Lucent Technologies Practices
231-390-521, Issue 6

Lucent Technologies
Bell Labs Innovations

1A ESS™ Switch
Network Interconnect
Common Channel Signaling System 7
Feature Document

Contents **Page**

Contents Page

Figures

Contents Page

Tables

1. Overview

Definition

⇒ **NOTE:**
As a prerequisite to understanding the **Network Interconnect (NI)** feature, the user should have a good working knowledge of the Carrier Interconnect (CI) feature and the Common Channel Signaling System 7 (CCS7) Integrated Services User Part (ISUP) feature. Refer to Part 7 A(3) and A(17).

1.01 The NI provides the 1A ESS Switch (operating either as an end office or an access tandem) with the ability to interface with Inter-LATA Carriers (ICs) and International Carriers (INCs) using the CCS7 ISUP protocol. This capability allows for basic CCS7 inter-LATA/ international calls and can (ideally) replace the internetwork multifrequency (MF) and equal access MF (EAMF) signaling introduced by the Carrier Interconnect (CI) feature. Figures 1 and 2 show the basic CCS7 NI signaling architectures. The NI feature is based on the Bell Communications Research TR-TSY-000394 (TR394; Issue 2, July 1989).

1.02 This practice is reissued to support the Toll Free Number Expansion Feature available in the 1AE13.02 Generic Program.

1.03 This practice does not contain admonishments.

1.04 Lucent Technologies welcomes your comments on this practice. Your comments aid us in improving the quality and usefulness of Lucent Technologies documentation. Please use the Feedback Form provided in this practice or call the Lucent Technologies Documentation Preparation Group at 630-224-7053.

1.05 Additional copies of this practice, associated appendices, and all referenced practices may be ordered from the Lucent Technologies Customer Information Center. One of the following methods should be used:

(a) **Lucent Technologies Employees:** Lucent Technologies employees should mail Form IND 1-80.80, available from the Lucent Technologies Customer Information Center, to:

Lucent Technologies Inc.
Customer Information Center
Attention: Order Entry Department
2855 N. Franklin Road
P. O. Box 19901
Indianapolis, Indiana 46219-1999

or

Call 1-888-LUCENT-8 (1-888-582-3688)

⇒ **NOTE:**
When ordering documentation from the Lucent Technologies Customer Information Center, each Lucent Technologies Business Unit/Division must be identified and all required billing information must be provided.

(b) **Local Exchange Carrier (LEC):** Orders should be processed through your Technical Information Resource Management (TIRM) coordinator. If you are unsure who your TIRM coordinator is, call 1-888-LUCENT-8.

(c) **Federal Government:** These orders should be processed through:

Lucent Technologies Inc.
P. O. Box 20046
Greensboro, NC 27420

or

Call 919-279-7424

(d) **All Others:** Call 1-888-LUCENT-8.

1.06 Every effort has been made to ensure that the information in this practice is complete and accurate at the time of printing. However, information is subject to change.

1.07 This practice is issued by:

Document Preparation Group
c/o M. W. Auter
Lucent Technologies Inc.
Network Software Center
2600 Warrenville Road
Lisle, IL 60532

1.08 Part 8 lists the abbreviations and acronyms with applicable terms used in this practice.

Background

1.09 In the 1AE10 generic program environment, the ISUP feature allowed intra-LATA interoffice calls to be made using the CCS7 protocol. The advantages of this protocol include the greater flexibility and capacity required to support features such as Local Area Signaling Services (LASS) and Integrated Services Digital Network (ISDN). However, the initial CCS7 specifications provided only for calls made within a single LEC and not for calls leaving the LEC. Therefore, inter-LATA and international calls had to resort back to using the EAMF signaling protocol implemented in the CI feature.

1.10 Since EAMF signaling is a type of per-trunk signaling (PTS) protocol, it cannot practically support advanced signaling features. In contrast, the NI feature allows LECs to interface with IC/INCs (collectively known as IXCs) using CCS7 signaling and provides the end-to-end CCS7 trunk signaling connectivity required by various CCS7 call associated features.

1.11 The 800 Number Exhaust Feature provides additional (besides 800) Service Access Codes (SACs) for toll-free numbering services. The first two new toll-free SACs are 888 and 877. Each new toll-free SAC functions virtually the same as the 800 SAC. The one exception is that 00Y codes are not supported for the new toll-free SACs.

1.12 The Toll Free Number Expansion Feature provides additional SACs for toll-free numbering services. The new codes include 866, 855, 844, 833 and 822. Each new SAC functions virtually the same as the 800 SAC. The one exception is that 00Y codes are not supported for the new toll-free SACs.

1.13 Any reference in this document to "800 Number Service", "800 NS", "800-SSP", "SSP800", or "800 Service" pertains to the feature which now includes all toll-free numbers. Also, in general, any reference to a "800 Call" or "800-NXX-XXXX" means a "toll-free" call or number.

Economic Worth

1.14 The NI feature performs signaling functions that allow the 1A ESS Switch to provide:

- Faster call setup
- Efficient trunking
- Advanced signaling features (those which are supported by the NI feature).

Availability

1.15 NI is an optional feature that is initially available in the 1AE11 and later generic programs/periodic partial updates (PPUs).

Feature Groups

1.16 The NI feature requires the following feature groups:

- NI feature group 9SBNI
- ISUP feature group 9SISUP
- CARI feature group 9SCARI.

Feature Assignment

1.17 This feature is provided on a per switch basis.

Feature Description

1.18 This feature introduces CCS7 signaling to the interface between the LEC and the Interexchange Carrier (IXC). It builds upon both the 1A ESS Switch CCS7 ISUP and Message Interface Processor (MIP) features which introduced CCS7 signaling to the local networks. The NI feature provides the basic end-to-end CCS7 trunk signaling connectivity required by future call-associated features. In addition, faster call setup on calls directed to IXCs, as well as more efficient trunking can be achieved.

1.19 The 1A ESS Switch access tandem (AT) switch provides the interworkings for EAMF signaling with CCS7 NI signaling. The

existing EAMF offices are not required to change because the AT switch would provide the interworking functionality.

1.20 Essentially, NI upgrades the EAMF signaling (used by CI) to use CCS7 ISUP signaling on ISUP trunks. Reduced call setup is possible because the single stage CCS7 signaling used by this feature, in pure CCS7 situations, is much faster than the traditional multistage EAMF signaling it replaces. However, when both CCS7 and EAMF interworkings occur, such advantages will not be realized. In fact, CCS7/EAMF interworkings may result in greater post-dial delay time.

1.21 The NI feature can be viewed as a large group of enhancements to both the ISUP and CI features; at the same time, the basic concepts remain intact. Almost all of the nonsignaling related concepts from the CI feature are reapplied here. Also, the basic intra-LATA CCS7 signaling concepts developed in the ISUP feature are reapplied as well. Most of the enhancements are in the call processing (CP), automatic message accounting (AMA), and Attached Processor System (APS) message transport subsystems. Other NI modifications include: data base (DB) (which consists of translations, RC, and verify), trunk maintenance (TM), TTY input/output (I/O), and library (LB).

1.22 Refer to Parts 2 and 3 for descriptions of the above mentioned NI enhancements.

Incompatibilities

1.23 In addition to the limitations and restrictions already imposed by the CI and ISUP features, NI does not support the following features and/or services, except as noted:

(a) **Operator System Signaling (OSS):** Calls that use operator signaling should continue to be routed to traditional operator services MF signaling instead of CCS7 NI signaling. IXC operator requested calls [0+, 10XXX (or 101XXXX with 1AE12)+0(0), or 00- dialed calls] directed over carrier routes that do not use OSS are supported by NI signaling.

(b) **Interworking with Non-EAMF Signaling:** NI supports feature group D 950+ calls from non-EAEOs [Equal Access End Offices]. Other than this special case, NI does not support the interworking of traditional signaling with CCS7 NI signaling. Calls arriving using traditional signaling will be handled as in intra-LATA signaling.

(c) **Circuit Switched Digital Capability (CSDC):** Currently, this capability is not supported by the NI feature.

(d) **HILO Access Tandem (HLAT):** Currently, the capability to provide NI signaling for HILO circuits at the 1A ESS Switch access tandem (AT) is not provided by the NI feature.

(e) **Advanced Services Platform-Network Access Point (ASP-NAP):** The capability to use CCS7 NI signaling to route ASP-NAP calls will be available in the 1AE11.02 and later generic programs.

(f) **Network Management Reroutes:** Currently, this capability is not supported by the NI feature. The NI feature does not support multiple access tandems (intermediate access tandems) on a single call.

2. Call Processing

General

2.01 Network Interconnect call processing (NICP) provides for initiating, setting up, supervising, and tearing down inter-LATA CCS7 calls at the originating or terminating LATA. These calls may be connected either directly or indirectly (via AT switch) to a carrier. In addition to these basic functions, this subsystem provides the interworking capabilities at the AT.

2.02 The NI protocol can be divided into the following two broad classes of signaling:

(a) **International Signaling:** This class of signaling is used for all calls to an INC and all calls outside of World Zone 1 (WZ1) to a consolidated carrier.

(b) **Inter-LATA Signaling:** This class of signaling is used for all calls to an IC

and calls within WZ1 to a consolidated carrier. In addition, inter-LATA signaling will be used for all intra-LATA calls directed to an IXC.

Ideally, inter-LATA/international calls will use CCS7 completely from the EAEO, through the AT, and then finally to the IXC.

2.03 Whenever an international or inter-LATA call is routed over a CCS7 trunk, CCS7 NI signaling is used. Both intra-LATA and inter-LATA calls can be routed over the same trunk group (TG) between the EAEO and the AT. Thus, shared TGs are still allowed (as in EAMF).

2.04 The following paragraphs describe the changes implemented to upgrade CCS7 ISUP signaling to CCS7 NI signaling. All messages and parameters not mentioned remain unchanged from that of similar intra-LATA CCS7 call situations.

Successful Call Setup

2.05 CCS7 initiates an inter-LATA /international call by sending a basic intra-network initial address message (IAM), with NI specific information added, for the selected outgoing circuit. The NI specific information indicates the routing, carrier, and charging information.

A. Originating 1A ESS Switch CCS7 EAEO

2.06 The following new requirements apply to the EAEO when NI signaling is used to the IXC (for direct IXC connections) or to the AT (for indirect IXC connections). In these situations, the types of CCS7 ISUP messages used are the same as those for intra-LATA ISUP calls with the addition of the exit message (EXM). Differences also exist within the parameters of existing messages.

Initial Address Message

2.07 After the 1A ESS Switch receives the dialed digits from the originating party, existing translations are performed to determine if the call must be routed to an IC/INC. If the call is to be routed to an IXC over a CCS7 trunk, an IAM is formatted and sent either directly or indirectly (via AT switch) to the IC/INC over the CCS7 trunk. This IAM contains all the necessary information to route the call to the terminating party. The IAM sent is similar to the intra-network IAM with changes to the following parameters.

Called Party Address

2.08 The called party address parameter has three fields: nature of address, address information, and numbering plan. The information contained in these fields is as follows and depends on the type of call (inter-LATA or international) initiated.

(a) **Nature of Address Indicator:** Set as appropriate based on the digits contained in the address information field.

(1) For inter-LATA calls, set to:

- Subscriber number for 7-digit nonoperator calls and for 950+ calls from a nonpublic station
- National significant number for 10-digit nonoperator calls
- Subscriber number operator requested for 7-digit calls assisted by an IXC operator
- National number operator requested for 10-digit calls assisted by an IXC operator
- No address present cut-through call to carrier when the caller requests a cut-through call to a carrier
- No address present operator requested when the caller requests a connection to the operator of a particular carrier
- 950+ call from public station or hotel/motel or non-EAEO for 950+ calls from a public station or hotel/motel.

(2) For international calls, set to:

- International number for CC+NN (country code + national number) nonoperator calls

- International number operator requested for CC+NN calls assisted by an INC operator
- National significant number for 10-digit nonoperator calls terminating outside the continental U.S. but within WZ1
- National number operator requested for 10-digit operator assisted calls terminating outside the continental U.S. but within WZ1
- No address present cut-through call to carrier when the caller requests a cut-through call to a carrier for a call to an INC carrier
- No address present operator requested when the caller requests a connection to the operator of a particular carrier for a call to an INC carrier.

(b) **Address Information:** This is the called directory number (DN) for inter-LATA/international calls. For international calls, the country code and national number will be included in the address information.

(c) **Numbering Plan:** Set to ISDN (telephony) numbering plan for all cases described in (a) and (b) above.

Transit Network Selection (TNS)

2.09 This parameter has four fields: type of network identification, network identification plan, network identification, and circuit code. The information contained in these fields depends on the type of signaling (inter-LATA or international) required.

2.10 **Inter-LATA Signaling:** This parameter is not used in direct EAEO to IC connections since the carrier and routing information is implied by the CCS7 trunk selected to the IC. In indirect EAEO to IC (via AT) connections, however, the TNS parameter is required and will include the carrier and routing information corresponding to the XXX (or XXXX with 1AE12) carrier identification code and 0ZZ (EAMF IC route identifier) digits from EAMF signaling. The information in the circuit code field of this parameter will indicate that this is a noninternational call. For this type of signaling, the specific fields within the TNS parameter are as follows:

(a) **Type of Network Identification:** This field indicates (signals) the type of network the network identification plan field specifies. Set to national network identification which indicates the information in this parameter pertains to U.S. national standards.

(b) **Network Identification Plan:** This field indicates the type of information contained in the network identification field. Set to three (or optional four with 1AE12) digit CIC code with circuit code to indicate that the digits field (D1, D2, D3 and optional D4 with 1AE12) contain the XXX (or XXXX with 1AE12) code (from EAMF signaling), and the circuit code field contains the equivalent of the 0ZZ (also from EAMF signaling).

