, and agreements will determine the EC handling of particular calling user-to-EC dialing sequences.

4.8.4.3 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol except reference in table 15 and INC replaces IC.

4.8.4.4 International system routing codes

Same as corresponding subclause in EAI Signaling protocol.

4.8.4.5 Carrier identifier

Same as corresponding subclause in EAI Signaling protocol.

4.8.4.6 Country code

Same as corresponding subclause in EAI Signaling protocol.

4.8.4.7 National number

Same as corresponding subclause in EAI Signaling protocol.

4.8.4.8 World Zone 1

Same as corresponding subclause in EAI Signaling protocol.

4.8.4.9 INC-to-EC supplementary 0S signals

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.4.10 EC-to-INC OS-recall signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.4.11 Connection-hold capabilities not available or not selected

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.4.12 Disconnect sequence

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.4.13 Test calls

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.8.5 Options

4.8.5.1 Carrier class

Same as corresponding subclause in EAI Signaling protocol except EAIOS/Basic Signaling protocol replaces EAI.

4.8.5.2 Digits in identification field

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.5.3 Call characteristic indicators

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.8.6 Time limits

4.8.6.1 Wink-start signal

Same as corresponding subclause in EAI Signaling protocol.

4.8.6.2 Wink-start signal guard

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.8.6.3 Second-wink signal

Same as corresponding subclause in EAI Signaling protocol.

4.8.6.4 Second-stage pulsing

Same as corresponding subclause in EAI Signaling protocol.

4.8.6.5 Interval between identification and address fields

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.8.6.6 Connect/hold signal and acknowledgment-wink signal

A connect/hold signal or an acknowledgment-wink signal shall be returned between 200 milliseconds and 7.5 seconds after receipt of the complete address field. The INC should not

attempt to use the talking path for communication with the calling user prior to returning either a connect/hold signal or an acknowledgment-wink signal.

4.8.6.7 Answer signal

When the INC sends an answer signal to the EC, the INC shall provide an on-hook state continuing for at least 250 milliseconds between the acknowledgment-wink signal and the answer signal (off-hook). For calls without connection-hold capabilities, the maximum time between signals is given in the EAI Signaling protocol.

4.8.6.8 Supplementary OS signals

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.6.9 Maintenance call clearing

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.6.10 Disconnect timing interval

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.6.11 Maintenance timing interval

On a call without connection-hold capabilities, maintenance timing shall be the same as the EAI Signaling protocol.

4.8.6.12 Trunk guard interval

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.8.7 Incomplete calls and irregularities

4.8.7.1 Wink-start signal time out

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.7.2 Second-wink signal time out

If an EC second-wink signal time out occurs, the EC shall release the trunk and return an announcement or tone to the calling user.

4.8.7.3 All trunks busy and seizure failure

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.7.4 No connect/hold signal or acknowledgment-wink signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.8.7.5 Invalid code

Same as corresponding subclause in EAI Signaling protocol.

4.8.7.6 False answer

For calls without connection-hold capabilities, the EC shall respond to false answer the same as the EANA Signaling protocol.

4.8.7.7 Glare

Same as corresponding subclause in EANA Signaling protocol except INC replaces IC.

4.8.7.8 Maintenance call clearing

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9 EAIOS/Expanded Signaling Protocol

4.9.1 Base specifications

4.9.1.1 General description

In the EAIOS/Expanded Signaling protocol, INC connotes either an INC or a consolidated carrier handling a call outside WZ1.

The protocol provides connection-hold capability signals The connection-hold capabilities signaling provides INC control of the connection disconnect, INC-to-EC supplementary OS signaling, and EC-to-INC OS-recall signaling.

For the disconnect sequences used by the protocol, the disconnect-control office is (1) on the INC side of the E-I interface when the connection-hold capabilities are requested and (2) on the EC side when they are not

4.9.1.2 Nominal sequence

The nominal EC-to-INC call signaling sequence, assuming connection-hold capabilities and all signaling fields are required, shall be the same as the EAIOS/Basic Signaling protocol except the step where the EC outpulses the identification and address fields (Step e) is changed to outpulse the identification, address, and charge fields.

4.9.2 Distinguishing characteristics

The following are the distinguishing characteristics of the signaling protocol determined from comparing the signaling protocol standards in clause 4 of this standard:

- The interface seizure signal is sent from the EC to the INC;
- The protocol usage exceptions given in the Protocol Combination subclause, 3.2.2, distinguish between signaling protocols that contain pulsing that is the same in more than one signaling protocol and that are used on trunks using other EC-to-INC and, for consolidated carriers, other EC-to-IC exchange access signaling protocols;
- There are either 9 or 10 digits between the KP and ST signals in the first MF-pulse field (country address field);
- The ST signal (no primes) ends the second field (identification field);
- An ST1P ends the third field (address field);
- Either 5, 15, 19, or 22 through 28 digits are between the KP and ST signals in the fourth MF-pulse field (charge field).

4.9.3 Specific example

A specific example of a call using the signaling protocol is shown in figure 11.

4.9.4 Variations

4.9.4.1 Call types

The signaling protocol shall accommodate the following call types:

- Call types that require special handling and that are intended for call completion with WZ1 but outside the forty-eight contiguous states of the United States;
- Call types that require special handling and that are intended for call completion outside WZ1.

4.9.4.2 MF pulse field

Same as corresponding subclause in EANAOS/Expanded Signaling protocol except reference is table 16 and INC replaces IC.

4.9.4.3 Call characteristic indicators

Same as corresponding subclause in EANAOS/Expanded Signaling protocol except reference is table 16.

4.9.4.4 International system routing codes

Same as corresponding subclause in EAI Signaling protocol.

4.9.4.5 Carrier identifier

Same as corresponding subclause in EAI Signaling protocol.

4.9.4.6 Country code

Same as corresponding subclause in EAI Signaling protocol.

4.9.4.7 National number

Same as corresponding subclause in EAI Signaling protocol.

4.9.4.8 World Zone 1

Same as corresponding subclause in EAI Signaling protocol.

4.9.4.9 INC-to-EC supplementary OS signals

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.4.10 EC-to-INC OS-recall signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.4.11 Connection-hold not available or not selected

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC and signals follow identification-field, address-field, and charge-field sequence.

4.9.4.12 Disconnect sequence

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.4.13 Test calls

Same as corresponding subclause in EANA Signaling protocol.

4.9.5 Options

4.9.5.1 Carrier class

Same as corresponding subclause in EAI Signaling protocol except EAIOS/Expanded Signaling protocol replaces EAI Signaling protocol.

4.9.5.2 Digits in identification field

Same as corresponding subclause in EANAOS/Expanded Signaling protocol.

4.9.5.3 Call characteristic indicators

Same as corresponding subclause in EANAOS/Expanded Signaling protocol.

4.9.5.4 Connection-hold capabilities

Same as corresponding subclause in EANAOS/Expanded Signaling protocol except INC replaces IC.

4.9.6 Time limits

4.9.6.1 Wink-start signal

Same as corresponding subclause in EAI Signaling protocol.

4.9.6.2 Wink-start signal guard

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.6.3 Second-wink signal

Same as corresponding subclause in EAI Signaling protocol.

4.9.6.4 Second-stage pulsing

Same as corresponding subclause in EAI Signaling protocol.

4.9.6.5 Interval between identification, address, and charge fields

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.6.6 Connect/hold signal or acknowledgment-wink signal

Same as corresponding subclause in EAIOS/Basic Signaling protocol.

4.9.6.7 Answer signal

Same as corresponding subclause in EAIOS/Basic Signaling protocol.

4.9.6.8 Supplementary OS signals

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.6.9 Maintenance call clearing

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.6.10 Disconnect timing interval

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.6.11 Maintenance timing interval

Same as corresponding subclause in EAI Signaling protocol.

4.9.6.12 Trunk guard interval

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.7 Incomplete calls and irregularities

4.9.7.1 Wink-start signal time out

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.7.2 Second-wink signal time out

Same as corresponding subclause in EAIOS/Basic Signaling protocol.

4.9.7.3 All trunks busy and seizure failure

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.7.4 No connect/hold signal or acknowledgment-wink signal

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.7.5 Invalid code

Same as corresponding subclause in EAI Signaling protocol.

4.9.7.6 False answer

Same as corresponding subclause in the EANA Signaling protocol.

4.9.7.7 Glare

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.9.7.8 Maintenance call clearing

Same as corresponding subclause in EANAOS/Basic Signaling protocol except INC replaces IC.

4.10 IC-to-EC Access Signaling

4.10.1 Base specifications

4.10.1.1 General description

The IC-to-EC Access Signaling protocol shall be applicable for IC calls crossing the E-I Interface toward the EC.

For the disconnect sequence, the disconnect-control office shall be on the IC side of the E-I interface.

4.10.1.2 Nominal sequence

The nominal IC-to-EC call signaling sequence shall be as follows:

a) The IC shall seize a trunk to the EC and apply a connect signal (off-hook) to the trunk;

b) The EC shall respond with a wink-start signal, which informs the IC that the EC is ready to receive the address field;

c) Upon receipt of this wink-start signal from the EC, the IC shall MF outpulse the address field;

d) The EC shall screen and translate this address field and complete the call to the proper line in the access service area;

e) The EC shall provide call progress tones and announcements;

f) When the called user answers, answer supervision (off-hook) shall be passed to the IC by the EC;

g) Depending on whether the IC or the EC initiates call clearing, one of the following two sequences shall occur:

1) If the IC is the first to be finished with the call (e.g., because of calling user hang-up), the following shall occur:

i) The IC shall terminate use of the talking path through the interface to the EC, should clear the IC connection, and shall send the disconnect signal (on-hook) to the EC;

ii) When the EC detects the IC disconnect signal, the EC shall send the EC disconnect signal (on-hook) to the IC and should clear the EC connection.

2) If the EC is the first to be finished with the call (e.g., because of called user hang-up), the following shall occur:

i) The EC shall send the hang-up signal (on-hook) to the IC. The interface remains dedicated to the call, but the EC may interrupt the talking path through the interface to the IC;

ii) Then the IC receives the EC hang-up signal and determines that disconnect should occur (e.g., when the disconnect-control office sends a disconnect signal because it either receives the calling user hang-up signal or the disconnect timing interval expires), the IC (a) shall send the IC disconnect signal (on-hook) to the EC, (b) shall terminate use of the interface for the call, and (c) should clear the IC connection.

iii) Upon receipt of the IC disconnect, the EC shall terminate use of the interface for the call and should clear the EC connection.

4.10.2 Distinguishing characteristics

The following are the distinguishing characteristics of the IC-to-EC Access Signaling protocol determined from comparing the signaling protocols in clause 4 of this standard:

- The interface seizure signal is sent from the IC to the EC;
- The protocol can appear on trunks that also use other IC-to-EC exchange access protocols;
- The KP signal (no primes) starts the address field.

4.10.3 Specific example

A specific example of a call using the IC-to-EC Access protocol is shown in figure 12.

4.10.4 Variations

4.10.4.1 Call types

The IC-to-EC Access protocol shall accommodate the following call types:

- IC-to-EC calls to directory numbers;
- IC-to-EC calls to directory assistance;
- IC-to-EC calls to test lines.

The variations in the address field based on the intended destination for the call are summarized in table 17.

4.10.4.2 Disconnect sequence

The EC may send a request to cancel the EC-initiated call clearing sequence and to reestablish the talking path through the interface to the IC by removing the EC hang-up signal. The IC shall honor the request if the signal arrives before the IC initiates the IC disconnect sequence.

4.10.5 Option

4.10.5.1 Number of digits

The EC specifies whether the address consists of 7 or 10 digits.

4.10.6 Time limits

4.10.6.1 Wink-start signal

The EC shall complete the wink-start signal to the POT within 3.5 seconds from the time of seizure of the trunk.

4.10.6.2 Address field

The IC shall start sending the address MF-pulse field to the EC within 3.5 seconds of receipt of the wink-start signal.

4.10.6.3 Disconnect timing interval

After receiving the EC hang-up signal in an EC-initiated call clearing sequence, the IC shall forward the hang-up signal to the disconnect-control office where a disconnect timing interval shall be initiated. The disconnect timing interval shall be between 10 and 12 seconds in length.

4.10.6.4 Maintenance timing interval

After sending the EC hang-up signal in an EC-initiated call clearing sequence, the EC may initiate a maintenance timing interval that shall be a minimum of 30 seconds.

4.10.6.5 Trunk guard interval

On EC-initiated call clearing sequences, the IC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the IC returns the IC disconnect signal (on-hook). On IC-initiated call clearing sequences, the IC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the IC disconnect signal (on-hook). On an IC-initiated call clearing sequence on a two-way trunk, the EC shall not send a new interface seizure signal for a minimum of 750 milliseconds after the EC returns the EC disconnect signal (on-hook).

4.10.7 Incomplete calls and irregularities

4.10.7.1 Time out

If the various signals described above are not transmitted within the specified times, the call shall be routed to an announcement, or tone.

4.10.7.2 Invalid code

If the call cannot be completed because the addressed station does not subtend the EC switch receiving the call, the EC shall return an announcement or tone.

4.10.7.3 Busy

If the called line is off-hook, the EC shall return an announcement or tone.

4.10.7.4 Maintenance call clearing

If the EC does not receive an IC disconnect signal before an EC maintenance timing interval expires, the EC may terminate use of the interface for the call, clear the IC connection, and, on two-way trunks, make the interface unavailable for EC-to-IC interface seizures until the IC disconnect is received.

4.11 IC-to-EC Facility/Service Selective Signaling

4.11.1 Base specifications

4.11.1.1 General description

The IC-to-EC Facility/Service Selective Signaling protocol is a protocol for IC-to-EC calls. It shall provide the features of facility code and service code selection in addition to the features furnished with the IC-to-EC Access Signaling protocol. For the disconnect sequence, the disconnect-control office shall be on the IC side of the E-I interface.

The address field shall contain a Service Code (SC), a Facility Code (FC), or both. To identify the different address field contents, different KP-primed signals[15] shall be used as the first

[15] The MF-pulse signals representing KP1P, KP2P, and KP3P have the same frequency combinations as the ST1P, ST2P, and ST3P signals, respectively. The relative positions in the address field differentiate the KP-primed signals from the ST-primed signals.

signal of the address field. The different KP-primed signals shall indicate the presence or absence of service and facility codes in the address field as shown in table 7.

4.11.1.2 Nominal sequence

The nominal IC-to-EC Facility/Service Selective Signaling call signaling sequence shall be as follows:

a) The IC shall seize a trunk to the EC and apply a connect signal (off-hook) to the trunk;

b) The EC shall respond with a wink-start signal, which informs the IC that the EC is ready to receive the address field;

c) Upon receipt of the wink-start signal from the EC, the IC shall send the address field;

d) The EC shall screen and translate the address field and complete the call in accordance with the given facility code or service code, or both;

e) The EC shall send the IC call progress tones and announcements;

f) When the called user answers, answer supervision (off-hook) shall be passed to the IC by the EC;

g) Depending on whether the IC or the EC initiates call clearing, one of the following two sequences shall occur:

1) If the IC is the first to be finished with the call (e.g., because of calling, user hang-up), the following shall occur:

i) The IC shall terminate use of the talking path through the interface to the EC, should clear the IC connection, and shall send the disconnect signal (on-hook) to the EC;

ii) When the EC detects the IC disconnect signal, the EC shall send the EC disconnect signal (on-hook) to the IC and should clear the EC connection.

2) If the EC is the first to be finished with the call (e.g., because of called user hang-up), the following shall occur:

i) The EC shall send the hang-up signal (on-hook) to the IC. The interface remains dedicated to the call, but the EC may interrupt the talking path through the interface to the IC.

ii) When the IC receives the EC hang-up signal and determines that disconnect should occur (e.g., when the disconnect-control office sends a disconnect signal because it either receives the calling user hang-up signal or the disconnect timing interval expires), the IC (a) shall send the IC disconnect signal (on-hook) to the EC, (b) shall terminate use of the interface for the call, and (c) should clear the IC connection.

iii) Upon receipt of the IC disconnect, the EC shall terminate use of the interface for the call and should clear the EC connection.

4.11.2 Distinguishing characteristics

The following are the distinguishing characteristics of the IC-to-EC Facility/Service Selective Signaling protocol determined from comparing the signaling protocols in clause 5 of this standard:

- The interface seizure signal is sent from the IC to the EC;
- The protocol can appear on trunks that also use other IC-to-EC exchange access protocols;
- Either the KP1P, KP2P, or KP3P signal starts the address field.

4.11.3 Specific example

A specific example of a call using the IC-to-EC Facility/Service Selective Signaling protocol is shown in figure 13.

4.11.4 Variations

4.11.4.1 Call types

The variations in the address field, which are based on the intended facility, service, and destination of the call, shall be as given in table 18.

4.11.4.2 Disconnect sequence

The EC may send a request to cancel the EC-initiated call clearing sequence and to reestablish the talking path through the interface to the IC by removing the EC hang-up signal. The IC shall honor the request if the signal arrives before the IC initiates the IC disconnect sequence.

4.11.4.3 Service code and address digits

The address digits associated with a service code shall have either (1) a Fixed format or (2) an Open format. Service codes apply industry wide in that a code identifies the same format type for all service providers.

4.11.4.4 Fixed format

Fixed-format addresses shall conform to the North American Numbering Plan, which is described in Bellcore "Numbering Plan and Dialing Procedures" in *BOC Notes on the LEC Networks - 1990.*

4.11.4.5 Open format

Open-format addresses shall consist of a sequence of unrestricted digits that may be any length from 0 to 15 digits, inclusive.

4.11.5 Option

4.11.5.1 Number of digits

The EC specifies whether the fixed format addresses contains 7 or 10 digits.

4.11.6 Time limits

Same as corresponding subclause in the IC-to-EC Access Signaling protocol.

4.11.7 Incomplete calls and irregularities

Same as corresponding subclause in the IC-to-EC Access Signaling protocol.

Table 1 – Notation conventions for signaling protocol field contents

Notation	Name	Description or contents
Symbols		
D	Digit(s)	Each digit 0 to 9
KP	Key Pulse	Start of field signal
KP1P	Key Pulse – 1 Prime	Start of field signal
KP2P	Key Pulse – 2 Prime	Start of field signal
KP3P	Key Pulse – 3 Prime	Start of field signal
KPV	Key Pulse Variable	Start of field signal, KP, KP1P, KP2P, or KP3P
NIDB	Number information data base	Generic data base name
ST	Start Pulse	End of field signal
ST1P	Start Pulse – 1 Prime	End of field signal
ST2P	Start Pulse – 2 Prime	End of field signal
ST3P	Start Pulse – 3 Prime	End of field signal
WZ1	World Zone 1	International address using North American Numbering Plan
+	Field separator	Not transmitted
( )	Variable inclusion	Contents may not be required
Digits		
0 to 9	Digit	Number 0 to 9 as given
X	Digit	Any number 0 to 9
N	Digit	Any number 2 to 9
N'	Digit	Any number 2 to 9, N' is not N
10D	Number of digits	10 digits
0/7/10D	Number of digits	0,7, or 10 digits
7/10D	Number of digits	7 or 10 digits
3/7/10D	Number of digits	3, 7, or 10 digits
3-10D	Number of digits	3 to 10 digits
10/14/17-23D	Number of digits	10, 14, or 17-to-23 digits
Codes		
AD	Address digits	0 to 15 digits
ANI	Automatic Number Identification	3, 7, or 10 digits
CAC	Carrier Access Code	Currently 5 digits (10XXX), last 3 each 0 to 9, where XXX is carrier identification code. See 1.3.6 for future CACs.
CC	Country Code	1 to 3 digits
CCC	Country Code	Padded 3 digits
CHG	Charged Number Identification	10, 14, or 17-to-23 digits
CIC	Carrier Identification Code	Currently 3 digits (XXX), each 0 to 9. See 1.3.6 for future CICs.
CIN	Call Identification Number	3, 7, or 10 digits
FC	Facility Code	2 digits
II	ANI Information Code	2 digits
INF	OSS Information Code	5 digits
NPA	Numbering Plan Area	3 digits
NN	National Number	National number plan address
SAC	Service Access Code	3 digits
SC	Service Code	2 digits
01R	World Zone 1 Region Code	3 digits, WZ1 outside 48 contiguous states of the United States
1NX	International Routing Code	3 digits
1N'X	International Routing Code	3 digits, N' is not N