(c) **Network Identification:** This field contains the requested carrier network. This corresponds to the EAMF XXX (or optional XXXX with 1AE12) code where each X digit is BCD coded in fields D1, D2, D3 (and optional D4 with 1AE12), respectively. This identifies the specific IC that the call should be routed to by the AT.

(d) **Circuit Code:** This field contains information which is used, in part, in determining the selected route for calls requiring inter-LATA signaling from the AT to the IXC (routing is also affected by other information such as TGN). Up to four values are identified for inter-LATA situations (up to four other values are identified for international situations) in this field. These values correspond to the 0ZZ used in EAMF signaling. In NI signaling, this information is carried by 4-bit binary values administered, on a per-office basis, by the LEC in agreement with the connected ICs. Refer to paragraph 4.16(d).

2.11 **International Signaling:** The TNS parameter is always included by the

EAEO in the IAM for international signaling, regardless of whether the EAEO is directly or indirectly connected to the INC. The information in the circuit code field will indicate that international signaling is required. The international carrier to whom the call is destined is identified in this parameter by the XXX (or optional XXXX with 1AE12) and 1NX (EAMF INC route identifier) or the 1N'X (EAMF INC route identifier–operator call) from EAMF signaling. The padded country code or CCC/01R from EAMF is not provided explicitly in the NI signaling sequence; when required however, this information will be derived from other parameters in the IAM. For this type of signaling, the specific fields within the TNS parameter are as follows:

(a) **Type of Network Identification:** This field indicates (signals) the type of network the network identification plan field specifies. Set to national network identification to indicate that the information in this parameter pertains to U.S. national standards.

(b) **Network Identification Plan:** Indicates the type of information contained in the network identification field. Set to three (or optional four with 1AE12) digit CIC code with circuit code to indicate that the digits field (D1, D2, D3 and optional D4 with 1AE12) contain the XXX (or XXXX with 1AE12) code (from EAMF signaling) and the circuit code field contains the equivalent of the 1NX or 1N'X (also from EAMF signaling).

(c) **Network Identification:** Contains the requested carrier network. This corresponds to the EAMF XXX (or optional XXXX with 1AE12) code where each X digit is BCD coded in fields D1, D2, D3 (and optional D4 with 1AE12), respectively. This identifies the specific INC the call should be routed to.

(d) **Circuit Code:** Contains information which is used, in part, in determining the selected route for calls requiring international signaling (routing is also affected by other information such as TGN). Up to four values are identified for international situations (up to four other values are identified for inter-LATA situations) in this field. These values correspond to the 1NX/1N'X used in EAMF signaling. In NI signaling, this information is carried by 4-bit binary values administered on a per-office basis by the LEC in agreement with the connected INCs.

Carrier Identification Parameter (CIP)

2.12 The optional Carrier Identification Parameter (CIP) provides the capability to consolidate trunk groups from Local Exchange Carrier (LEC) switching offices (end or tandem) to IXC switching offices by delivering the Carrier Identification Code (CIC) for a given call to the IXC. The CIP optional feature requires Fast Feature set card FF121. The optional CIP is carried in the Initial Address Message (IAM). The CIP is delivered to the IXC in a forward direction to indicate the Interexchange Carrier Identification presubscribed by the call originator, the CIC as dialed by the originator, the CIC response to a Number Services or Intelligent Network Database query, or the CIC assigned via a digit translation (e.g., a CIC assigned to an 800-NXX or 900-NXX).

2.13 This parameter has three fields: Type of Network Identification, Network Identification Plan, and Carrier Identification Code.

(a) Type of Network Identification: This field indicates the type of network that the network identification plan field specifies. It is set to "National Network Identification" which indicates that the information in this parameter pertains to U. S. national standards.

(b) Network Identification Plan: This field indicates the type of information contained in the Network Identification Field. It is set to indicate whether a three-digit or a four-digit Carrier Identification Code is included in the CIP parameter.

(c) Carrier Identification Code: This field contains the specified CIC.

2.14 When including a CIP with three significant digits in an outgoing IAM, the Switch will transmit a three- or four-digit (by adding a leading zero) CIC based upon the "Number of CIC Digits" subscription indicator for the outgoing route selected for the call. When including a CIP with four significant digits in an outgoing IAM, the Switch will

transmit a four-digit CIC, regardless of the "Number of CIC Digits" subscription indicator for the outgoing route selected for the call.

2.15 The 1A ESS Switch can include the CIP in an outgoing IAM on a per-CIC value per route basis. For example, if an IXC is assigned five CICs for different call services, calls with different CIC values can be configured to terminate to the IXC from a LEC EO on a single trunk group. When configuring the trunk group, the LEC has the ability to transmit the CIP on that trunk group for any number of CICs. The LEC might choose to send the CIP for only two CICs, in which case the IAM for the other three CIC values would not include the CIP.

2.16 When the 1A ESS Switch serves as an EAEO, for standard 1 + 7/10 digit (non 800, 900, etc.) calls, the presubscribed CIC (e.g., presubscribed line, group, or office PIC), adjusted to three or four digits, is the value used for the CIP. If the end user dials 10XXX or 101XXXX + 7/10 digits, the CIC code dialed (i.e., the XXX or the XXXX), adjusted to three or four digits (as discussed earlier), is the value used for the CIP.

2.17 If the end user dials a 700 series number (without dialing a CIC code), then the end user's presubscribed CIC, adjusted to three or four digits, is the value used for the CIP. If the end user dials 10XXX or 101XXXX + a 700 series number, then the CIC code dialed (i.e., the XXX or the XXXX), adjusted to three or four digits is the value used for the CIP.

2.18 If the end user dials an 800-NXX or 900-NXX number which uses a six-digit translation (not a database query), the CIC code assigned to the 800-NXX or 900-NXX, adjusted to three or four digits is the value used for the CIP. If on the other hand the end user dials an toll-free database call, the CIC code returned by the database query, adjusted to three or four digits is the value used for the CIP.

2.19 SS7 EAEO to IXC Using a Direct Trunk: In formulating the IAM, the 1A ESS Switch serving as the SS7 EAEO will include all the mandatory fixed and mandatory variable length parameters, as well as the optional parameters specified. The CIP, if specified, will be included with the optional parameters. For this case, the originating EAEO will include the CIP in the outgoing IAM if the CIC value determined for the call is subscribed to by the IXC for the selected route. It is especially to be noted that the CIP parameter will not be included for International calls.

2.20 SS7 EAEO to IXC via an SS7 AT: In formulating the IAM, the 1A ESS Switch will also include all the specified parameters. It is to be especially noted that for this case, the CIP will always be included in the outgoing IAM to the SS7 AT whether or not the specific CIC being used has been subscribed to by the IXC. The above is true for International calls as well.

Forward Call Indicators

2.21 This parameter remains unchanged from the intra-LATA case.

Charge Number

2.22 This parameter contains the billing number, which in EAMF is the automatic number identification (ANI). The charge information is sent based on a class-of-service and per-IXC basis. This corresponds to when EAMF sends II (information digits) + ANI. The specific fields in this parameter are as follows:

(a) **Nature of Address:** Set to ANI of calling party, national number to indicate (signal) that the address digits field contains a 3- or 10-digit ANI. In the event that ANI should be sent, but is not available, this field is set to ANI not available or not provided.

(b) **Address Presentation Restricted Indicators:** This field is not used by the NI feature.

(c) **Numbering Plan:** This field indicates the numbering plan of the billing DN. Set to ISDN (telephony) numbering plan.

(d) **Address Digits:** This field contains the actual 3- or 10-digit billing number (ANI). If these digits are the same as those in the calling party address parameter, the entire charge number parameter is omitted while the originating line information (OLI) is retained.

Originating Line Information (OLI)

2.23 This parameter is present when charge information is included. When the charge number parameter is absent, its presence indicates that the billing number

(ANI) is the same as the calling party number, and therefore, is provided in the calling party number parameter. It contains information pertaining to the originating line of the NI call and carries the meaning of the II digits in EAMF. Any flexible ANI II digits that apply to the call will be in this parameter. The coding of this parameter corresponds to the numerical equivalent of the II digits in binary (for example; if II=20 [decimal], then OLI contains 00010100 [binary]).

Calling Party Number

2.24 This parameter contains the DN (3-, 6-, or 10-digit) of the originating party and is provided on a per-IXC basis. Except for the screening indicator field, this parameter is unchanged by the NI feature.

(a) **Nature of Address:** This field indicates (signals) the type of calling party address provided in this parameter. Set to national (significant) number - unique if the calling party address provided uniquely identifies the originating party [based on the LASS definition of uniqueness; refer to Part 7 A(14)]. Otherwise, set to national (significant) number - nonunique.

(b) **Address Presentation Restricted Indicators:** This field indicates whether terminating features (such as LASS features) are allowed to present the calling party address to called users. Set according to the existing LASS privacy indicator of the calling party [refer to Part 7 A(15)].

(c) **Numbering Plan:** Set to ISDN (telephony) numbering plan.

(d) **Address Digits:** Contains the actual 3-, 6-, or 10-digit calling party address. The 1A ESS Switch will only initiate 10-digit calling party address but will pass 3, 6, or 10 digits.

(e) **Screening Indicator:** This field indicates whether the calling party address was screened for validity by the switch when provided by the calling subscriber. Set to network provided.

Calling Selection Information

2.25 This parameter contains an indication of how the IXC that a call is routed to is chosen. It includes whether or not the originating party dialed the IXC via 10XXX (or optional 101XXXX with 1AE12) and whether or not the originating party is presubscribed to the dialed IXC.

2.26 In direct connect situations, carrier connect time (CCT) (see Figure 3) is achieved after the IAM is sent to the IXC. In addition, the outgoing TG number (TGN) used by the call is recorded. CCT is achieved even if glare occurs or the continuity check fails the first time. Refer to the AMA description, paragraphs 3.09 through 3.13.

2.27 Indirect connections do not achieve CCT until either the exit message (EXM), answer message (ANM), or address complete message (ACM) is received. The ANM will never trigger CCT if either the EXM or the ACM arrived first. In cases where the ANM is received in lieu of an ACM, the ANM causes CCT to be recorded. Refer to the AMA description, paragraphs 3.09 through 3.13.

Exit Message

2.28 This message was added to the ISUP protocol for indirect NI calls in which CCS7 signaling is used all the way from the EAEO, through the AT, to the IXC (see Figure 4). Specifically, the EXM is received by the EAEO from the AT after the AT sends out an IAM to the IXC. Its reception indicates to the EAEO that the CCS7 signaling path between the AT switch and the IXC has been reserved, and therefore, CCT has been achieved. The EXM also carries the TGN used by the AT to reach the IXC. The TGN is also saved by the EAEO in a modified AMA record (see paragraph 3.17). In some cases, the EXM will not contain a TGN (for example, 800-SSP calls). In cases where the TGN is not carried in the EXM, the 1A ESS Switch creates the billing record as though the call encountered CCS7 to EAMF interworkings at the AT switch. Also, for 800-SSP calls, the EXM is always sent back to the EAEO regardless of the type of signaling used on the outgoing trunk (OGT).

2.29 In a situation where the EAEO to AT connection is CCS7, while the AT to IXC connection is EAMF, the EXM is not used. In this case, the receipt of the ACM indicates that CCT was achieved. (Refer to Figure 5 and

paragraph 2.31.)

COT (Continuity Message)

2.30 In a successful call, no changes related to the COT message apply in this situation.

Address Complete Message

2.31 No changes related to the ACM message apply in a direct connect situation.

2.32 In an indirect connect situation, however, receipt of the ACM without previous receipt of an EXM indicates that CCS7 signaling was used only from the EAEO to the AT. This also indicates that EAMF signaling was used from the AT to the IXC. (Refer to Figures 5 and 6.) The ACM is sent from the AT back to the EAEO after the IXC returns its first wink. Receipt of this ACM corresponds to the CCT. In this case, the TGN of the trunk to the AT is stored in the AMA record since the ACM does not contain the TGN used between the AT and IXC.

Answer Message

2.33 When the ANM is received, answer time is indicated in the AMA record. This applies for both direct and indirect connect situations. As in intra-LATA CCS7 signaling, the ANM can be received in lieu of the ACM in pure CCS7 connections only. In this case, the TGN used to the IXC is always available at the EAEO.

Release Message (REL)

2.34 During the talking stage of a call, when either party hangs up, a REL message is sent or a REL message is received. In either case, the disconnect time is recorded. Thus, no additional functionality is introduced for this message.

B. Originating 1A ESS Switch CCS7 Access Tandem

2.35 Access tandem offices interconnect end offices to the various IXCs. This allows end offices, within a LATA, access to the IXCs without requiring direct TGs between each end office and IXC. The 1A ESS Switch NI ATs can connect end offices to IXCs using three different signaling arrangements. These arrangements allow existing EAMF EAEOs and IXCs to operate without modification, even when CCS7 NI signaling is used in only part of the connection. The three signaling arrangements are as follows:

2.36 **Situation 1 - CCS7 to CCS7 NI Calls:** The presence of the TNS parameter in the IAM received at the tandem office incoming trunk (ICT) indicates that a NI call is requested. This also indicates that the call should be routed to an IXC (Figure 4). To be consistent with EAMF and ISUP signaling, only calls on TG type 10 with an IAM containing a TNS will be allowed by NI. In this situation, the following NI signaling requirements apply (in order of their use). The circuit code field of the TNS parameter can be translated to the 0ZZ/1NX/1N'X code. Then, as in EAMF, the 0ZZ/1NX/1N'X code translates to call type 30. Refer to paragraphs 2.72 and 2.73.