Table 2 – Exchange Access North American Signaling

Call type	Example calling user dialing		MF pulse field	
	To use predesignated carrier	To override predesignation	Identification	Address
Direct-dialed distant access service area	(1)+7/10D	CAC+(1)+7/10D	KPV+(II+ANI)+ST	KP+7/10D+ST
Service Access Code Embodied	–	(1)+SAC+7D	KPV+(II+ANI)+ST	KP+SAC+7D+ST
Interexchange assistance				
0+ call	0+7/10D	CAC+0+7/10D	KPV+(II+ANI)+ST	KP+0+7/10D+ST
0– call	00	CAC+0	KPV+(II+ANI)+ST	KP+0+ST
Home access service area	CAC+(1)+7/10D	CAC+(1)+7/10D	KPV+(II+ANI)+ST	KP+7/10D+ST
Test line	10X	–	–	KP+10X+ST
	958+XXXX	–	–	KP+958+XXXX+ST
	959+XXXX	–	–	KP+959+XXXX+ST

Table 3 – Example assignments of call characteristic indicators

Indicator(s) provided	Call characteristic		Identification field KPV value
	Calling user signaling	Predesignation indication	
None	–	–	KP
Calling user signaling only			
	Dial Pulse	–	KP
	DTMF	–	KP2P
Predesignation indication only			
		Predesignated IC	KP
		Not Predesignated IC or Don't Know	KP1P
Calling user signaling and predesignation indication			
	Dial Pulse	Predesignated IC	KP
	Dial Pulse	Not Predesignated IC or Don't Know	KP1P
	DTMF	Predesignated IC	KP2P
	DTMF	Not Predesignated IC or Don't Know	KP3P

Table 4 – Example II code assignments for Exchange Access Signaling

Code	Description
00	Identified line – No special treatment
01	ONI (multiparty)
02	ANI failure
06	Hotel/motel
07	Coinless (hospital, inmate, etc)
20	AIOD – Listed directory number sent
27	Coin

NOTE – Excerpted from LERG (see Bellcore, LERG).

Table 5 – Exchange Access International Signaling

	Example calling user dialing		MF pulse field		
Call type	To use predesignated carrier	To override predesignation	Country address	Identification	Address
Direct-dialed outside WZ1	011+CC+NN	CAC+011+CC+NN	KP+1NX+CIC+CCC+ST	KPV+(II+ANI)+ST	KP+CC+NN+ST
International assistance outside WZ1					
0+ call	01+CC+NN	CAC+01+CC+NN	KP+1N'X+CIC+CCC+ST	KPV+(II+ANI)+ST	KP+CC+NN+ST
0– call	00	CAC+0	KP+1N'X+CIC+000+ST	KPV+(II+ANI)+ST	KP+0+ST
Direct-dialed inside WZ1	(1)+10D	CAC+(1)+10D	KP+1NX+CIC+01R+ST	KPV+(II+ANI)+ST	KP+10D+ST
International assistance inside WZ1	0+10D	CAC+0+10D	KP+1N'X+CIC+01R+ST	KPV+(II+ANI)+ST	KP+0+10D+ST
Service Access Code Embodied	—	(1)+SAC+7D	KP+1NX+CIC+010+ST	KPV+(II+ANI)+ST	KP+SAC+7D+ST

Table 6 – Exchange Access Cut-Through Signaling

Carrier class	Example calling user dialing		MF pulse field	
	To use predesignated carrier	To override predesignation	Country address	Identification
Interexchange or consolidated	CAC+#	CAC+#	–	KPV+(II+ANI)+ST1P
International	CAC+#	CAC+#	KP+1NX+CIC+000+ST	KPV+(II+ANI)+ST1P

Table 7 – KP-primed signals in Facility/Service requests

Facility/Service request	Address field KP-primed signal
Service code only	KP1P
Facility code only	KP2P
Facility code and service code	KP3P

Table 8 – EC-to-IC Facility/Service Selective Signaling

Call type	Example calling user dialing		MF pulse field	
	To use predesignated carrier	To override predesignation	Identification	Address
SC only	*SC+AD(#)	CAC+*SC+AD(#)	KPV+(II+ANI)+ST	KP1P+SC+AD+ST
FC only	#FC+AD(#)	#FC+CAC+AD(#)	KPV+(II+ANI)+ST	KP2P+FC+AD+ST
SC & FC	#FC+*SC+AD(#)	#FC+CAC+*SC+AD(#)	KPV+(II+ANI)+ST	KP3P+FC+SC+AD+ST

Key –

AD Address digits, length between 0 and 15 including any prefix (see 4.4.4.7 and 4.4.4.8).
(#) Dialing of # is optional.

Table 9 – Operator Services Signaling for IC calls

Call type	Example calling user dialing		MF pulse field	
	To use predesignated carrier	To override predesignation	Address	Identification
From Non-Coin Line				
To interexchange carrier				
0+ (IN WZ1)	0+7/10D	CAC+0+7/10D	KP+7/10D+ST3P	KP+II+0/7D+ST
1+ (IN WZ1)	(1)+7/10D	CAC+(1)+7/10D	KP+7/10D+ST2P	KP+II+0/7D+ST
0–	00	CAC+0	KP+ST3P	KP+II+0/7D+ST
To international carrier				
0+ (IN WZ1)	0+10D	CAC+0+10D	KP+10D+ST3P	KP+II+0/7D+ST
1+ (IN WZ1)	(1)+10D	CAC+(1)+10D	KP+10D+ST2P	KP+II+0/7D+ST
0–	00	CAC+0	KP+ST3P	KP+II+0/7D+ST
To consolidated or international carrier				
0+ (OUT WZ1)	01+CC+NN	CAC+01+CC+NN	KP+1+CC+NN+ST3P	KP+II+0/7D+ST
1+ (OUT WZ1)	011+CC+NN	CAC+011+CC+NN	KP+1+CC+NN+ST2P	KP+II+0/7D+ST
From Coin Line				
To intererchange carrier				
0+ (IN WZ1)	0+7/10D	CAC+0+7/10D	KP+7/10D+ST1P	KP+II+0/7D+ST
1+ (IN WZ1)	(1)+7/10D	CAC+(1)+7/10D	KP+7/10D+ST	KP+II+0/7D+ST
0–	00	CAC+0	KP+ST1P	KP+II+0/7D+ST
To international carrier				
0+ (IN WZ1)	0+10D	CAC+10D	KP+10D+ST1P	KP+II+0/7D+ST
1+ (IN WZ1)	(1)+10D	CAC+(1)+10D	KP+10D+ST	KP+II+0/7D+ST
0–	00	CAC+0	KP+ST1P	KP+II+0/7D+ST
To consolidated or international carrier				
0+ (OUT WZ1)	01+CC+NN	CAC+01+CC+NN	KP+1+CC+NN+ST1P	KP+II+0/7D+ST
1+ (OUT WZ1)	011+CC+NN	CAC+011+CC+NN	KP+1+CC+NN+ST	KP+II+0/7D+ST

Table 10 – Operator Services Signaling for EC calls routed to an IC operator system

Call type	Example calling user dialing	MF pulse field	
		Address	Identification
From Non-Coin Line			
0+	0+3/7/10D	KP+3/7/10D+ST3P	KP+II+0/7D+ST1P
1+	(1)+3/7/10D	KP+3/7/10D+ST2P	KP+II+0/7D+ST1P
0–	0	KP+ST3P	KP+II+0/7D+ST1P
From Coin Line			
0+	0+3/7/10D	KP+3/7/10D+ST1P	KP+II+0/7D+ST1P
1+	(1)+3/7/10D	KP+3/7/10D+ST	KP+II+0/7D+ST1P
0–	0	KP+ST1P	KP+II+0/7D+ST1P

Table 11 – Example II code assignments for Operator Services Signaling

Code	Description
00	Identified line – No special treatment
01	ONI (multiparty)
02	ANI failure
06	Hotel/motel
07	Coinless (hospital, inmate, etc)
20	AIOD – Listed directory number sent

Table 12 – EANAOS/Basic

Call type	Example calling user dialing	MF pulse field	
		Identification	Address
0+ call	CAC+0+7/10D	KPV+(II+(CIN))+ST	KP+0+7/10D+ST
	0+7/10D	KPV+(II+(CIN))+ST	KP+0+7/10D+ST
	0+*SC+AD(#)	KPV+(II+(CIN))+ST	KP1P+SC+0+AD+ST
	CAC+0+*SC+AD(#)	KPV+(II+(CIN))+ST	KP1P+SC+0+AD+ST
	0+#FC+AD(#)	KPV+(II+(CIN))+ST	KP2P+FC+0+AD+ST
	0+#FC+CAC+AD(#)	KPV+(II+(CIN))+ST	KP2P+FC+0+AD+ST
	0+#FC+*SC+AD(#)	KPV+(II+(CIN))+ST	KP3P+FC+SC+0+AD+ST
	0+#FC+CAC+*SC+AD(#)	KPV+(II+(CIN))+ST	KP3P+FC+SC+0+AD+ST
0– call	CAC+0	KPV+(II+(CIN))+ST	KP+0+ST
	00	KPV+(II+(CIN))+ST	KP+0+ST
1+ call	CAC+(1)+7/10D	KPV+(II+(CIN))+ST	KP+7/10D+ST
	(1)+7/10D	KPV+(II+(CIN))+ST	KP+7/10D+ST
	(1)+*SC+AD(#)	KPV+(II+(CIN))+ST	KP1P+SC+AD+ST
	CAC+(1)+*SC+AD(#)	KPV+(II+(CIN))+ST	KP1P+SC+AD+ST
	(1)+#FC+AD(#)	KPV+(II+(CIN))+ST	KP2P+FC+AD+ST
	(1)+#FC+CAC+AD(#)	KPV+(II+(CIN))+ST	KP2P+FC+AD+ST
	(1)+#FC+*SC+AD(#)	KPV+(II+(CIN))+ST	KP3P+FC+SC+AD+ST
	(1)+#FC+CAC+*SC+AD(#)	KPV+(II+(CIN))+ST	KP3P+FC+SC+AD+ST
Test line	10X		KP+10X+ST
	958+XXXX		KP+958+XXXX+ST
	959+XXXX		KP+959+XXXX+ST

Table 13 — EANAOS/Expanded

Call type	Example calling user dialing	MF pulse field		
		Identification	Address	Charge
0+ call	CAC+0+7/10D	KPV+(II+CIN)+ST	KP+0+0/7/10D+ST1P	KP+INF+CHG+ST
	0+7/10D	KPV+(II+CIN)+ST	KP+0+0/7/10D+ST1P	KP+INF+CHG+ST
	0+*SC+AD(#)	KPV+(II+CIN)+ST	KP1P+SC+0+AD+ST1P	KP+INF+CHG+ST
	CAC+0+*SC+AD(#)	KPV+(II+CIN)+ST	KP1P+SC+0+AD+ST1P	KP+INF+CHG+ST
	0+#FC+AD(#)	KPV+(II+CIN)+ST	KP2P+FC+0+AD+ST1P	KP+INF+CHG+ST
	0+#FC+CAC+AD(#)	KPV+(II+CIN)+ST	KP2P+FC+0+AD+ST1P	KP+INF+CHG+ST
	0+#FC+*SC+AD(#)	KPV+(II+CIN)+ST	KP3P+FC+SC+0+AD+ST1P	KP+INF+CHG+ST
	0+#FC+CAC+*SC+AD(#)	KPV+(II+CIN)+ST	KP3P+FC+SC+0+AD+ST1P	KP+INF+CHG+ST
0– call	CAC+0	KPV+(II+CIN)+ST	KP+0+ST1P	KP+INF+CHG+ST
	00	KPV+(II+CIN)+ST	KP+0+ST1P	KP+INF+CHG+ST
1+ call	CAC+(1)+7/10D	KPV+(II+CIN)+ST	KP+7/10D+ST1P	KP+INF+CHG+ST
	(1)+7/10D	KPV+(II+CIN)+ST	KP+7/10D+ST1P	KP+INF+CHG+ST
	(1)+*SC+AD(#)	KPV+(II+CIN)+ST	KP1P+SC+AD+ST1P	KP+INF+CHG+ST
	CAC+(1)+*SC+AD(#)	KPV+(II+CIN)+ST	KP1P+SC+AD+ST1P	KP+INF+CHG+ST
	(1)+#FC+AD(#)	KPV+(II+CIN)+ST	KP2P+FC+AD+ST1P	KP+INF+CHG+ST
	(1)+#FC+CAC+AD(#)	KPV+(II+CIN)+ST	KP2P+FC+AD+ST1P	KP+INF+CHG+ST
	(1)+#FC+*SC+AD(#)	KPV+(II+CIN)+ST	KP3P+FC+SC+AD+ST1P	KP+INF+CHG+ST
	(1)+#FC+CAC+*SC+AD(#)	KPV+(II+CIN)+ST	KP3P+FC+SC+AD+ST1P	KP+INF+CHG+ST
Test line	10X		KP+10X+ST	
	958+XXXX		KP+958+XXXX+ST	
	959+XXXX		KP+959+XXXX+ST	

Table 14 — INF code structure and example contents

INF code subdivision	Information category(ies) in subdivision	Example information in category
First digit (X– – – –)	Original OSS-access prefix	
		1+
		0+
		0–
	Information-entry type	
		Manual by OSS operator
		Automated at OSS from tone input
		Automated at OSS from spoken input
Second and third digits (–XX – –)	Charge-to type	
		Unknown
		Credit card – Telecommunications Co. format, EC-assigned PIN
		Credit card – Telecommunications Co. format, other-assigned PIN
		Credit card – Telecommunications Co. format, unknown-assigned PIN
		Credit card – Non-telecommunications Co. format
		Collect
		Third number
		Sent paid
	Charge-to number-specific information	
		Information not applicable for call type or information usually provided but EC made no NIDB query[1)]
		Information usually provided but no response from NIDB query
		Information usually provided but NIDB reports information not available
		Information provided and NIDB reports verify by automated method
		Information provided and NIDB reports verify by operator
		Information provided and NIDB reports authorized accept or information not provided by agreement[1)]
	Call-connection type	
		Station-to-station
		Person-to-person
Fourth digit (– – –X–)		
	Calling user special-handling request	
		Call completion
		Time and charge
		Rate information
		Trouble reporting
		Dialing instructions
		Credit reporting
		General assistance
Fifth digit (– – – –X)		
	IC-access determination	
		Carrier access code dialed
		Predesignated carrier
		Primary preferred carrier of charged party
		Alternate preferred carrier of charged party
		Verbal instruction from calling user
		Verbal instruction from charged party
		EC-OSS emergency call handling

1) Differentiation, when desired, may be accomplished by using the other provided call information and the EC-IC agreement.

Table 15 – EAIOS/Basic

Call type	Example calling user dialing	MF pulse field		
		Country address	Identification	Address
0– call	CAC+0 00	KP+1N'X+CIC+000+ST KP+1N'X+CIC+000+ST	KPV+(II+(CIN))+ST KPV+(II+(CIN))+ST	KP+0+ST KP+0+ST
Outside WZ1 0+ call	CAC+01+CC+NN 01+CC+NN	KP+1N'X+CIC+CCC+ST KP+1N'X+CIC+CCC+ST	KPV+(II+(CIN))+ST KPV+(II+(CIN))+ST	KP+CC+NN+ST KP+CC+NN+ST
1+ call	CAC+011+CC+NN 011+CC+NN	KP+1NX+CIC+CCC+ST KP+1NX+CIC+CCC+ST	KPV+(II+(CIN))+ST KPV+(II+(CIN))+ST	KP+CC+NN+ST KP+CC+NN+ST
Inside WZ1 0+ call	CAC+0+10D 0+10D	KP+1N'X+CIC+01R+ST KP+1N'X+CIC+01R+ST	KPV+(II+(CIN))+ST KPV+(II+(CIN))+ST	KP+0+10D+ST KP+0+10D+ST
1+ call	CAC+(1)+10D (1)+10D	KP+1NX+CIC+01R+ST KP+1NX+CIC+01R+ST	KPV+(II+(CIN))+ST KPV+(II+(CIN))+ST	KP+10D+ST KP+10D+ST
Test line	10X 958+XXXX 959+XXXX			KP+10X+ST KP+958+XXXX+ST KP+959+XXXX+ST

Table 16 – EAIOS/Expanded

Call type	Example calling user dialing	MF pulse field			
		Country address	Identification	Address	Charge
0– call	CAC+0	KP+1N'X+CIC+000+ST	KPV+(II+CIN)+ST	KP+0+ST1P	KP+INF+CHG+ST
	00	KP+1N'X+CIC+000+ST	KPV+(II+CIN)+ST	KP+0+ST1P	KP+INF+CHG+ST
Outside WZ1					
0+ call	CAC+01+CC+NN	KP+1N'X+CIC+CCC+ST	KPV+(II+CIN)+ST	KP+CC+NN+ST1P	KP+INF+CHG+ST
	01+CC+NN	KP+1N'X+CIC+CCC+ST	KPV+(II+CIN)+ST	KP+CC+NN+ST1P	KP+INF+CHG+ST
1+ call	CAC+011+CC+NN	KP+1NX+CIC+CCC+ST	KPV+(II+CIN)+ST	KP+CC+NN+ST1P	KP+INF+CHG+ST
	011+CC+NN	KP+1NX+CIC+CCC+ST	KPV+(II+CIN)+ST	KP+CC+NN+ST1P	KP+INF+CHG+ST
Inside WZ1					
0+ call	CAC+0+10D	KP+1N'X+CIC+01R+ST	KPV+(II+CIN)+ST	KP+0+10D+ST1P	KP+INF+CHG+ST
	0+10D	KP+1N'X+CIC+01R+ST	KPV+(II+CIN)+ST	KP+0+10D+ST1P	KP+INF+CHG+ST
1+ call	CAC+(1)+10D	KP+1NX+CIC+01R+ST	KPV+(II+CIN)+ST	KP+10D+ST1P	KP+INF+CHG+ST
	(1)+10D	KP+1NX+CIC+01R+ST	KPV+(II+CIN)+ST	KP+10D+ST1P	KP+INF+CHG+ST
Test line	10X			KP+10X+ST	
	958+XXXX			KP+958+XXXX+ST	
	959+XXXX			KP+959+XXXX+ST	

Table 17 – IC-to-EC Access Signaling

Call type	MF pulse field Address
Directory number	KP+7/10D+ST
Directory assistance	KP+555+1212+ST KP+NPA+555+1212+ST
Test	KP+10X+ST KP+958+XXXX+ST KP+959+XXXX+ST

Table 18 – IC-to-EC Facility/Service Signaling

Call type	MF pulse field Address
Service code only	KP1P+SC+AD+ST
Facility code only	KP2P+FC+AD+ST
Facility code and Service code	KP3P+FC+SC+AD+ST

Key –

AD Address digits, length between 0 and 15 including any prefix (see 4.11.4.4 and 4.11.4.5).