IAM Received on Incoming Trunk

2.37 Upon receipt of the IAM, the following parameters are examined specifically for a NI call:

Transit Network Selection (TNS) Parameter

2.38 The following summarizes the fields of the TNS parameter:

(a) **Type of Network Identification Field:** This field must be set to national network identification indicating that U.S. national standards are used.

(b) **Network Identification Plan Field:** This field must be set to carrier identification code with circuit code indicating that the NI equivalents to the EAMF 0ZZ and XXX (or optional XXXX with 1AE12) (for inter-LATA calls) or 1NX/1N'X and XXX (or optional XXXX with 1AE12) (for international calls) are contained in this field.

(c) **Network Identification Field:** If the network identification plan field indicates carrier identification code with circuit code, this field contains the 3 (or optional 4) digit carrier identification code (the EAMF XXX or optional XXXX with 1AE12) necessary to route the call to the IXC.

(d) **Circuit Code Field:** If the network identification plan field indicates carrier identification code with circuit code, this field contains routing

information which takes part in determining the path from the AT to the specified carrier. This information corresponds to the 0ZZ or the 1NX/1N'X in EAMF signaling.

Carrier Identification Parameter

2.39 SS7 Access Tandem (AT) to IXC Using SS7 Connectivity: If the CIC value received in the CIP for the incoming call is subscribed by the IXC for the selected outgoing route, the AT includes the CIP Parameter, adjusted to three or four digits, in the outgoing IAM. Otherwise, the AT drops the CIP from the IAM. It is to be especially noted that the AT does not send CIP for International calls.

2.40 If a CIP is not received at the Access Tandem in the incoming IAM message (e.g., the EO is not CIP capable), the AT generates the CIP Parameter and includes it in the outgoing IAM if the IXC subscribes to the CIC value for the selected outgoing route. The CIC value received in the Transit Network Selection (TNS) Parameter, adjusted to three or four digits, is used for encoding the CIP. For International calls, no CIP is sent.

2.41 If the SS7 AT is not CIP capable, but receives a CIP in the incoming IAM, it treats CIP as an unrecognized optional parameter. According to existing ISUP procedures, the AT passes the unrecognized parameter transparently to the succeeding exchange without any modification.

Called Party Address Parameter

2.42 This parameter contains the main information necessary for the IXC to complete a NI call. The nature of address field indicates the type of NI call being processed and is screened for valid inter-LATA and international cases [refer to paragraph 2.08(a)]. Upon receipt of an invalid nature of address, the call fails and subsequently is released.

2.43 If the received IAM indicates that INC signaling is being performed (the circuit code in the TNS parameter equates to a 1NX/1N'X value), then additional processing of the called party number may be required based on the nature of address of the called party number parameter as follows:

(a) If the nature of address indicates that the called party number is an international number (operator requested or not) then an IDDD translation will be performed to obtain the country code length. This would be required in formatting the padded country code portion of the EAMF signaling sequence (1NX/1N'X) + XXX (or optional XXXX with 1AE12) + CCC.

(b) If the nature of address indicates that the called party number is a national number then the called party number is interpreted as an excepted code (a number outside of the continental United States but within World Zone 1) because the TNS indicated INC signaling. In this case, we will use the 3-digit translator which was previously defined as the number service designated translator (2-wire) to translate the first three digits of the called party number to obtain the R-value which would have been included in the initial EAMF signaling sequence (1NX/1N'X) + XXX (or optional XXXX with 1AE12) + 01R.

Bearer Capability (User Service Information) Parameter

2.44 This parameter indicates the type of transmission medium required for the call connection. The 1A ESS Switch is analog in nature and currently does not support digital data transmissions for CCS7. Upon receipt, this parameter is screened for compatibility with the 1A ESS Switch. If compatibility is not possible, the call is rejected (refer to paragraphs 3.39 through 3.46 for unsuccessful call setup). The following fields must be set as indicated; otherwise, no further call processing will be allowed:

(a) **Coding Standard:** CCITT Standard.

(b) **Information Transfer Capability:** Speech or 3.1-kHz audio.

(c) **Transfer Mode:** Circuit Mode. (Packet mode transfer is not supported by the 1A ESS Switch.)

(d) **Information Transfer Rate:** 64 kb/s (defined for use with analog circuits)

(e) **User Layer Protocol:** Layer 1 (for the 1AE11.06 and later generic programs).

The remaining parameters in the received IAM are handled the same as in intra-LATA ISUP calls.

IAM Sent on Outgoing Trunk

2.45 After completion of the continuity check process on the ICT (when applicable), the call is routed to the IXC via a selected OGT. The same IAM received on the ICT is formatted and then sent directly to the IXC over the OGT. The TNS parameter is passed with the outgoing IAM only in international NI signaling; otherwise, it is deleted. All other information is passed through the AT.

2.46 If glare is encountered on the OGT after the IAM is sent, the following basic outcomes are possible (refer to paragraphs 3.43 and 3.44):

(a) When the call leaving the AT has priority, the IAM just received (on the same trunk) is simply ignored and the outgoing call continues as in normal nonglare situations.

(b) When the glaring call has control, the outgoing call must yield to the incoming call. In this case, the outgoing call must be completed using another trunk.

2.47 If the newly chosen OGT uses CCS7 NI signaling, then the call proceeds as a pure CCS7 to CCS7 NI call with the possibility that optional/nonessential information in the received IAM may be lost. The IAM sent will retain all the information in the received IAM up to the point when the EXM is returned on the ICT. If the new OGT is EAMF, then CCS7 to EAMF interworking occurs at the AT.

EXM Sent on Incoming Trunk

2.48 After the outgoing IAM is sent, the EXM is returned (to the AT, only in CCS7 to CCS7 connections) on the ICT. This can occur either before or after completion of continuity check on the OGT. The EXM is sent on the ICT shortly after the OGT IAM is sent. This will occur after a specified delay (see description of office options table translator in paragraph 4.16), or before an ACM or ANM is sent on the AT ICT. Receipt of the EXM by the EAEO indicates when carrier connect time occurs. The EXM also provides the TGN of the trunk used between the AT and the IXC.

2.49 If a retry (call) is necessary on the OGT (due to glare, continuity check failure, etc.), two scenarios are possible. First, the EXM has yet to be returned and therefore must be updated to include the TGN of the newly selected trunk upon retrying the call. Secondly, if the EXM has already been returned, no additional EXM will be sent. The EAEO will use the TGN provided in the initial EXM (which may or may not be the same as the retry TGN).

⇒ **NOTE:**
For retried calls, unknown optional parameters are not included in the IAM (for the 1AE11.05 and earlier generic programs). For the 1AE11.06 and later generic programs, unknown optional parameters are preserved in a message block and are included in the IAM if a retry is necessary.

2.50 Should the call fail after seizing the OGT (due to glare, continuity check failure, receipt of REL, etc.) and before the EXM is sent, the EXM must be returned before any REL is sent on the AT ICT.

2.51 **Situation 2–EAMF to CCS7 NI Calls:** In situations where CCS7 connectivity exists from the AT to the IXC, but not from the EAEO to the AT, EAMF to CCS7 interworkings will occur for inter-LATA and international calls (refer to Figures 7 and 8). After the AT receives the first EAMF stage of signaling on the ICT, code interpretation is performed and an appropriate OGT is seized. In this situation, the OGT uses the CCS7 protocol and the following NI signaling requirements apply.

Circuit Reservation Message (CRM) Sent on Outgoing Trunk

2.52 The first EAMF signaling stage received on the ICT contains information necessary to route the NI call correctly. It contains the 0ZZ+XXX (or optional XXXX with 1AE12) for inter-LATA signaling or the 1NX/1N'X+XXX (or optional XXXX with 1AE12) +CCC/01R for international signaling. After this first EAMF stage is received, the new CRM is sent to reserve the CCS7 trunk between the AT and the IXC while waiting for the remaining EAMF signaling stages to arrive on the ICT. The CRM contains the mandatory nature of connection indicators parameter which

indicates whether a continuity check should be performed, whether a satellite is present in the call path, and whether an echo suppressor is active on the particular trunk. The settings of these fields are set in the same way as the nature of connections parameter of the intra-LATA IAM [refer to Part 7 A(17)].

2.53 Since the CRM is the first message to be sent out on the CCS7 OGT, there is a possibility that glare will occur. In this situation, glare occurs when an IAM is received after sending out the CRM. If the outgoing trunk has control in glare situations, the received IAM will be ignored and the outgoing call will proceed normally. If the OGT does not have control, it must back down and accept the incoming call. In this case, the original outgoing call must be retried on another CCS7 OGT.

Circuit Reservation Acknowledgement Message (CRA) Received From Outgoing Trunk

2.54 After sending the CRM, receipt of the CRA indicates that the trunk to the IXC has been successfully reserved and the call may proceed. This corresponds to the receipt of the first wink from the carrier. If no continuity check is being performed on this OGT or if the continuity check has already been completed, a wink is generated on the EAMF ICT when the CRA is received. This wink indicates the beginning of CCT. If a continuity check is in progress, however, it must be completed before the wink is generated on the EAMF ICT.

2.55 For inter-LATA signaling, this wink triggers the EAMF EAEO to begin outpulsing the second stage of signaling. The typical digit sequence is KP + [II + ANI] + ST + KP + (0) + 7/10D + ST.

2.56 For international signaling, the first wink after the seizure wink sent from the AT to the EAEO is optional; this is based on an existing AT ICT TG option. If this first wink is utilized, a second wink is returned after a specified delay (refer to Timing Requirements in paragraph 2.76) following the first wink. This second wink or second start dial (SSD) corresponds to when the international gateway is ready to receive inband information in EAMF signaling; it also triggers the EAMF EAEO to begin outpulsing the second stage of international digits to the AT. Typically, the KP + [II + ANI] + ST + KP + CC + NN + ST is sent by the EAEO at this point. If the first wink from the carrier is not required, the AT generates the SSD wink immediately at the point where the first wink is normally sent and is prepared to receive the second stage of digits from the EAMF EAEO. In this case, the SSD wink is used as the indication of CCT.

2.57 If the CRA is not received within the specified time, another trunk to the IXC is seized and the outpulsing attempt retried.

Continuity Message Sent on Outgoing Trunk

2.58 When appropriate, a continuity check procedure is performed after the CRM is sent to verify the integrity of the speech path. This procedure is the same as that used in intra-LATA ISUP calls except that it occurs after CRM, instead of after IAM. Upon successful completion of the continuity check, the AT sends a COT message to the IXC and returns the appropriate wink(s) as previously indicated.

2.59 If the continuity check procedure fails, the (failing) trunk is handled by existing trunk maintenance procedures. The call itself is then retried on another trunk. Since the initial carrier wink has not been generated on the ICT, the newly chosen trunk could use either NI or EAMF signaling without affecting the call status at the EAMF EAEO. Thus, the retried call could be another EAMF to CCS7 NI interworking call or it could use EAMF signaling all the way to the carrier (refer to Call Reattempts in paragraph 3.46).

IAM Sent on Outgoing Trunk

2.60 After the second stage of digits are collected on the EAMF ICT, the AT formats and sends an IAM on the CCS7 OGT to the IXC. The received called party address on an INC is based on the call type 30 rate and route pattern associated with the translation of the received 1NX/1N'X. When the IAM is sent, an acknowledgement wink is transmitted to the EAMF EAEO on the ICT after a short delay (approximately 200 ms). The IAM sent is similar to the intra-LATA IAM during PTS to CCS7 interworking with the following differences:

(a) **Called Party Address Parameter:** This parameter contains information necessary to route the call. The nature of address and address information fields are directly related to the EAMF digits received on the ICT as described in paragraphs 2.08(a) and (b).

(b) **TNS Parameter:** In EAMF to CCS7 interworking situations, this parameter is only included by the AT in the outgoing IAM for international signaling. In this case, it contains the XXX (or optional XXXX with 1AE12) and 1NX/1N'X information received on the EAMF ICT during the first stage of international signaling from the EAEO. The specific fields and the information contained therein are described in paragraph 2.11.

(c) **Charge Number Parameter:** This parameter is included in the IAM sent on the CCS7 OGT only if II+ANI was received on the EAMF ICT. The specific fields and the information contained therein are described in paragraph 2.22.

(d) **Originating Line Information Parameter:** The OLI parameter is included in the IAM sent on the CCS7 OGT only if II+ANI was received on the EAMF ICT. The actual coding is the binary equivalent of the II digits received.

(e) **Carrier Identification Parameter:** For interworking EAMF inband signaling to CCS7 signaling, the Access Tandem includes the CIP Parameter in the outgoing IAM based upon the Office Interworking Allowed Option, the CIC value, and the selected outgoing route. If the Office Interworking Allowed Option permits CIP for EAMF-CCS7 interworking, then the CIC value and the selected route are checked for IXC subscription. If the CIP is to be sent, then the XXX or XXXX in the received KP+0ZZ+XXXX+ST, adjusted to three or four digits, is used to encode the CIP. If the Office Interworking Allowed Option does not permit CIP for EAMF-CCS7 interworking or the Office Interworking Allowed Option does permit interworking but the IXC is not subscribed for the indicated CIC and route, then the CIP is not sent. The Office Interworking Allowed Option defaults to "Yes". Also, the CIP Parameter is not included in the outgoing IAM for International calls.

2.61 **Situation 3 – CCS7 to EAMF NI Calls:** In situations where CCS7 connectivity exists from the EAEO to the AT, but not from the AT to the IXC, CCS7 to EAMF interworking will occur for inter-LATA and international calls (refer to Figures 5 and 6). The presence of the TNS parameter in the IAM received at the tandem office ICT indicates that a NI call is requested. This also indicates that the call should be routed to an IXC. In this case, the OGT uses the EAMF protocol, and the following NI signaling requirements apply.

IAM Received on Incoming Trunk

2.62 Upon receipt of the IAM, verification of relevant information contained within the IAM is performed as described in paragraphs 2.38 through 2.44. When applicable, continuity check is performed on the ICT before an appropriate OGT is chosen to the IXC.

2.63 At this point, the IAM has provided the AT with all the information necessary to route the call. The AT uses the XXX (or optional XXXX with 1AE12) digits and circuit code in the TNS parameter in conjunction with possible ICT information to select the appropriate route to the IXC. An inband seize signal is then sent on the chosen trunk to the IXC. After the carrier start pulsing wink is received from the IXC, the AT sends an ACM to the CCS7 EAEO to initiate CCT.

2.64 After the ACM is returned, the address information necessary to route the call is sent on the EAMF OGT as follows:

(a) If the TNS parameter indicates that inter-LATA signaling is being used, the AT sends a single stage of address information to the IXC using the EAMF protocol.

(b) If international signaling is being utilized, two stages of address information, as defined under the EAMF protocol, are sent instead.

The information outpulsed on the EAMF OGT is directly related to the information contained in the received IAM as described in paragraphs 2.08(a) and (b).

C. Terminating 1A ESS Switch CCS7 EAEO

2.65 The signaling requirements for successful calls terminating to a local LATA are the same as those defined for intra-LATA calls. That is, direct terminating calls are handled the same as for incoming intra-LATA

CCS7 calls. Indirect terminating calls are handled the same as for intra-LATA tandem calls. However, screening requirements established for EAMF also apply at the first office in the local LATA (refer to paragraph 2.69).

Screening

2.66 The basic call screening capabilities specified for EAMF are applied without change for this feature. Screening of CCS7 ISUP messages, however, is applied with modifications as described in the following paragraphs. Calls which fail screening are routed to an appropriate tone or announcement.

A. Originating LATA Screening

2.67 **Originating CCS7 EAEO:** The IAM sent to the IXC will contain all identified mandatory parameters. In addition, the calling party number parameter generation at the EAEO depends on specific agreements between the LEC and the IXC. The new recent changeable per-IXC indication will indicate whether a particular IXC should be provided the calling party number of the originating party (refer to paragraph 4.16).

2.68 **Originating CCS7 Access Tandem Switch:** With the 1AE11.06 and later generic programs, two new recent changeable items will indicate whether the access transport parameter (ATP) and/or the user-to-user information (UUI) parameter contained in an ISUP message received by an originating access tandem from an IXC office are allowed to be passed to the originating LATA.

B. Terminating LATA Screening

2.69 As previously mentioned, if a call fails subtending screening, tone/announcement is provided to the customer (refer to paragraph 3.40). Whether a REL or an inband tone/ announcement is provided at the first office in the terminating LATA depends on the new per-TGN internetwork indication (refer to paragraph 4.16). If the REL is used, the cause value is set to no route to destination for these failures.

2.70 **Terminating CCS7 EAEO:** Currently, any network specific information will be ignored by terminating CCS7 1A ESS Switch end offices. This includes the Carrier Identification Parameter (CIP).

2.71 **Terminating CCS7 Access Tandem Switch:** With the 1AE11.06 and later generic programs, two new recent changeable items and an office options table translator indicator will indicate whether the access transport parameter (ATP) and/or the user-to-user information parameter contained in an ISUP message received by a terminating access tandem from an IXC office are allowed to be passed to the terminating LATA. If the Carrier Identification Parameter (CIP) is received at the terminating Access Tandem Office from the Toll Office (from the IXC), it is discarded.

Call Routing

2.72 Call routing remains unchanged from that of the CI feature. For the NI feature, the information contained in the TNS parameter, along with the information on the incoming trunk group, is used as input to the existing 1A ESS Switch routing scheme. No new call routing is defined by this feature.

2.73 For CCS7 to CCS7 NI calls routed to an IXC, only calls on TG type 10 with an IAM containing a TNS are allowed by NI. The circuit code field of the TNS parameter can be translated to the 0ZZ code. Then, as in EAMF, the 0ZZ/1NX /1N'X code will translate to call type 30. Refer to paragraph 2.36 and Part 7 A(2) and A(3).

⇒ **NOTE:**
The receipt of a 1N'X indicates an operator requested call.

Normal 1A ESS Switch Call Release

2.74 Calls can be released normally both before and after completion of call setup. Before call setup, normal release occurs if the calling party abandons or if the called party is busy. Both of these cases occur before ACM. After completion of call setup, normal release occurs if either the calling or the called party hangs up. This case occurs after the occurrence of ACM. In all of the above cases, the basic release procedures specified

for intra-LATA calls apply for inter-LATA calls.

2.75 In addition to the existing intra-LATA requirements, the location field in the cause parameter of the REL message is recoded and mapped whenever the REL is received from the IXC. (Refer to Table A.)

Timing Requirements for NI Signaling

2.76 In addition to the existing timing requirements for intra-LATA CCS7 ISUP signaling and EAMF, this feature introduces the following three new timing requirements that have been implemented at the AT switch for NI signaling.

- **Texm,d**: This timer defines the timing value that will be used for the delay time at the AT before an EXM is returned after sending out an IAM. This timing value is recent changeable (refer to paragraph 4.16) in 100 ms increments [range 100 - 1200 ms; default value = 10 (1000 ms)]. This timer will be used in all CCS7 to CCS7 NI call situations where the call is routed from EAEO through AT to IXC.
- **Tcrm**: This timer defines the timing value (3 seconds) that will be used for the time at the AT while awaiting a CRA after sending a CRM. This timer will be used in EAMF to CCS7 NI interworkings at the AT.
- **Tssd**: This timer defines the timing value (400 ms) that will be used for the delay time at the AT before sending back a SSD wink after generating the first wink from carrier. This timer will be used in international outgoing calls where EAMF to CCS7 NI interworkings occur.

3. User Perspective

User Profile

3.01 The NI feature is transparent to the end telephone subscriber.

Customer Premises Equipment

3.02 No special customer premises equipment is required for NI.

Attached Processor System Message Transport

3.03 The APS Message Transport subsystem provides the physical routing of CCS7 messages. This capability has been extended beyond the local network, across network boundaries. The 1A ESS Switch APS Message Transport subsystem provides application-specific enhancements to the common network interface (CNI) capability. The application-specific functions are resident in the 3B20D Computer and the Direct Link Node/Application Processor (DLN/AP) to support message routing, data base administration, and maintenance.

3.04 Unlike the other NI subsystems, the APS Message Transport subsystem work involves modifications external to the 1A ESS Switch. Refer to Part 7 A(11).

Automatic Message Accounting

3.05 The NI AMA subsystem is responsible for recording the call information associated with a NI call. This subsystem is also responsible for meeting existing AMA standards and objectives. In performing these recording responsibilities, this subsystem does the following:

(a) Creates AMA records for all inter-LATA calls (whether the call uses EAMF or NI signaling) at the EAEO and first office going into a terminating LATA. Also, originating LATA ATs can do billing functions for incoming calls from non-EAEOs to interexchange carrier directory numbers (ICDNs) as currently provided in EAMF signaling. For information on EAMF AMA, refer to Part 7 B(12).

(b) Updates the call event status (CES) when prompted by the CP subsystem and records information such as connection type and TGN.

(c) Assures any NI modifications to Old Format AMA are compatible with previous AMA standards and can be mapped from standard entry AMA records.

(d) Provides appropriate APS changes to support new NI AMA formats and information under existing AMA standard entry (AMASE) conventions.

3.06 The basic charge treatment procedures are carried over from the CI feature. However, there are changes to the AMA records defined by this feature.

A. Originating LATA AMA

3.07 This feature correlates CCS7 ISUP NI signaling with existing EAMF billing milestones. Billing for inter-LATA/international calls is performed at the EAEO for basic NI calls. Billing is performed at the AT switch only if the AT serves: (a) a nonconforming EO or (b) directly connected customers in which it plays the role of the EAEO. As in EAMF, separate AMA records are made on a per-carrier basis for all calls to an IXC. Test calls arriving from an IXC are also billed as in the existing EAMF scheme.

3.08 The following definitions apply for CCS7 NI signaling at the originating LATA.

3.09 **Carrier Connect Time:** CCT indicates when contact with the IXC is made. This corresponds to the receipt of first wink from the IXC in EAMF. Unlike in EAMF, no confirmation of the circuit to the IXC is needed to achieve CCT for CCS7. Therefore, the possibility of glare and continuity failure still exists after CCT.

3.10 Whether or not CCT is achieved depends on if the EAEO is directly connected to the IXC or indirectly connected via an AT. For directly connected EAEOs, CCT is achieved when the IAM is sent from the EAEO to the IXC. This is true whether the call completes normally or encounters retry conditions. The CCT is always retained from the initial NI attempt even if EAMF signaling is used on the retry. For indirectly connected EAEOs, CCT is achieved upon receipt of the EXM, ACM, or ANM, whichever occurs first.

3.11 For indirect connections, if an event forces the call to be retried on another circuit to the AT (due to glare, continuity failure, etc.), CCT is not recorded for the initial attempt unless an EXM was received. If a reattempt is made on a CCS7 trunk, CCT is achieved as for an initial attempt. If the second attempt also fails, CCT is not achieved at all (that is, no AMA record is made unless 100 percent call recording is active).

3.12 Reattempts by the AT to the IXC may result in having an incorrect TGN and connection type saved in the AMA record. This is because the EXM carrying the original TGN may already have been sent from the AT.

3.13 After the CCS7 trunk is released at the billing office, the 1A ESS Switch will not continue to accumulate CCT.

3.14 **Answer Time:** Indicates when the inter-LATA/international call was answered by the called party. This occurs when an ANM is received at the EAEO for both directly and indirectly connected calls.

3.15 **Termination Time:** Indicates when the call is finished. Elapsed time is calculated from some beginning point to when a REL/reset circuit message (RCM) is sent or received at the EAEO. Elapsed time from CCT is the interval between CCT and REL/RSC. Elapsed time from answer is the interval between ANM and REL.

AMA Record Coding

3.16 In the Standard Format AMA TABLE 83 [based on reference in Part 7 B(12)], binary coded decimal (BCD) character 1 is currently unused by EAMF and padded to all zeros. This field is now used by the BNI feature to indicate the connection type that exists between the CCS7 EAEO and the IXC for a NI call and the TGN stored in BCD characters 2 through 5 of the same record. This affects the various AMA records utilizing this table (for example, AMA call code 110 may be used for inter-LATA station paid, AMA call code 141 may be used for 800 SSP NI, etc.). In addition, a corresponding change to Old Format AMA recording reflects the NI modifications.

3.17 In Standard Format AMA TABLE 83, the following values are now defined for BCD character 1.

(a) **Non-CCS7 EAEOs Directly Connected to an IXC:** Character 1 is set to a value of 1 which indicates non-CCS7 direct TGN. Characters 2 through 5 contain the actual TGN of the circuit utilized for the EAEO to IXC connection. The same is true for

retried calls. This situation occurs in non-CCS7 inter-LATA calls.

⇒ **NOTE:**
Not packaged with the NI feature package but used for EAMF.

(b) **Non-CCS7 EAEOs Indirectly Connected to an IXC:** Character 1 is set to a value of 2 which indicates non-CCS7 common TGN. Characters 2 through 5 contain the actual TGN of the circuit utilized from the EAEO to the AT. The same is true for retried calls. This situation also occurs in non-CCS7 inter-LATA calls.

(c) **CCS7 EAEOs Directly Connected to an IXC:** Character 1 is set to a value of 3 which indicates CCS7 direct TGN. Characters 2 through 5 contain the actual TGN of the circuit utilized. This is true even for retried calls.

(d) **CCS7 EAEOs Indirectly Connected to an IXC (No Interworking):** Character 1 is set to a value of 4 which indicates CCS7 AT TGN (AT to IC/INC TGN). Characters 2 through 5 contain the actual TGN of the circuit used between the AT and the IXC. In this case, the TGN is carried back from the AT via the EXM.

(e) **CCS7 EAEOs Indirectly Connected to an IXC (CCS7 to MF Interworking):** Character 1 is set to a value of 5 which indicates CCS7 end office TGN (end office to AT TGN with CCS7 to MF interworking). Characters 2 through 5 contain the actual TGN of the circuit used between the EAEO and the AT.

3.18 In Old Format AMA, data group T BCD character 19, the following values are now defined:

(a) **Non-CCS7 EAEOs Directly Connected to an IXC:** Character 1 is set to a value of 0 which indicates non-CCS7 direct TGN. Characters 22 through 25 contain the actual TGN of the circuit utilized for the EAEO to IXC connection. The same is true for retried calls. This situation occurs in non-CCS7 inter-LATA calls.

(b) **Non-CCS7 EAEOs Indirectly Connected to an IXC:** Character 1 is set to a value of 1 which indicates non-CCS7 common TGN. Characters 22 through 25 contain the actual TGN of the circuit utilized from the EAEO to the AT. The same is true for retried calls. This situation also occurs in non-CCS7 inter-LATA calls.

(c) **CCS7 EAEOs Directly Connected to an IXC:** Character 1 is set to a value of 2 which indicates CCS7 direct TGN. Characters 23 through 25 contain the actual TGN of the circuit utilized. This is true even for retried calls.