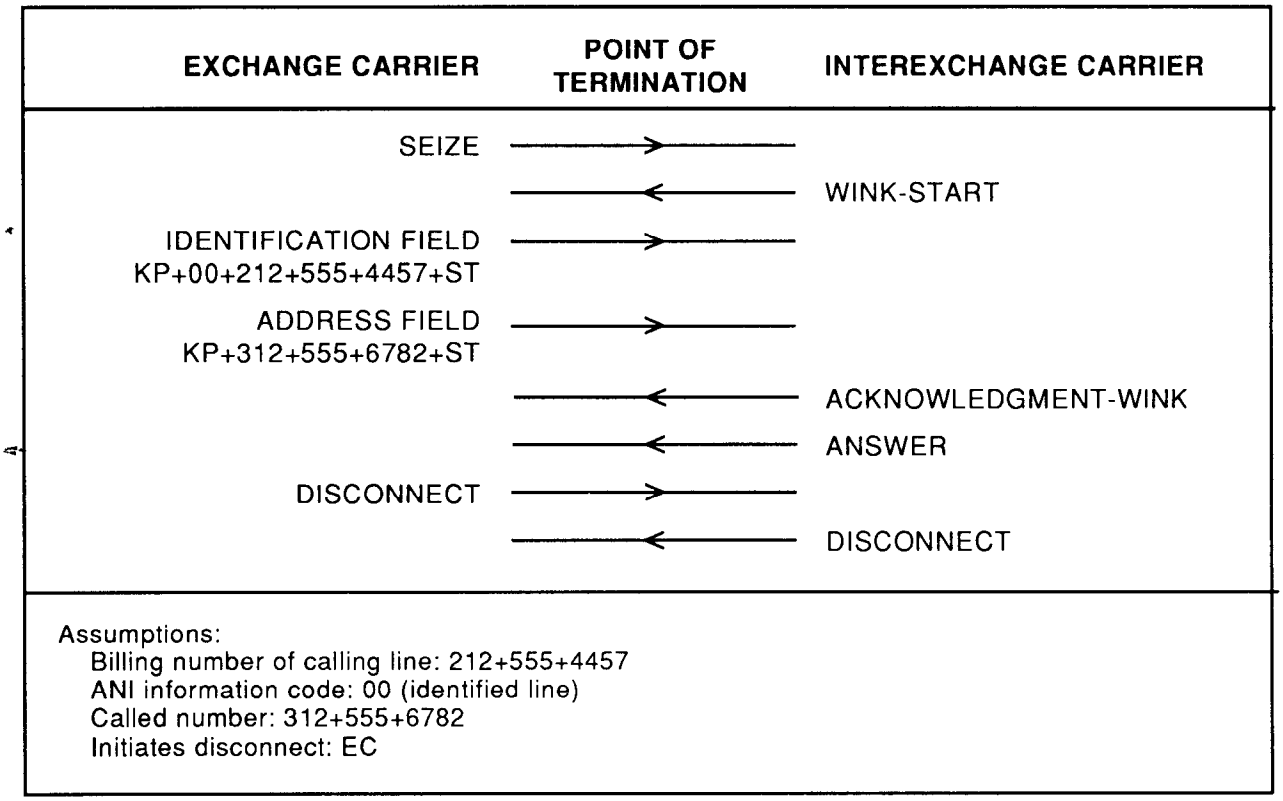

Figure 1 – Direct dialed call to IC for completion in WZ1

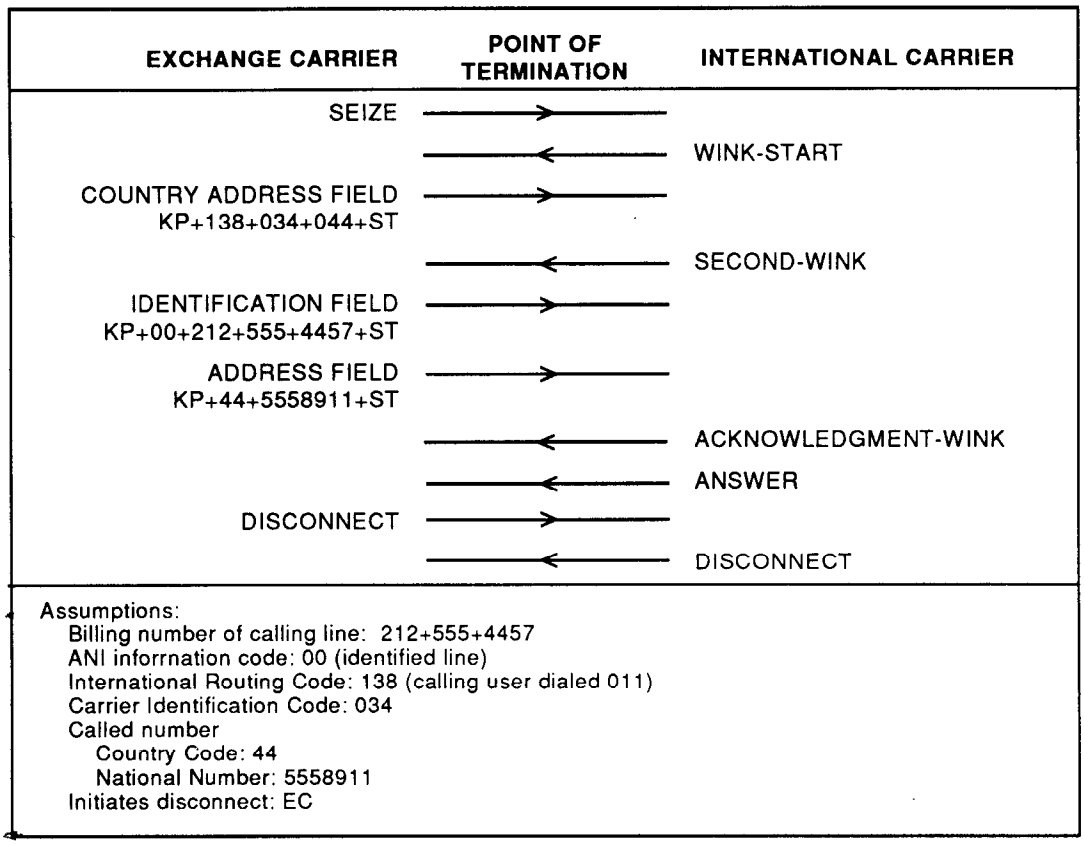

Figure 2 – Direct dialed EC-to-INC call for completion outside WZ1

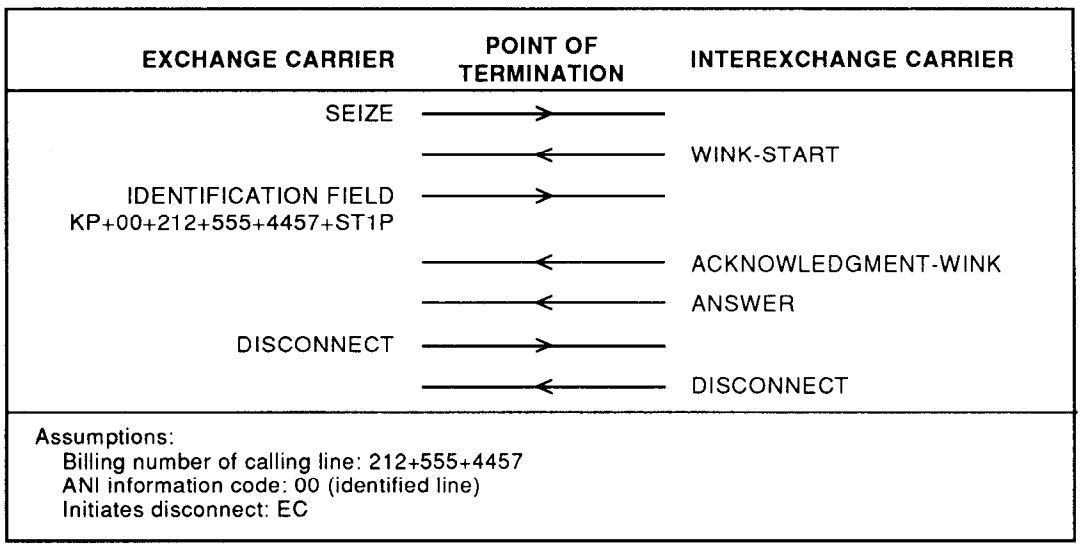

Figure 3 – Cut-through originating call to IC

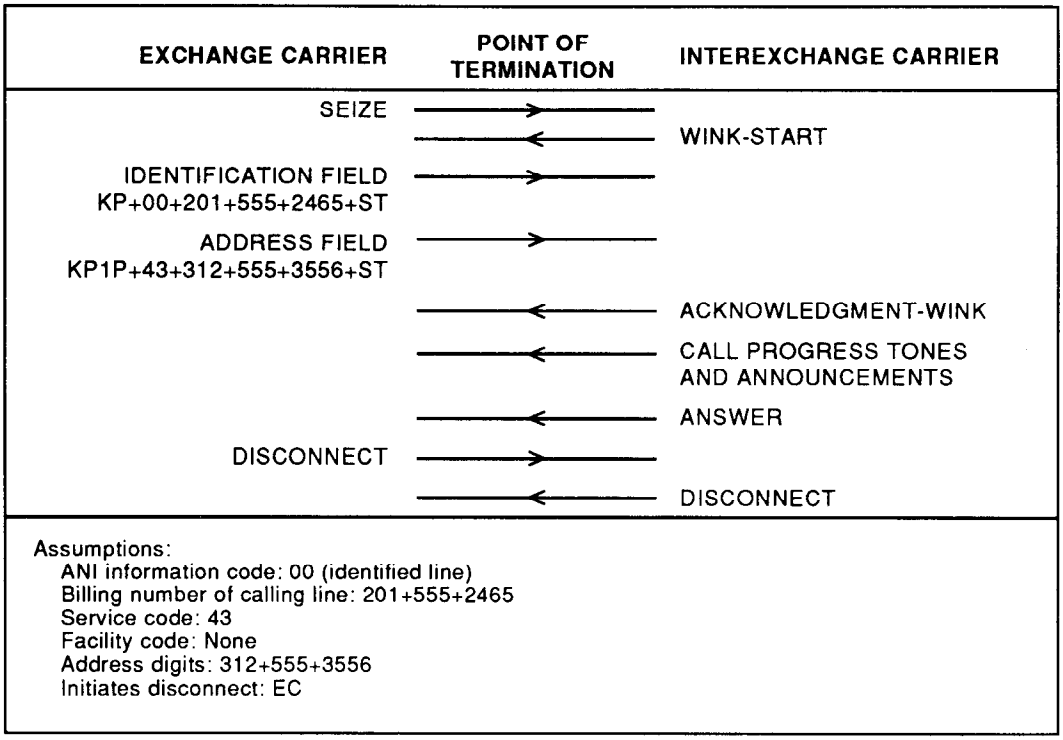

Figure 4 – Service-type call to IC