(d) **CCS7 EAEOs Indirectly Connected to an IXC (No Interworking):** Character 1 is set to a value of 3 which indicates CCS7 AT TGN (AT to IC/INC TGN). Characters 22 through 25 contain the actual TGN of the circuit used between the AT and the IXC. In this case, the TGN is carried back from the AT via the EXM.

(e) **CCS7 EAEOs Indirectly Connected to an IXC (CCS7 to MF Interworking):** Character 1 is set to a value of 4 which indicates CCS7 end office TGN (end office to AT TGN with CCS7 to MF interworking). Characters 22 through 25 contain the actual TGN of the circuit used between the EAEO and the AT.

Call Event Status – Abnormal Events

3.19 Standard AMA Record TABLE 58 (as well as Old Format AMA, Data Group T) contains an indication of the last event prior to an abnormal call release. No new CES indications have been defined; however, existing CES fields are utilized by NI to indicate the progress of failing NI calls. Some basic principles apply in utilizing existing EAMF CESs in NI.

(a) **Direct Connect Situations:**

(1) **First Wink:** Contact with the IXC is assumed as soon as the IAM is sent to the IXC. Therefore, failures after this point have progressed past the first wink for IC/INC (originating LATA) (CES value

= 01) milestone.

(2) **Acknowledgement Wink:** Carrier acknowledgement wink corresponds to the point when ACM (or ANM in lieu of ACM) is received from the IXC. Therefore, failures after this point have progressed past the acknowledgement wink received milestone. Failures which occur while waiting for ACM result in a time-out while waiting for acknowledgement wink (CES value = 07) status.

(b) **Indirect Connect Situations:**

(1) **First Wink:** Contact with the IXC is first assumed when either an EXM (in pure CCS7 situations) or ACM (in interworking situations) is received at the CCS7 EAEO. Therefore, failures after this point have progressed past the first wink for IC/INC (originating LATA) (CES value = 01) milestone. Failures prior to this point are not recorded unless 100 percent recording is in effect.

(2) **Acknowledgement Wink:** As in the direct connect case, carrier acknowledgement wink corresponds to the point when an ACM (or an ANM in lieu of ACM – only in pure CCS7 situations) is received from the IXC. If an EXM was received prior to ACM or ANM, failures which occur while waiting for ACM result in a time-out while waiting for acknowledgement wink (CES value = 07) status (this can occur only in pure CCS7 connections since the EXM is not used in interworking situations).

3.20 Once a CES is established, it will not be backed off to a previous point (status). Using the previously mentioned guidelines, CCS7 NI events are indicated in the CES as follows:

(a) **Second CCS7 Continuity Failure – Direct Connection:** For CCS7 EAEOs directly connected to the IXC, a second continuity failure will cause the CES to remain at first wink from IC/INC (originating LATA) (value = 01). In this type connection, any call which fails continuity check will result in this setting of the CES.

(b) **Second CCS7 Continuity Failure – Indirect Connection:** For CCS7 EAEOs indirectly connected to the IXC, a second continuity failure to the AT will cause the CES to be set to attempt recording is in effect and the first wink is not received (value = 00). In this type connection, any call which fails continuity check will result in this setting of the CES. This is done only when 100 percent recording is performed; when there is not 100 percent recording, no AMA record is made at all.

(c) **Abnormal Release Before ACM – Directly Connected EAEO:** If a REL is received, or for some other reason (such as repeated glare) the call connection cannot be maintained, and no ACM or ANM has been received, the CES is set to first wink from IC/INC (originating LATA) (value = 01).

(d) **Abnormal Release Before ACM – Indirectly Connected EAEO:** If a REL is received, or for some other reason the connection to the AT cannot be maintained, and an EXM was previously received but no ACM or ANM has been received, the CES is set to first wink from IC/INC (originating LATA) (value = 01).

(e) **Abnormal Release Between ACM and ANM – Directly Connected EAEO:** If a REL is received, or for some other reason the call connection cannot be maintained, and an ACM has been received but no ANM was received for the call, the CES is set to acknowledgement wink received (value = 07).

(f) **Abnormal Release Between ACM and ANM – Indirectly Connected EAEO:** If a REL is received, or for some other reason the call connection cannot be maintained, and an ACM has been received but no ANM was

received for the call, the CES is set to acknowledgement wink received (value = 07).

(g) **ACM Timer Expiration:** If the timer expires for ACM prior to receipt of an EXM, the CES is set to attempt recording is in effect and the first wink is not received (value = 00). Once the EXM is received, the expiration of the ACM timer will cause an update of the CES to time-out while waiting for acknowledgement wink (value = 04).

For more information on CES indications, refer to Part 7 B(12).

Calling Party Number/Billing Number Information

3.21 The originating IXC AMA records generated for calls that use CCS7 ISUP NI signaling all the way to the IXC (direct or indirect connection) include indication of whether or not the calling party number (CPN) and/or the billing number (ANI) were delivered to the IXC.

3.22 Standard Format AMA TABLE 60 is expanded to record the following if:

(a) No ANI and no CPN are provided

(b) ANI only is provided

(c) ANI and CPN are provided

(d) CPN only is provided to the IXC.

ANI is considered to be provided if the OLI and charge number parameters or OLI and calling party number parameters are sent in the IAM. CPN is considered to be provided if a calling party number parameter is sent in the IAM.

3.23 For EAMF signaling, CCS7 to EAMF interworking, or EAMF to CCS7 interworking calls, Standard Format AMA TABLE 60 continues to only record if no ANI or if ANI is provided to the IXC. Refer to Part 7 B(13) for information concerning changes to TABLE 60.

3.24 Corresponding changes have been made to the ANI indicator in data group T (BCD character 21) of the Old Format AMA record, where data group T BCD character 21 is expanded to record the following if:

(a) No ANI and no CPN are provided.

(b) ANI only is provided.

(c) ANI and CPN are provided.

(d) CPN only is provided to the IXC.

B. Terminating LATA AMA

3.25 The first office (EO or AT) to receive a call from a carrier in a local network produces AMA billing records for terminating access charges. To this end, the following definitions apply for CCS7 NI signaling at the terminating LATA:

(a) **Carrier Connect Time:** CCT indicates when contact is made from the IXC. This occurs when an IAM is received and is accepted by the first office in the terminating LATA. Should glare occur (and the carrier yields) or for some other reason the call must be retried on another trunk by the IXC, CCT will not be achieved (value = 01).

(b) **Answer Time:** This indicates when the incoming IXC call was answered by the called party. This occurs when the answer event is detected [for example, when an ANM/off-hook is received at the first office entering the terminating LATA (AT) or when an off-hook is detected by a directly connected EO] (value = 10).

(c) **Termination Time:** This indicates when the call is completed. Elapsed time from CCT is the interval between CCT and REL/RSC. Elapsed time from answer is the interval between ANM and REL (value = status at time of release).

AMA Record Coding

3.26 As in the originating LATA AMA, in the existing Standard Format AMA TABLE 83, the BCD character 1 is used by the NI feature to indicate the connection type that the IXC used to enter the local network and the TGN of the trunk used between the IXC and the local network, stored in BCD characters 2 through 5 of the same record. Here again, a corresponding change to old format AMA recording is required to reflect these NI modifications. Changes are also required in the APS AMA software to support these modifications. [Refer to Part 7 B(12) for information on Standard Format AMA TABLE 83.]

3.27 In Standard Format AMA TABLE 83, the following values are defined for BCD character 1:

(a) **Terminating Non-CCS7 End Offices Directly Connected to an IXC:** Character 1 is set to indicate (value = 1) non-CCS7 direct TGN. This occurs only in pure MF terminating calls.

(b) **Terminating Non-CCS7 End Offices Indirectly Connected to an IXC:** Character 1 is set to indicate (value = 2) non-CCS7 from IXC to AT and non-CCS7 from AT to end office. This occurs only in pure MF terminating calls.

(c) **Terminating CCS7 End Offices Directly Connected to an IXC:** Character 1 is set to indicate (value = 3) CCS7 direct TGN.

(d) **Terminating CCS7 End Offices Indirectly Connected to an IXC (No Interworking):** Character 1 is set to indicate (value = 4) CCS7 from IXC to AT and CCS7 from AT to end office.

(e) **Terminating CCS7 End Offices Indirectly Connected to an IXC (MF to CCS7 Interworking):** Character 1 is set to indicate (value = 5) non-CCS7 from IXC to AT and CCS7 from AT to end office.

(f) **Terminating CCS7 End Offices Indirectly Connected to an IXC (CCS7 to MF Interworking):** Character 1 is set to indicate (value = 6) CCS7 from IXC to AT and non-CCS7 from AT to end office.

3.28 The 1A ESS Switch defines a NI call as reaching its destination (terminated) when it arrives at the switch serving the customer with the specified called party address. Thus, directly connected terminating situations include calls which terminate to PBXs as well as those which become forwarded out of a directly connected end office.

Calling Party Number/Billing Number Information

3.29 The terminating IXC AMA record (call code 119), generated at the first office in the terminating LATA, may include indication of receipt of the CPN and/or the ANI from the IXC on NI calls.

3.30 For Standard Format AMA, if the incoming call uses CCS7 signaling and if the incoming IAM has CPN and/or ANI information, then structure code 625 is generated instead of code 653 in a short duration record and structure code 627 is generated instead of code 654 in a long duration record. If the incoming IAM does not include either the calling party number parameter or the charge number parameter, then the existing format of call code 119 (with structure code 653 or 654) will be generated.

3.31 Structure codes 625 and 627 include four tables not in structure codes 653 and 654 which are populated as follows:

(a) **TABLE 13:** This table records digits 1 through 3 from the charge number parameter if it is received. It records digits 1 through 3 from the calling party number parameter if a charge number parameter is not received.

(b) **TABLE 14:** This table records digits 4 through 10 from the charge number parameter if it is received. It records digits 4 through 10 from the calling party number parameter if a charge number parameter is not received.

(c) **TABLE 60:** This table records for one of the following:

(1) No ANI and no CPN are provided

(2) ANI only is provided

(3) ANI and CPN are provided

(4) CPN only is provided to the IXC.

⇒ **NOTE 1:**
CPN is considered to be provided if a calling party number parameter is received.

⇒ **NOTE 2:**
ANI is considered to be provided if a charge number parameter is received, if OLI and charge number parameters are received, or if OLI and calling party number

parameters are received.

(d) **TABLE 85:** This table is included in structure codes 625 and 627, but is extraneous in call code 119. It is filled with hex F fill characters.

3.32 In addition to the above tables, BCD character 6 of the study indicator table TABLE 8 is used to indicate if partial digits (3 or 6) were received and recorded in TABLES 13 and 14.

3.33 Refer to Part 7 B(13) for further information about call code 119 generated on NI calls.

3.34 For old format AMA, if the incoming call uses CCS7 signaling, and if the incoming IAM has CPN and/or ANI information, then a new type entry code V66 is generated. If the incoming IAM does not include either the calling party number parameter or the charge number parameter, then the existing terminating access record, type entry code V64 is generated.

3.35 Entry code V66 includes the same data groups as entry code V64 plus data group J. Entry code V66 is built like the entry code V64 record, but three additional data groups are populated as follows:

(a) **Data Group J:** Data group J records digits 1 through 3 from the charge number parameter if it is received. It records digits 1 through 3 from the calling party number parameter if a charge number parameter is not received.

(b) **Data Group B2:** Data group B2 records digits 4 through 10 from the charge number parameter if it is received. It records digits 4 through 10 from the calling party number parameter if a charge number parameter is not received.

(c) **Data Group T:** Data group T (BCD character 21) records for one of the following reasons:

(1) No ANI and no CPN are provided

(2) ANI only is provided

(3) ANI and CPN are provided

(4) CPN only is provided to the IXC.

⇒ **NOTE 1:**
CPN is considered to be provided if a calling party number parameter is received.

⇒ **NOTE 2:**
ANI is considered to be provided if a charge number parameter is received, if OLI and charge number parameters are received, or if OLI and calling party number parameters are received.

3.36 Refer to Part 7 A(12) for additional information about entry code V66.

Trunk Maintenance

3.37 Existing trunk maintenance procedures for ISUP and CI apply for this feature; however, the following procedures have been upgraded for NI:

(a) **Billing of Incoming Test Calls Arriving from IXCs:** Existing CI billing procedures are used. If billing is required, the TM subsystem will interface with the AMA subsystem to produce the appropriate AMA records.

(b) **Handling of the All/None Glare Method Indication:** Modifications to the circuit validation test (CVT) procedure will reflect this new glare resolution procedure. For any CVT request, the terminating exchange will send a CVT response message to the originating exchange indicating the type of glare method (odd/even or all/none) used.

(c) **Upgrading of TTY Maintenance Messages:** All applicable messages (TN06, TN22, etc.) will reflect NI TM modifications to include carrier ID, where appropriate.

All other TM procedures remain unchanged from that of the ISUP feature.

Data Base

3.38 The DB subsystem provides the translation structures, recent change mechanisms, and verification procedures required by the NI feature. The following new and/or modified methods are provided:

(a) A method to indicate whether a particular IXC has subscribed to receiving calling party address information (refer to paragraph 4.16 and Figure 9).

(b) A method to indicate the type of dual seizure control to be used and the control status for the all/none glare resolution method (refer to paragraph 4.16). New indicators, shown in Figure 10, define the type of glare method (odd/even or all/none) used and whether or not a particular TG has control in glare situations. The all/none glare resolution method is an ISUP modification and, therefore, is available with or without the NI feature.

(c) For each internetwork TG at the terminating LATA, a method is provided which indicates whether tone or announcement is to be provided locally or at a previous in-chain office based on whether the call arrived using CCS7 signaling all the way to the terminating LATA (refer to paragraph 4.16 and Figure 10). The following two new indicators are provided:

(1) The internetwork tone/announcement indicator for calls that arrived using CCS7 signaling all the way

(2) The internetwork tone/announcement indicator for calls that arrived not using CCS7 signaling all the way.

(d) A method of providing circuit code information for use at the NI EAEO (refer to Part 2).

(e) A method of relating circuit code to the EAMF 0ZZ/1NX/1N'X indications (refer to Part 2).

(f) A method of relating the NPA in the called party address to the EAMF 01R (refer to Part 2).

(g) A method of providing the EAMF padded country code (CCC) digits from the CC+NN (country code and national number) digits (refer to Part 2).

(h) A method of allowing the new **Texm,d** timer to be recent changeable (refer to paragraph 2.75 and the description of office options table translator in paragraph 4.16).

(i) A method to indicate whether or not a particular IXC has subscribed to receiving carrier selection information (refer to paragraph 4.16 and Figure 9).

(j) A method of allowing the ATP and/or UUI parameters to be recent changeable (refer to the description of CCS7 features TG translator in paragraph 4.16).

Abnormal Operations

A. Unsuccessful Call Setup

3.39 Call setups may fail for a variety of abnormal reasons. For example, if the terminating line is out of order or the call did not pass basic inter-LATA call screening, the call will fail. In cases such as these, a REL may be returned from the terminating office all the way back to the originating office. The requirements for these inter-LATA calls are the same as those specified for intra-LATA calls.

3.40 In EAMF to CCS7 interworking situations at the originating LATA, a call may fail on the CCS7 leg to the IXC for various reasons (for example, continuity failure, ACM time-out, REL received, BLO received, receipt of unreasonable messages, etc.). If this occurs before the second wink is returned to the EAMF EAEO, an off-hook indication is sent back to the EAMF EAEO before an appropriate tone/announcement is played at the AT. If the second wink has been sent already, the AT must wait till the completion of address signaling from the EAEO and then play the appropriate tone/announcement with the EAMF ICT in the on-hook state.

3.41 Either tone/announcement or a REL is returned to the originating LATA for calls

which fail subtending screening (screening of the called party address to determine whether the call can terminate in the current office or in an office served either directly or indirectly by the terminating AT switch) at the terminating LATA. Whether tone/announcement or a REL is returned depends on which IXC handled the call and whether the call arrived using CCS7 signaling all the way as indicated in the forward call indicators parameter of the IAM. If RELs are not allowed to immediately terminate calls which fail screening, local tone/announcements are provided at the office where the screening failed.

3.42 As in the normal call release scenario, the location field in the cause parameter of the REL message is mapped whenever it is received from an IXC.

B. Dual Seizure (Glare)

3.43 Dual seizure occurs when both ends of a two way trunk are seized at the same time. When this occurs, a systematic glare resolution procedure is utilized to determine which of the two competing calls has control of the particular trunk. Beginning with the 1AE11 generic program, a new method of glare resolution (the all/none method) is added to the existing method for all CCS7 calls [refer Part 7 A(17)]. For internetwork circuit groups, a predesignated method (either the odd/even or the all/none circuit control method) is agreed upon between the networks.

3.44 With the all/none circuit control method, an office controls either all or none of the circuits in a particular TG (refer to paragraph 4.16).

C. Timer Expiration

3.45 Various events are timed during the process of a NI call at the AT switch. The basic CCS7/EAMF timing intervals as well as resulting actions for intra-LATA CCS7 and EAMF (when applicable) calls apply for NI calls. Additional actions are defined for handling the expiration of new/existing timers that coincide with the introduction of NI. These timers, used to wait for specific responses, are as follows:

(a) **Time-out While Waiting for CRA (Tcrm; value = 3 sec):** This can occur in EAMF to CCS7 interworking situations at the AT after a CRM is sent to the IXC. If a CRA is not received from the IXC for an initial attempt, the AT reattempts the same call on another circuit. If a CRA is not received on a second attempt, an off-hook indication is sent to the EAMF EAEO. As a result, the speech path is set up and an appropriate inband tone/ announcement are played by the AT. The trunk(s) is then released and idled for new traffic.

(b) **Time-out While Waiting for SSD Wink:** This can occur in CCS7 to EAMF interworking situations at the AT after the first stage of international signaling has been completed to the EAMF IXC. When this occurs, the OGT is released and reorder tone is provided to the calling party. Whether the reorder tone is provided by the CCS7 AT or the CCS7 EAEO depends on the per-office local tone/announcement option chosen by the AT (refer to paragraph 4.16).

(c) **Time-out While Waiting for Acknowledgement Wink:** This can occur in CCS7 to EAMF interworking situations at the AT after all digits are outpulsed to the IXC. For both inter-LATA and international calls, if an EAMF acknowledgement wink is not received by the AT, the OGT is released and reorder tone is provided to the calling party. Once again, whether the reorder tone is provided by the CCS7 AT or the CCS7 EAEO depends on the local tone/announcement option chosen by the AT.

Upon expiration of any of the above timers, maintenance personnel will be notified via the TN08 output message.

D. Call Reattempts

3.46 An initial outpulsing attempt may be unsuccessful for various reasons, and therefore have to be retried on another trunk. The trunk seized for the second attempt is not limited to the same signaling protocol used for the initial attempt. For example, if an initial attempt on an EAMF trunk fails, the second attempt can be retried on a CCS7 NI trunk if necessary. As in intra-LATA CCS7 signaling, no reattempts are made after the first backward message is received on the OGT unless

otherwise specified.

Interactions

3.47 The NI feature relies heavily on the CI and ISUP features. The carrier and routing translations, AMA formats and principles, call screening capabilities, and the originating line logic introduced in the CI feature are applied either directly or with some modification by this feature [refer to Part 7 A(2), A(3), and A(17).]

3.48 Similarly, the CCS7 address and supervisory signaling capabilities introduced in the ISUP feature are applied here as well. Existing network management call gapping capabilities are retained for NI calls. Those calls which are blocked due to "call gapping" will be provided tone/announcement treatment based on existing ISUP requirements. The originating line logic used for LASS to obtain the calling party's address and privacy status is also utilized.

3.49 This feature may also interact with some upgraded ISUP capabilities such as automatic congestion control (ACC) [refer to Part 7 A(17)].

Operational Limitations

3.50 No overlap outpulsing is allowed for CCS7 trunks.

4. Engineering

4.01 These guidelines are for planning purposes only. The Central Office Equipment Engineering System (COEES) Information System engineering document, Index 90, should be used to manually order and engineer the 1A ESS Switch. The standard recommended automated procedure is COEES-MO (Mechanized Ordering).

Hardware

4.02 No new hardware is required for the 1A ESS Switch NI feature. The hardware required for NI is the same as that required for the CCS7 feature [refer to Part 7 B(2)]. Refer to Table B for a list of trunk circuits that can be used for NI (CCS7) signaling.

4.03 Continuity check circuits are used to pass a tone(s) between networks to determine that the voice path continuity and transmission levels are acceptable. Use SD-1A436 (CPI 088) for 2-wire circuits. These circuits are used as a transceiver during outgoing calls and as a transponder for incoming calls.

4.04 Additional continuity check circuits are required for NI. For more details, refer to Part 7 B(2).

4.05 Additional trunk link network (TLN) termination and TLN/line link network (LLN) usage requirements resulting from continuity check circuits can be determined by adjusting the usage inputs on the COEES 443X form (for local or combined local/toll offices).

4.06 The implementation of the NI feature decreases the usage on the MF transmitters and receivers. NI could increase usage for MF digit receivers in EAMF to CCS7 AT. The total number can be determined by adjusting the usage inputs on the COEES 443X form (for local or combined local/toll offices). These circuits can then be reengineered. The excess can be removed to allow for a reduction in the restricted DCS requirements.

Software

A. Base Generic Program

4.07 The NI feature requires the 1AE11 generic program (or later) in the 1A ESS Switch. Also required is the APS generic AP<3>3C (or later). The AP<3>3C generic program must be loaded before loading the 1AE<C9B11>11 generic program. Refer to Part 7 A(10) for APS implementation.

B. Optionally Loaded Feature Groups

4.08 The amount of program store (PS) required for the NI feature can be determined using Table C.

C. Parameters/Call Store Areas

4.09 Refer to paragraphs 5.05 through 5.12 for set card definitions. Refer to Part 7 B(7) and B(8) for comprehensive parameter information.

4.10 The NI plant measurements table (BNIPLANT), in variable DCS, is required for collecting plant measurement counts associated with the NI feature. The actual length of this table is determined by the number of valid carriers for each office, plus one utility word, plus nine words for the invalid IC/INC carriers.

4.11 Parameter word BNI_PM_TBL contains the address and size of the BNIPLANT table +1. The formula used to calculate the size (for each office) is:

[[9 × (NICS + 1) +1] × mark(NICS) × 9F251]

(Set card NICS defines the number of CCS7 IC/INCs.)

4.12 Parameter B6BNI contains the address and size (10) of the NI traffic counts in the variable DCS.

4.13 The CCS7 call registers are used to store incoming/outgoing call data. There are no new restricted DCS requirements for NI. If NI is being loaded into an existing 1A ESS Switch with CCS7, the registers listed below may have to be reengineered if inter-LATA calls increase the total number of CCS7 calls. Refer to Part 7 B(2).

(a) **Originating Registers (ORs):** The number of OR words required = 31 × C7IR.

(b) **Transmitter JR Register (AX):** The CCS7 annex register number (set card NAX7) is based on the holding time and the number of CCS7 outgoing calls.

(c) **AMA Number Services Register:** The number of words required = 28 × NAMS. Refer to Part 7 B(3) for engineering requirements.

If NI is loaded into an existing 1A ESS Switch, no additional AMA registers are required for inter-LATA calls.

4.14 If NI is loaded into an existing CCS7 office, the following unrestricted DCS requirements may have to be reengineered due to additional inter-LATA CCS7 traffic [refer to Part 7 B(2)]:

(a) Trunk state block (TSBSA)

(b) CCS7 timing block (TIMBLK7)

(c) CCS7 message block head cells (MBHCA)

(d) CCS7 temporary message buffer (TMBTOP)

(e) Software carrier group alarm (SCGA) control blocks (ALMBL7)

(f) SCGA activity bit table (ACTBLK7)

(g) Delayed message processor (DUMP) trunk blocks (DTRK)

(h) Buffer administration timing blocks (BATB) for LASS and/or Number Services [refer to Part 7 B(1) for LASS and Part 7 B(3) for Number Services].

4.15 If NI and CCS7 are being initially loaded in an office, in addition to engineering the previously mentioned unrestricted DCS requirements, the following DCS requirements need to be engineered and added [refer to Part 7 B(2) for details]:

(a) CCS7 message block (MSGBLK)

The following unrestricted DCS requirements will need to be engineered and added if the Transactions Capability (TCAP) feature is loaded:

(b) TCAP transaction descriptor (TCAPTD)

(c) TCAP component descriptor (TCAPCD)

(d) TCAP temporary storage (TCAPTS).

D. Translations

4.16 No new translators are created for the NI feature. Those that are required are the same as those required for the CCS7 and ISUP features [refer to Part 7 A(16) and A(17)], however, the following translators have been modified for NI:

(a) **Number Services Designated Translator:** This is an existing translator used by the service switching point (SSP) and is now used by NI. The translator is used to return a 01R for a NPA. The 3-digit translation environment is designated by the office options table (word 5, bits 0 through 5), and is required at the CCS7 to EAMF AT. Refer to Part 7 A(9) for additional information.

(b) **IC Information Translator:** This translator provides pertinent information about a carrier. The IC common block describes features and routing characteristics of the associated carrier. Word 0, bit 15 (previously unused) of the IC common block is now used to indicate whether a particular IC should be provided the calling party DN of the originating party. A modified layout of word 0 is shown in Figure 9. Word 0, bit 17 (previously unused) of the IC common block is now used to indicate whether or not a particular IC should be provided the carrier selection information parameter.

(c) **CCS7 Features TG Translator:** This translator provides information on each CCS7 TG. Four new bits are defined for this translator on a per-TG basis. The first two bits define the type of glare method used and whether or not a particular TG has control in glare situations. The other two bits are used to indicate whether an inband tone/announcement or release message (REL) should be provided to an earlier CCS7 switch. These modifications, provided on a per-TG basis, are shown in Figure 10.

With the 1AE11.06 and later generic programs, two new recent changeable items will indicate whether the access transport parameter (ATP) and/or the user-to-user information parameter contained in an ISUP message received by an AT from an IXC office are allowed to be passed to the originating or terminating LATA. These RC items, provided on a per trunk group basis (incoming to an AT from an IXC), are shown in Figure 10.

(d) **Office Options Table Translator:** This translator provides office translation data. Several new fields are defined for this translator. One new 4-bit field in the office options table defines a new timing value. This value is used for the delay time before an exit message (EXM) is returned after sending out an initial address message (IAM). Also, two new tone/announcement indicators are provided (on a per-office basis); they are identical to those provided on a per-TG basis. Eight new 4-bit fields are defined in the office options table auxiliary block for the NI circuit code. The 0ZZ corresponds to the NI circuit code and must have a one-to-one correspondence. Modification to this translator is shown in Figure 11.

(e) **IDDD Translator:** The 1A ESS Switch AT will need to have an IDDD translator.

4.17 If NI is loaded into an existing office, the following translators may have to be reengineered due to additional inter-LATA trunks. Refer to Part 7 B(2) for additional information.

(a) CCS7 TNN-TGN auxiliary block

(b) Circuit identification code (CIC) subtranslator

(c) Internal point code (IPC) TGN translator

(d) Carrier group alarm (CGA) to CIC translator

(e) Software CGA (SCGA) to CIC translator

(f) CCS7 TG option auxiliary block [required for Number Services; refer to Part 7 B(3)].