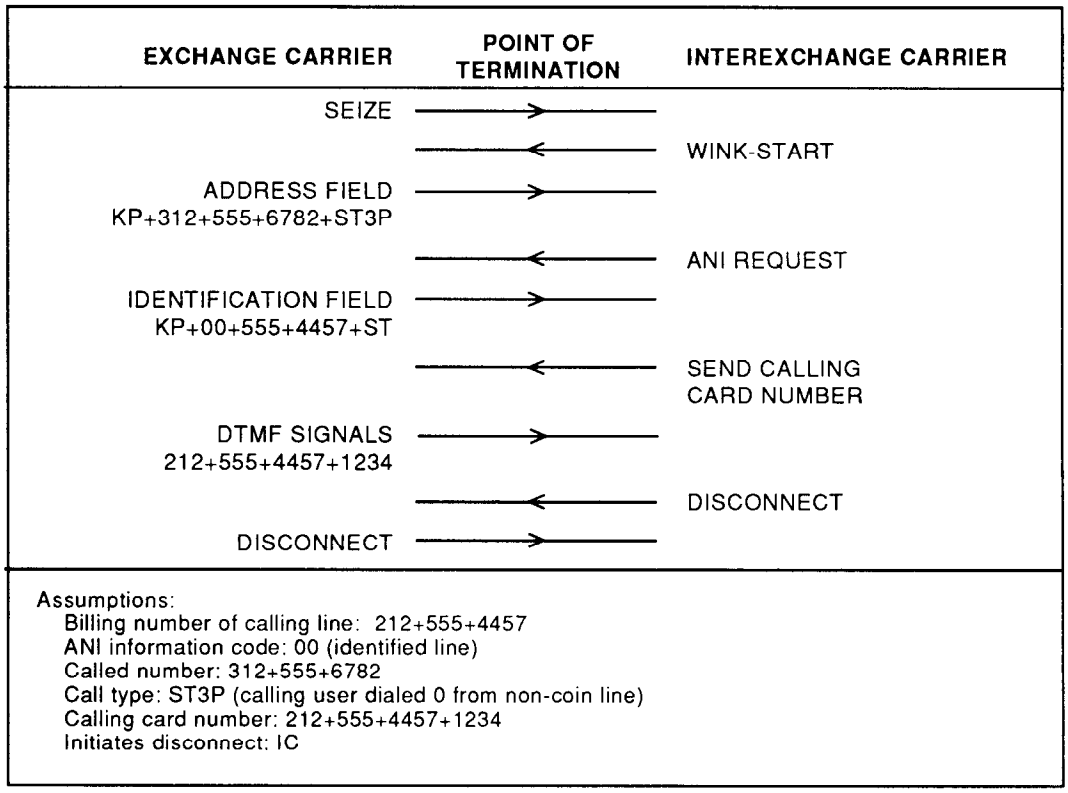

Figure 5 – Operator services EC-to-IC call for completion in WZ1

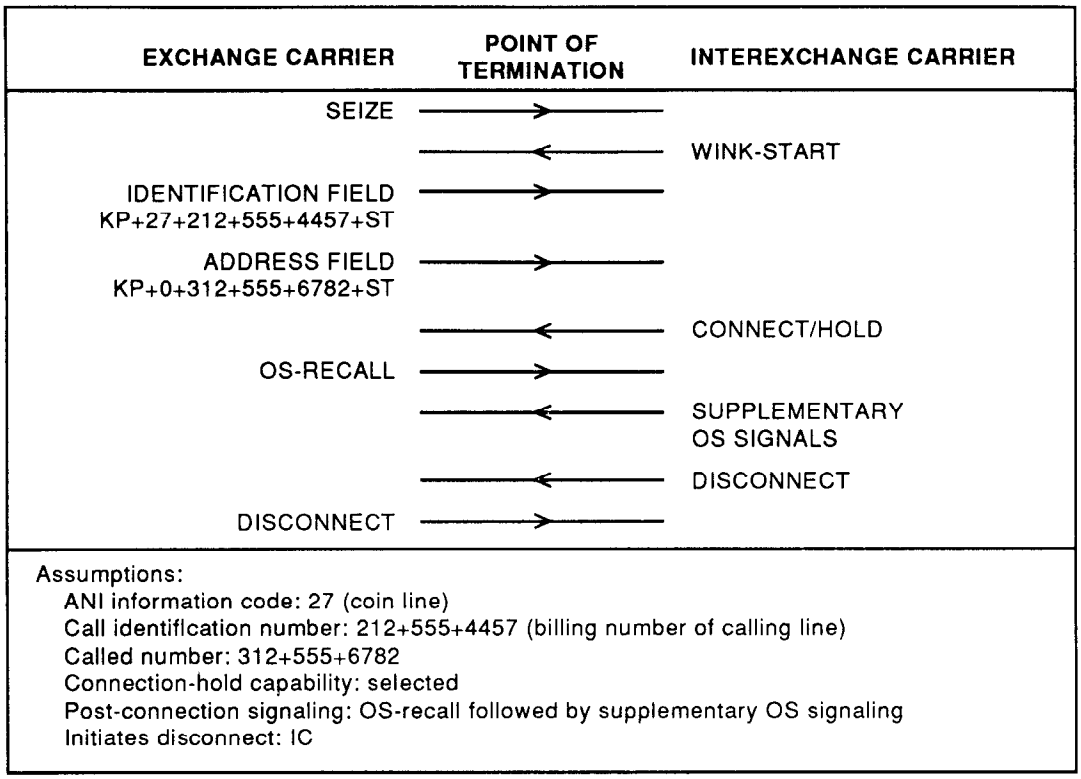

Figure 6 – EANAOS/Basic with connection-hold capabilities selected

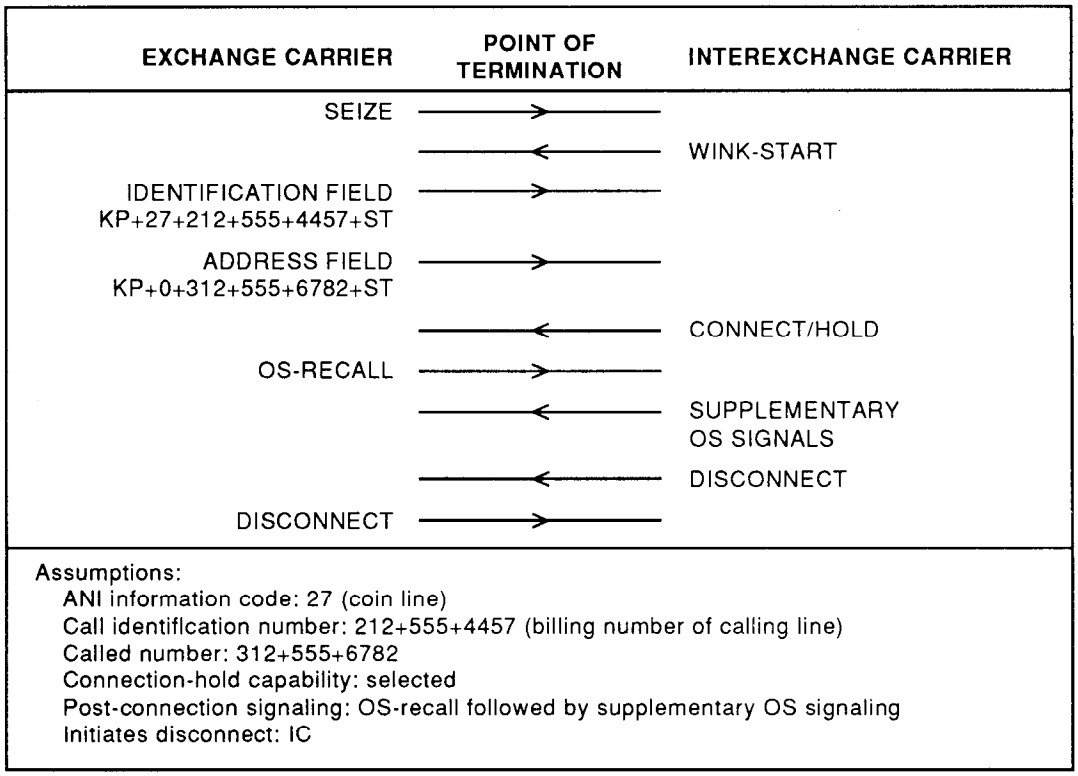

Figure 7 – EANAOS/Basic without connection-hold capabilities

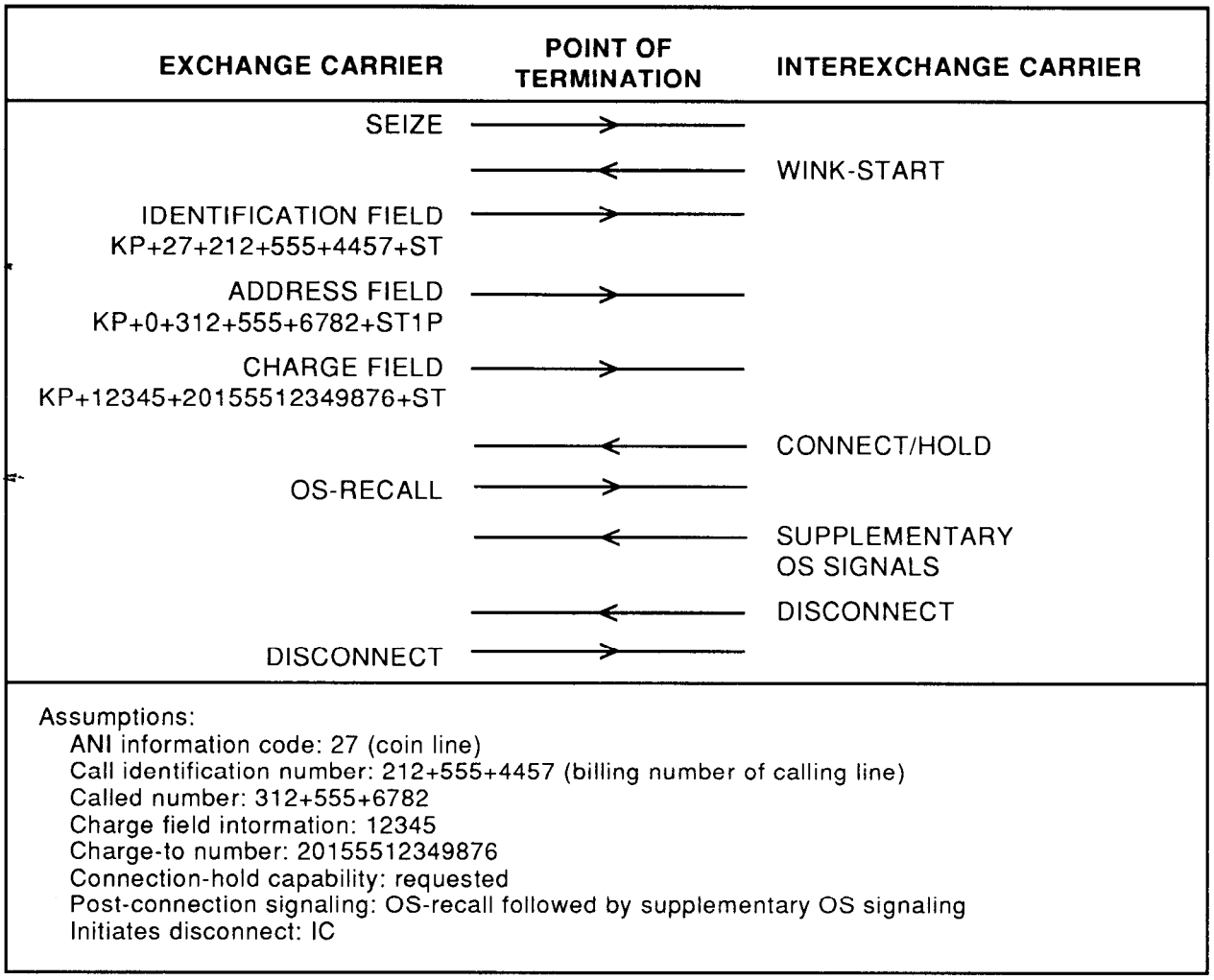