Real Time

4.18 Refer to Part 7 B(4) for details.

5. Implementation

5.01 If non-CI offices are to be upgraded to use NI signaling, refer to Part 7 B(12) for additional information on applicable service changes.

5.02 Offices which do not have EA capabilities must have CI data structures (translations, presubscription indication, etc.) updated before this feature can be implemented. [Refer to Part 7 B(12) for additional information.]

5.03 To install this feature in an existing 1A ESS Switch EAEO or AT office, do

the following:

(1) If not present, add ISUP capabilities. [Refer to Part 7 A(17).]

(2) Refer to Part 4 for engineering requirements.

(3) Establish CCS7 signaling connections to each connected IXC.

(4) Add/update/verify NI specific data structures (for example, IXC subscription to calling party number, glare method, circuit code values, etc.). Refer to Part 4 and paragraphs 5.14 through 5.20.

(5) Convert existing CI EAMF trunks to NI signaling (see Note). [Refer to Part 7 A(8).]

⇒ **NOTE:**
This feature modifies CCS7 ISUP signaling for internetwork use. It is intended as an eventual replacement for EAMF signaling. However, since operator services signaling is currently not supported by NI, a number of MF trunks must remain in service to handle calls requiring this capability. In general, internetwork trunks which require special signaling not defined by CCS7 signaling should not be migrated to NI signaling.

Calls using non-inter-LATA or non-international signaling will use intra-LATA CCS7 signaling, even if the same TG can carry NI traffic.

Assignment Restriction

5.04 It is necessary to restrict CCS7 TGs to contain only CCS7 trunks because of translation and RC restrictions. Therefore, the smallest unit to which the NI feature could be assigned is on a per-TG basis.

Set Cards

5.05 Refer to Part 7 B(7) and B(8) for comprehensive set card information. This part describes those set cards that must be input for NI feature implementation. Refer to Part 7 A(17) for set card information that pertains to ISUP.

(a) 9SBNI defines the (optional) feature group for NI. The value for this set card is 1 if the BNI feature group is loaded; otherwise, 0. Feature groups 9SISUP, 9SCARI, 9SMIP, 9SVMI1, 9SAPS, and feature packages 9FBNI, 9FMIP, 9FISUP, 9FCARI, 9FCC67S, 9FSCG, and 9FVMI1 are required for 9SBNI.

(b) 9FBNI defines the feature package for NI (required by 9SBNI). The feature package number is 251. The value for this set card is 1 if NI is loaded; otherwise, 0.

5.06 The values of the following CCS7 set cards will remain unchanged if NI is loaded in an existing CCS7 office. If NI and CCS7 are being initially loaded in an office, these set cards will have to be engineered and added per Part 7 B(2).

(a) MIP feature set cards MPCLU, MPDMAI, MPDMAO, MPINOF, MPINON, MPINSZ, MPMEM, MPNET, MPOTOF, MPOTON, MPOTSZ, and MPOVTO.

(b) ISUP feature set cards MBLNGA, MPLNGB, MPLNGC, and MPLNGD.

5.07 The following CCS7 set cards will have to be reengineered if NI is loaded in an existing CCS7 office and the number of CCS7 calls increase due to additional inter-LATA calls. If NI and CCS7 are being initially loaded in an office, the ISUP feature set cards (CCTB, CDTRK7, C7IR, MBNUMA, MBNUMB, MBNUMC, MBNUMD, NAX7, NCAB7, TOMB and TSBNUM) will have to be engineered and added per Part 7 B(2).

5.08 If NI is loaded in an office that has LASS and CCS7, the values of the following set cards need not change. If NI and CCS7 with LASS are being initially loaded in an office, the LASS and MIP set cards (SNLASS and STLASS) will have to be engineered and

added per Part 7 B(1) and B(2).

5.09 If NI is loaded in an office that has SSP800 (800 Number Service) and CCS7, the values of the following set cards need not change. If NI and CCS7 with SSP800 are being initially loaded in an office, the SSP800 and MIP set cards (SN800S and ST800S) will have to be engineered and added per Part 7 B(2) and B(3).

5.10 If NI is loaded in an office that has LASS and/or SSP800, the value of set card BATBS may have to be reengineered if the number of LASS or SSP800 calls increases due to additional inter-LATA traffic. If NI, CCS7, LASS, and/or SSP800 are being initially loaded in an office, this set card will have to be engineered and added per Part 7 B(1) and B(3).

5.11 The value of set cards NOR and NAX7 will have to be changed if the number of CCS7 registers differ from that of previous MF requirements. Refer to Part 7 B(2) and B(8).

5.12 If NI is loaded in an existing office that has Number Services, the value of set card NAMS may have to be reengineered if the number of 800 Number Service calls increases due to additional inter-LATA traffic. Refer to Part 7 B(3).

5.13 The Carrier Identification Parameter (CIP) optional feature requires Fast Feature set card FF121.

Translation Forms

5.14 The following translation forms are applicable to the NI feature. Refer to Part 7 B(9) for details.

- Form ESS 1204 – Trunk Class Code Record
- Form ESS 1226 – Software Carrier Group Index to TNN Record
- Form ESS 1232 – CCS7 Trunk Group and Point Code Record
- Form ESS 1233A/B – Hardware Carrier Group Alarm to TNN Record
- Form ESS 1303 – Trunk and Service Circuit Route Index Record
- Form ESS 1333 – Interexchange Carrier Common Block Record
- Form ESS 1500B – General Information Record (item 39)
- Form ESS 1500D – Office Options Record
- Form ESS 1600 – Master Scanner Record.

Recent Change Messages

5.15 Table D lists the NI recent change messages and related translators.

5.16 In addition to the messages listed in Table D, RC:PSWD is used to add/change the new office options table translator and the TCC translator data, and RC:TRFHC is used to activate NI traffic measurements.

5.17 Modifications have been made to the following RC messages to add and maintain BNI translations: RC:ICCB, RC:TG, RC:POINTC, RC:TRFHC, and RC:TGMEM. Refer to Part 7 A(1), A(6), A(7), and A(8) for specific changes to these RC messages for NI.

Verification

5.18 The new keywords, ICSCPN and CSI, have been added to the VF:ICSVY input message. The ICSCPN keyword initiates a search for IC/INCs that should be provided the calling party DN of the originating party. The CSI keyword initiates a search for the IC/INCs that should be provided the carrier selection information parameter. For each IXC found, a TR1361 output message will provide the requested data from the IC information translator common block.

5.19 The VFY-TKGN input message is used to verify translation data for a particular TG. The resulting TR10 output message will provide the requested data. The TR10 output data will also include the newly added NI modifications made to the CCS7 feature TG translator. (Refer to paragraph 4.16.)

5.20 For verification of the office options table translation data, the VF:DATA input message provides sufficient capability.

6. Administration

Measurements

6.01 Traffic and plant measurements are provided for the NI feature.

6.02 NI CI plant measurements are provided in the new PM06 plant measurements summary. The IC/INC counts associated with the NI plant measurements are as follows [refer to Part 7 A(4) for details]:

(a) **PMCOT FAIL EAEO:** Count of the number of call failures due to CCS7 continuity failures from an EAEO to the IC/INC.

(b) **PMCOT FAIL AT:** Count of the number of call failures due to CCS7 continuity failures from an AT office to the IC/INC.

(c) **PMEXM TOUT:** Count of the number of time-outs while waiting for the EXM message at the CCS7 EAEO.

(d) **PMACM TOUT:** Count of the number of time-outs while waiting for the ACM message at the CCS7 EAEO and AT offices.

(e) **PMCRA TOUT:** Count of the number of time-outs while waiting for the CRA message at the CCS7 AT office.

(f) **PMSSD TOUT** Count of the number of time-outs while waiting for the CCS7 SSD message wink at CCS7 AT offices during CCS7 to EAMF interworking.

(g) **PMIC WINK TOUT:** Count of the number of time-outs while waiting for the acknowledgement wink at the AT office for CCS7 to EAMF calls using inter-LATA signaling.

(h) **PMINC WINK TOUT:** Count of the number of time-outs while waiting for the acknowledgement wink at the AT office for CCS7 to EAMF calls using international signaling.

(i) **PMINV MESG:** Count of the number of unreasonable messages received causing unsuccessful call setups.

6.03 Traffic counts are printed on hourly, selected quarter hour, and special (S1 and S2) schedules.

6.04 The traffic measurement code (TMC) 170 (NI peg count) is available for the NI feature. The equipment group or office count (EGO) numbers follow. For additional information concerning traffic measurements, refer to Part 7 A(13).

EGO	Description
000	**Originating EAEO Directly Connected CCS7 Trunk:** This peg count accumulates the number of NI call attempts at the originating EAEO using a CCS7 trunk which is directly connected to an IC/INC.
001	**Originating EAEO Indirectly Connected CCS7 Trunk:** This peg count accumulates the number of NI call attempts at the originating EAEO using a CCS7 trunk indirectly connected to an IC/INC.
002	**Originating LATA AT Using CCS7 Incoming and CCS7 Outgoing Trunks:** This peg count accumulates the number of NI call attempts entering the originating LATA AT on a CCS7 trunk and leaving the AT via a CCS7 trunk to an IC/INC.
003	**Originating LATA AT Using EAMF Incoming and CCS7 Outgoing Trunks:** This peg count accumulates the number of NI call attempts entering the originating LATA AT on an EAMF trunk and leaving the AT via a CCS7 trunk to an IC/INC.
004	**Originating LATA AT Using CCS7 Incoming and EAMF Outgoing Trunks:** This peg count accumulates the number of NI call attempts entering the originating LATA AT on a CCS7 trunk and leaving the AT via an EAMF trunk to an IC/INC.
005	**Incoming CCS7 Calls to First Switch in the Terminating LATA:** This peg count accumulates the number of NI call attempts incoming to the first switch in the terminating LATA.

7. Supplementary Information

References

7.01 The following documents contain information related to or affected by the BNI feature.

A. Lucent Technologies Practices

(1) 231-048-313 – *Inter-LATA Carrier Recent Change Formats*

(2) 231-048-350 – *Carrier Interconnect Recent Change Implementation Procedures*

(3) 231-090-120 – *Carrier Interconnect Feature*

(4) 231-300-015 – *Plant Measurements*

(5) 231-301-302 – *CCS7 Trunk Maintenance Changes for CCS7*

(6) 231-318-334 – *Trunk Recent Change Formats*

(7) 231-318-338 – *Traffic Measurement Recent Change Formats*

(8) 231-318-375 – *CCS7 Recent Change Implementation and Trunk Conversion*

(9) 231-318-376 – *CCS7 SSP Translation Implementation Procedures*

(10) 231-361-026 – *CCS7 CNI (Common Network Interface) Ring Implementation Guide*

(11) 231-368-020 – *APS Operations, Maintenance, and Recovery User's Guide*

(12) 231-390-063 – *Automatic Message Accounting Feature*

(13) 231-390-207 – *Traffic Measurements Feature*

(14) 231-390-239 – *Automatic Recall/Automatic Callback – Local Area Signaling Services*

(15) 231-390-244 – *Individual Calling Line Identification – Local Area Signaling Services*

(16) 231-390-500 – *CCS7 General Description Feature*

(17) 231-390-502 – *CCS7 ISUP Feature*

(18) 231-390-510 – *800 Service CCS7 Feature*

B. Other Documentation

(1) *COEES Information System Engineering Document – Index 38*

(2) *COEES Information System Engineering Document – Index 60*

(3) *COEES Information System Engineering Document – Index 75*

(4) *COEES Information System Engineering Document – Index 90*

(5) *Input Message Manual IM-6A001*

(6) *Output Message Manual OM-6A001*

(7) *Office Parameter Specification PA-6A001*

(8) *Parameter Guide PG-1A*

(9) *Translation Guide TG-1A*

(10) *Translation Output Configuration PA-6A002*

(11) *PK-1A120-02*

(12) Bell Communication Research TR-TSY-000064 (TR064 dated December 1984)

(13) *Bell Communication Research TA-TSY-000394 (TA394, Issue 2 dated May 1989)*

(14) *COEES Information System Engineering Document – Index 108*

8. Abbreviations and Acronyms

01R
Region within WZ1

0ZZ
EAMF Inter-LATA Carrier Route Identifier

1N'X
EAMF INC Route Identifier – Operator Call

1NX
EAMF INC Route Identifier

A

ACC
Automatic Congestion Control

ACM
Address Complete Message

AMA
Automatic Message Accounting

AMASE
AMA Standard Entry

ANI
Automatic Number Identification

ANM
Answer Message

APS
Attached Processor System

ASP-NAP
Advanced Services Platform – Network Access Point

AT
Access Tandem

B

BATB
Buffer Administration Timing Blocks

BCD
Binary Coded Decimal

BN
Billing Number

C

CC
Country Code

CCC
Country Code (Padded)

CCS7
Common Channel Signaling System 7

CCT
Carrier Connect Time

CES
Call Event Status

CGA
Carrier Group Alarm

CI
Carrier Interconnect

CIC
Carrier Identification Code

CIC
Circuit Identification Code

CICE
Carrier Identification Code Expansion

CIP
Carrier Identification Parameter

CIR
CCS7 Incoming Registers

CNI
Common Network Interface

COEES
Central Office Equipment Engineering System

COT
Continuity Message

CP
Call Processing

CPI
Circuit Program Index

CPN
Calling Party Number

CRA
Circuit Reservation Acknowledgement Message

CRM
Circuit Reservation Message

CSDC
Circuit Switched Digital Capability

CSI
Carrier Selection Information Parameter

CVT
Circuit Validation Test

D

DB
Data Base

DCS
Duplicated Call Store

DLN-AP
Direct Link Node–Application Processor

DN
Directory Number

DTRK
Delayed Message Processor (DUMP) Trunk Blocks

E

EA
Equal Access

EAEO
Equal Access End Office

EAMF
Equal Access Multifrequency

EGO
Equipment Group or Office (Count Number)