Figure 8 – EANAOS/Expanded with connection-hold capabilities selected

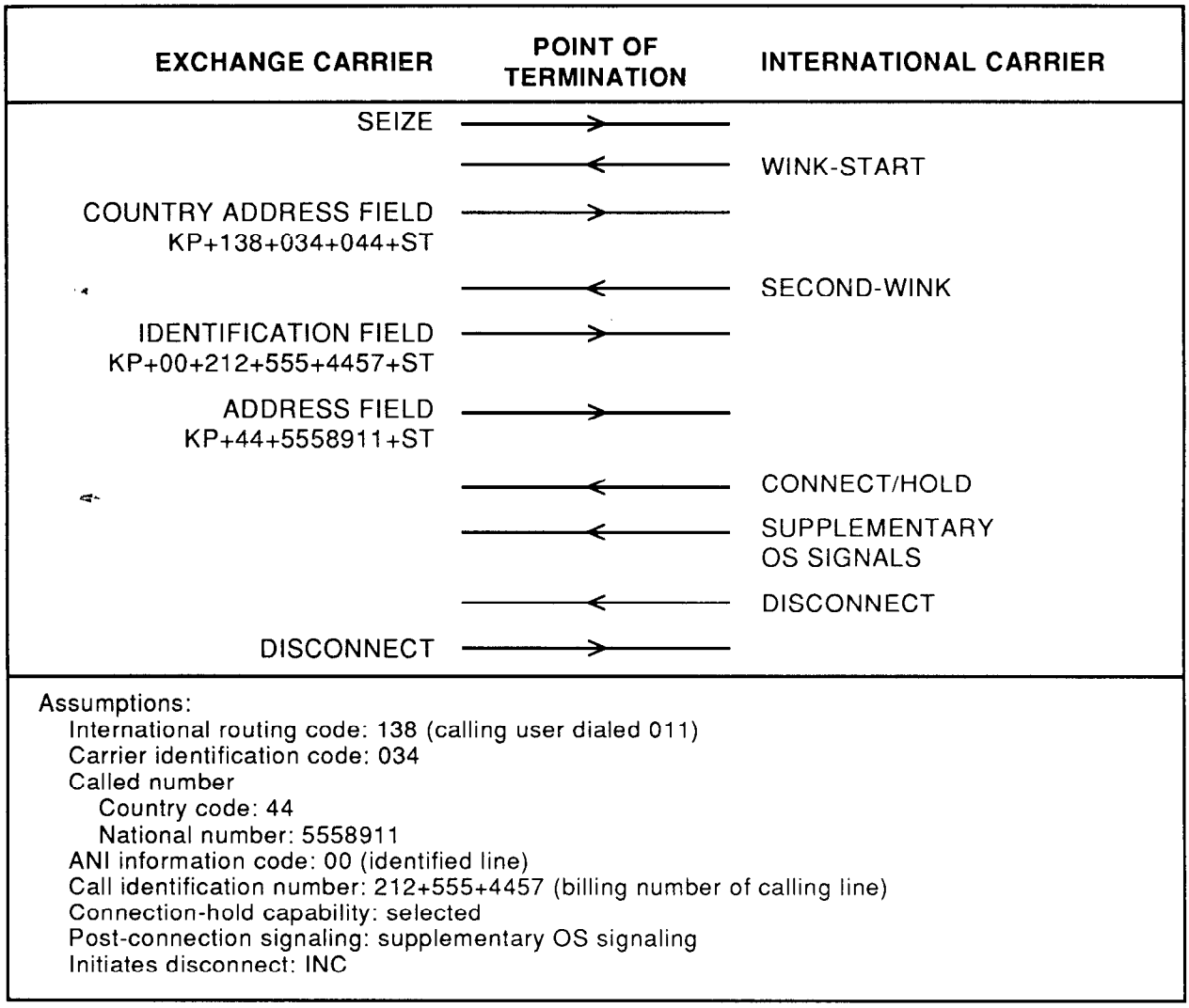

Figure 9 – EAIOS/Basic with connection-hold capabilities selected

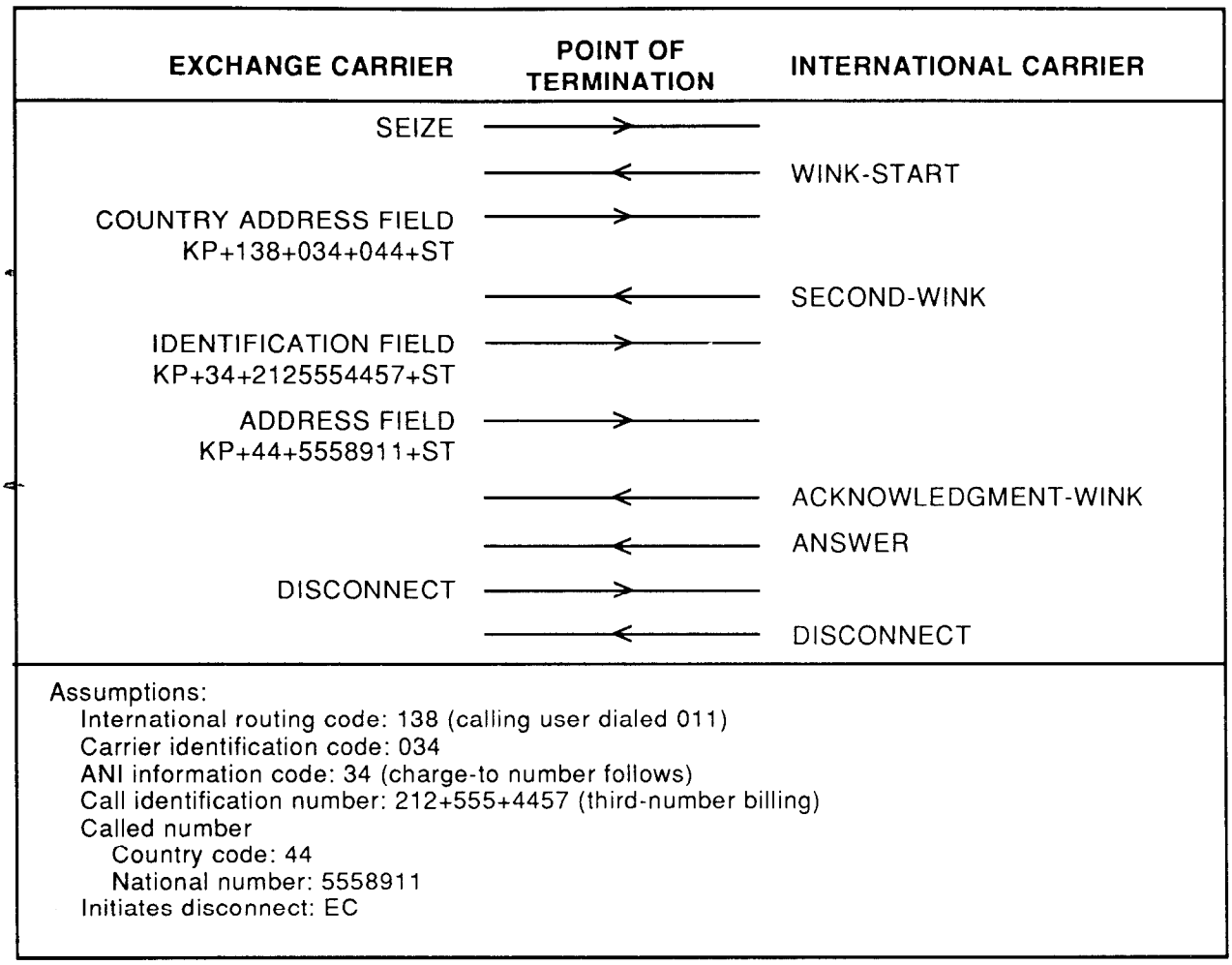

Figure 10 – EAIOS/Basic without connection-hold capabilities

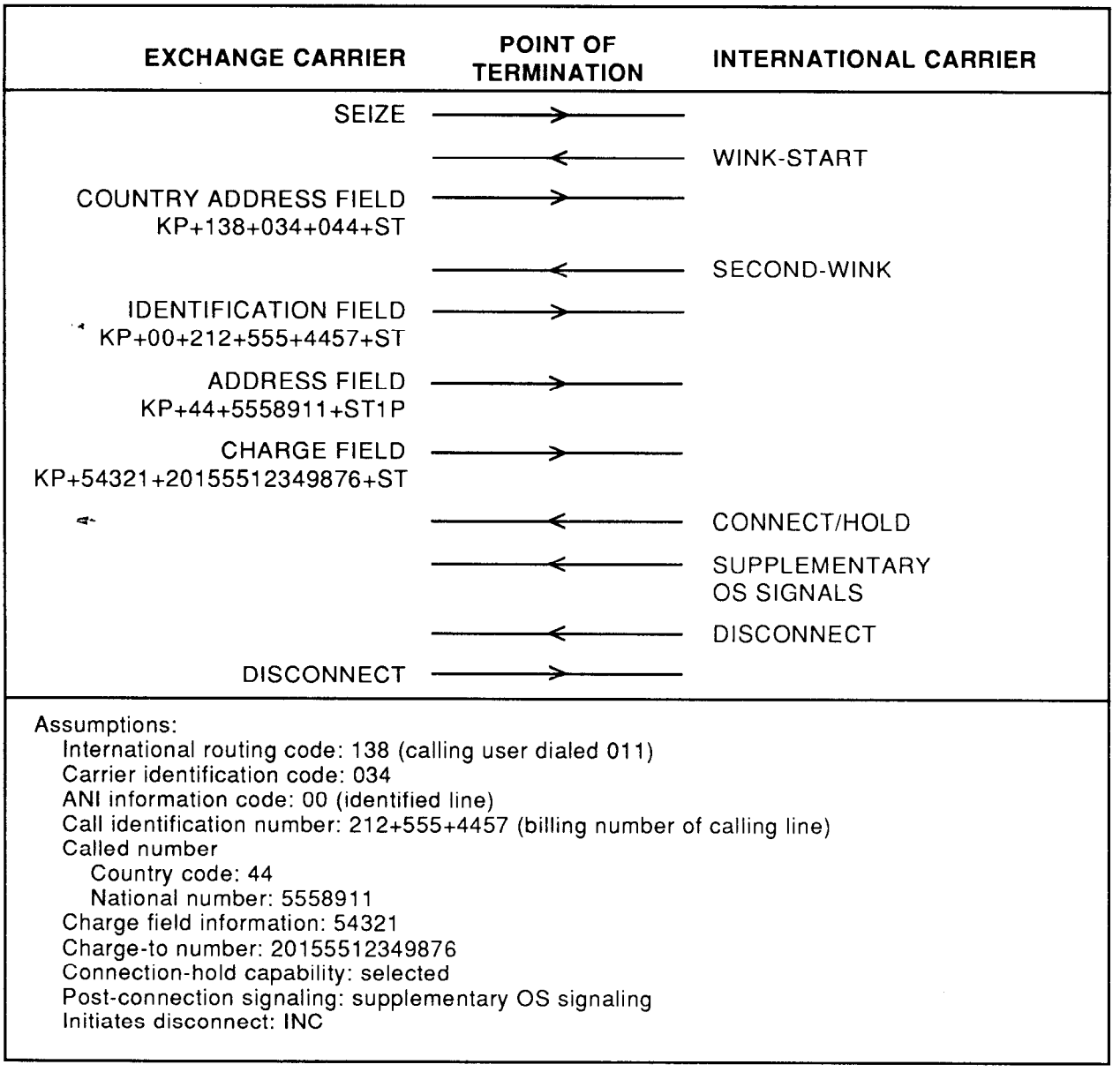

Figure 11 – EAIOS/Expanded with connection-hold capabilities selected

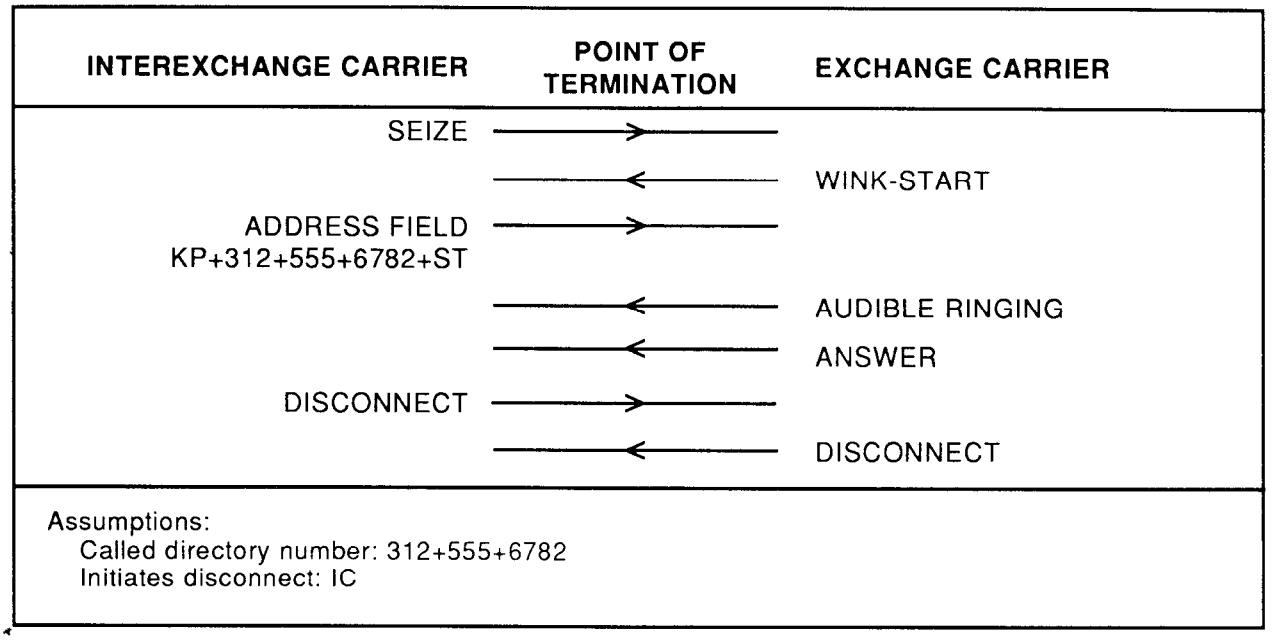

Figure 12 – IC-to-EC call to directory numbers

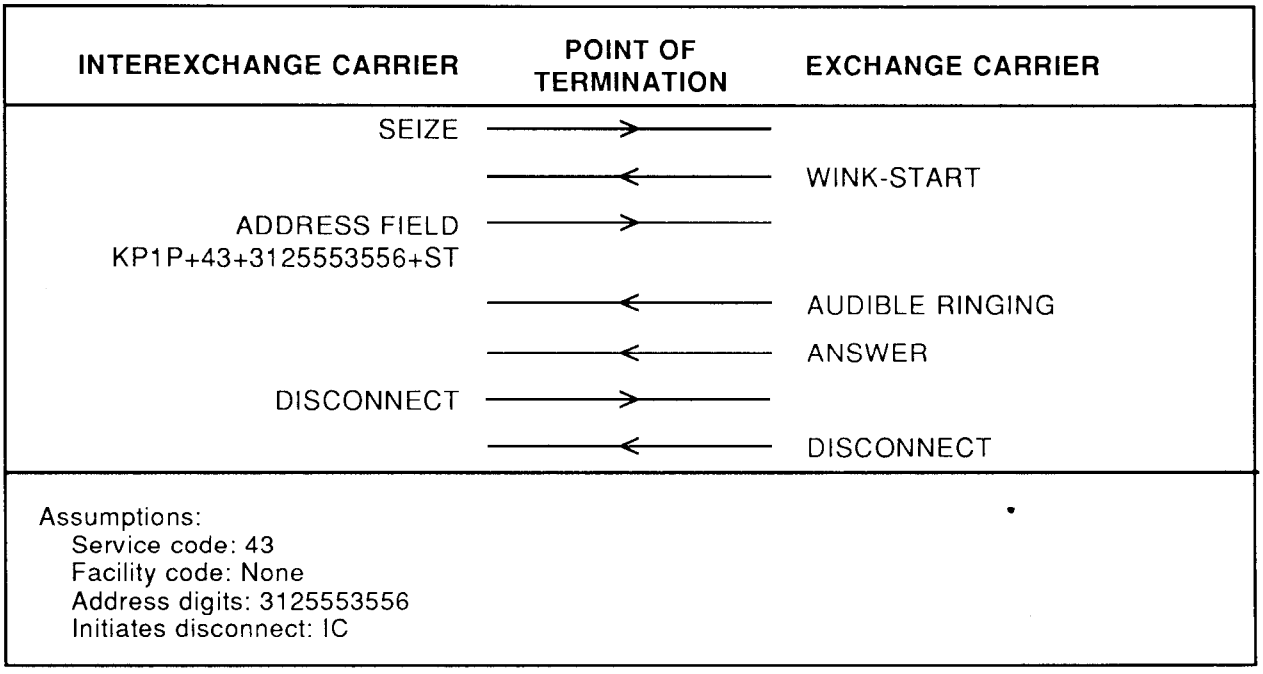

Figure 13 – Service-type call to EC

Annex A
(informative)

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19) Available from Exchange Carriers Standards Association, 5430 Grosvenor Lane, Suite 200, Bethesda, MD 20814-2122.