EXM
Exit Message

H

HLAT
HILO Access Tandem

I

IAM
Initial Address Message

IC
Inter-LATA Carrier

ICDN
Interexchange Carrier Directory Number

ICT
Incoming Trunk

II
Information Digits

IMS
Interprocess Message Switch

INC
International Carrier

IPC
Internal Point Code

ISDN
Integrated Services Digital Network

ISUP
Integrated Services User Part

IXC
Interexchange Carrier

L

LASS
Local Area Signaling Services

LATA
Local Access and Transport Area (Calling Zone)

LEC
Local Exchange Carrier

LLN
Line Link Network

M

MF
Multifrequency

MIP
Message Interface Processor

MO
Mechanized Ordering (COEES)

N

NCP
Network Control Point

NI
Network Interconnect

NN
National Number

O

OGT
Outgoing Trunk

OLI
Originating Line Information

OSS
Operator System Signaling

P

PPU
Periodic Partial Update

PTS
Per-Trunk Signaling

R

RB
Reverse Battery

REL
Release Message

RSC
Reset Circuit Message

S

SAC
Service Access Code

SCGA
Software Carrier Group Alarm

SSD
Second Start Dial

SSP
Service Switching Point

T

TCAP
Transactions Capability

TG
Trunk Group

TGN
Trunk Group Number

TIRM
Technical Information Resource Management

TLN
Trunk Link Network

TMC
Traffic Measurement Code

TNS
Transit Network Selection

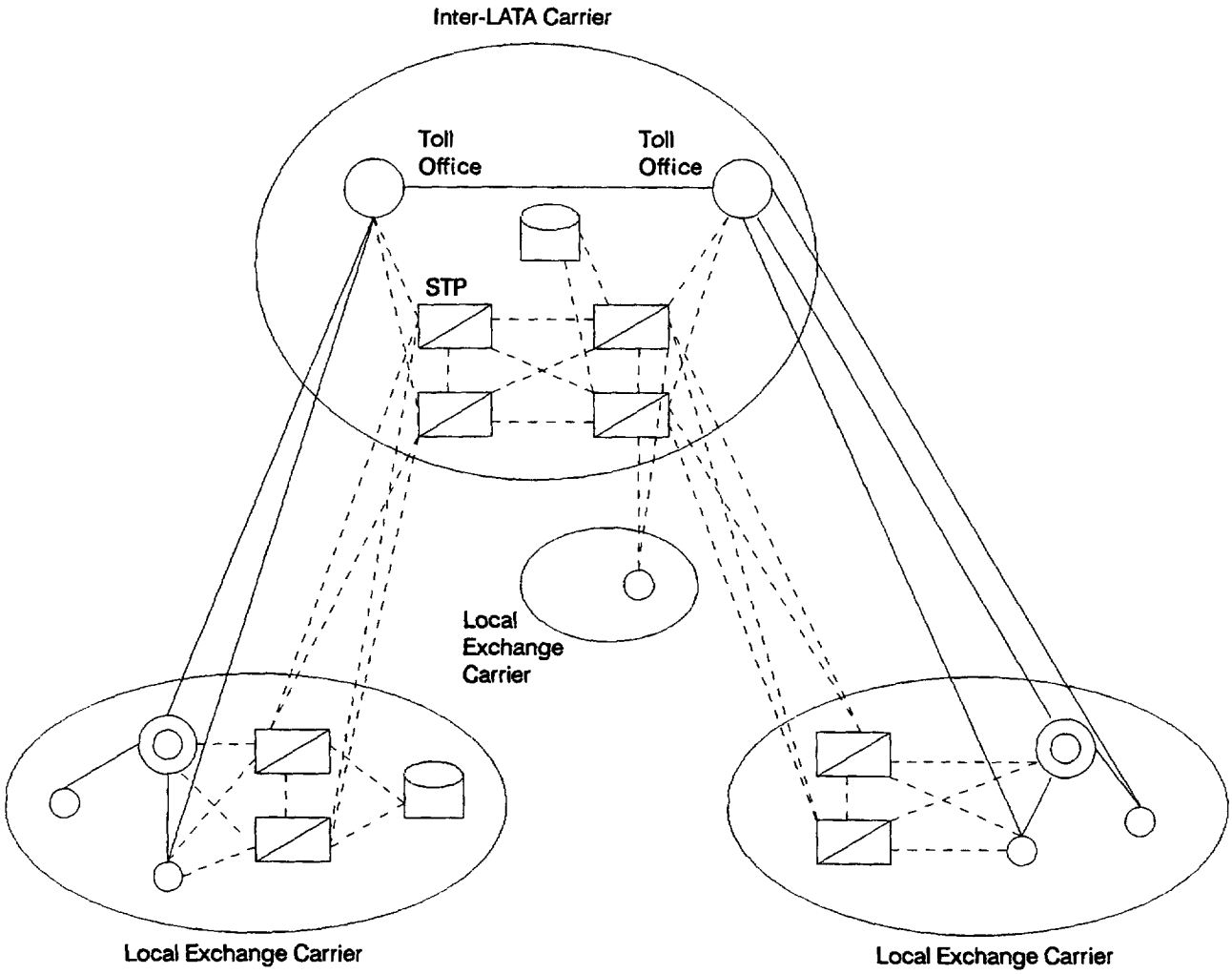
W

WZ1
World Zone 1 (North American Numbering Plan)

X

XXX
Carrier Identification Code prior to 1AE12

XXXX
Carrier Identification Code 1AE12 and later



Legend:

- CCS7 Signaling Link
- Voice/Data Circuit
- Switching Office
- Access Tandem Switch
- Signal Transfer Point (STP)
- Data Base (SCP)

Figure 1. Typical Network Interconnect Architecture

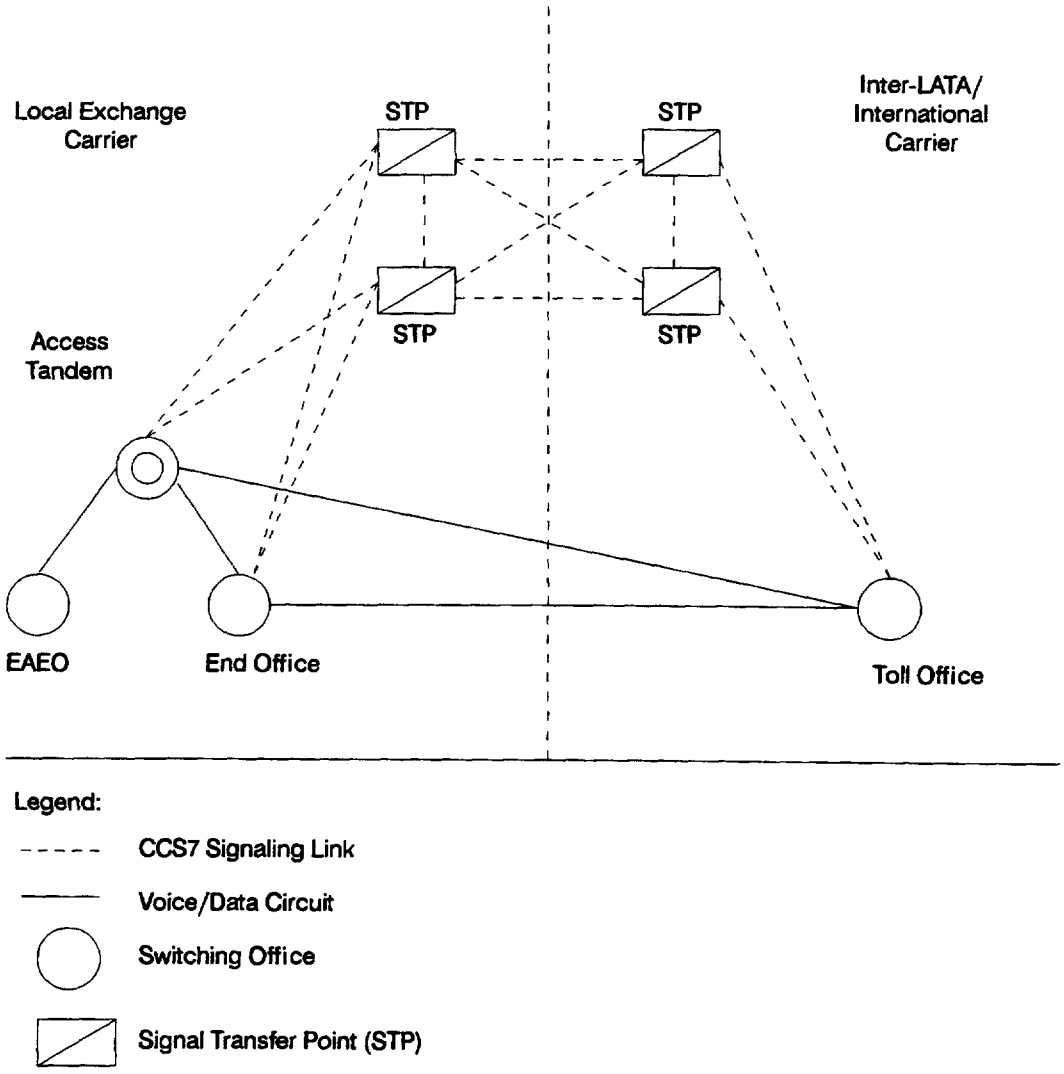
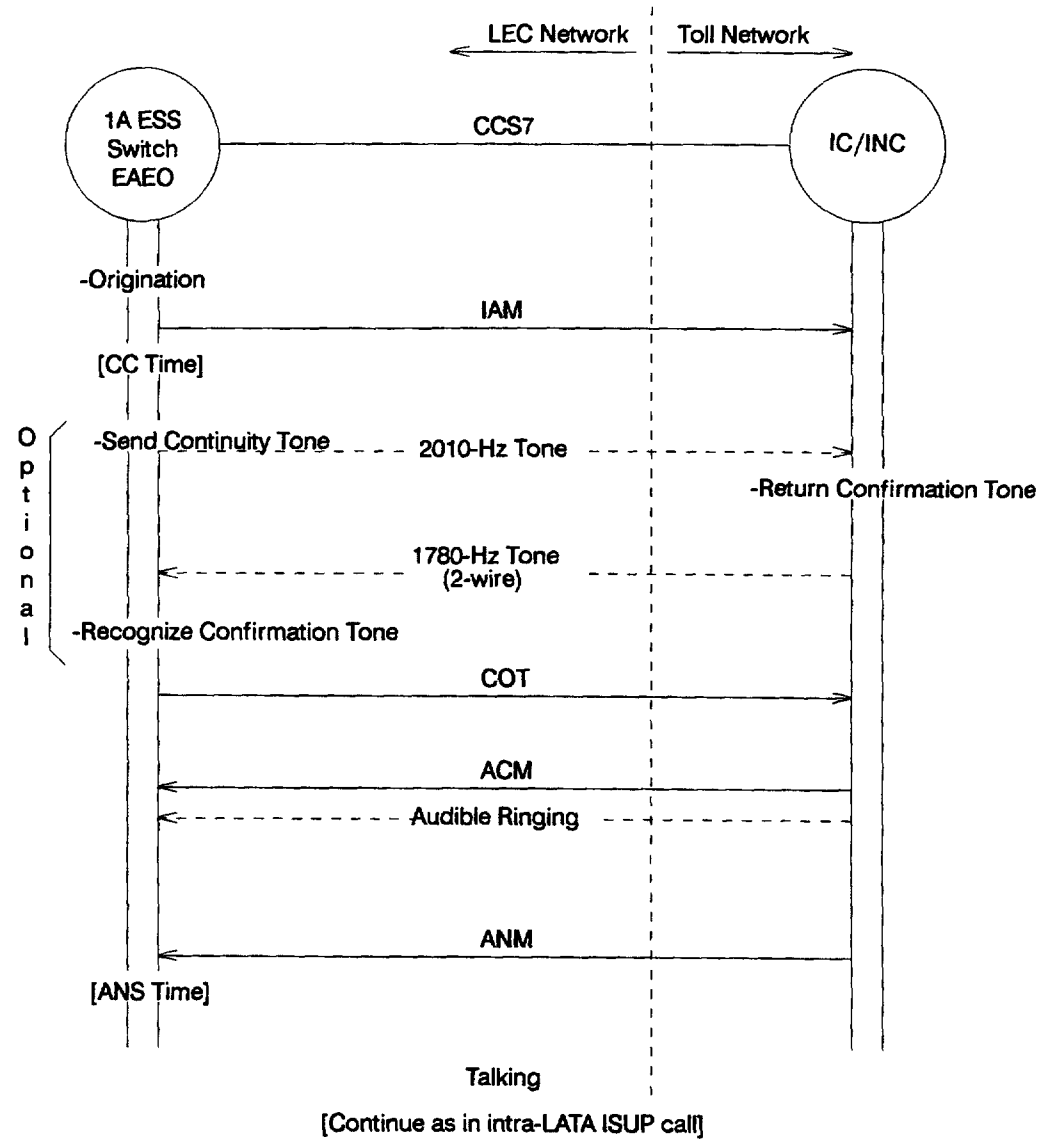


Figure 2. Local Exchange Carrier Architecture for Network Interconnect

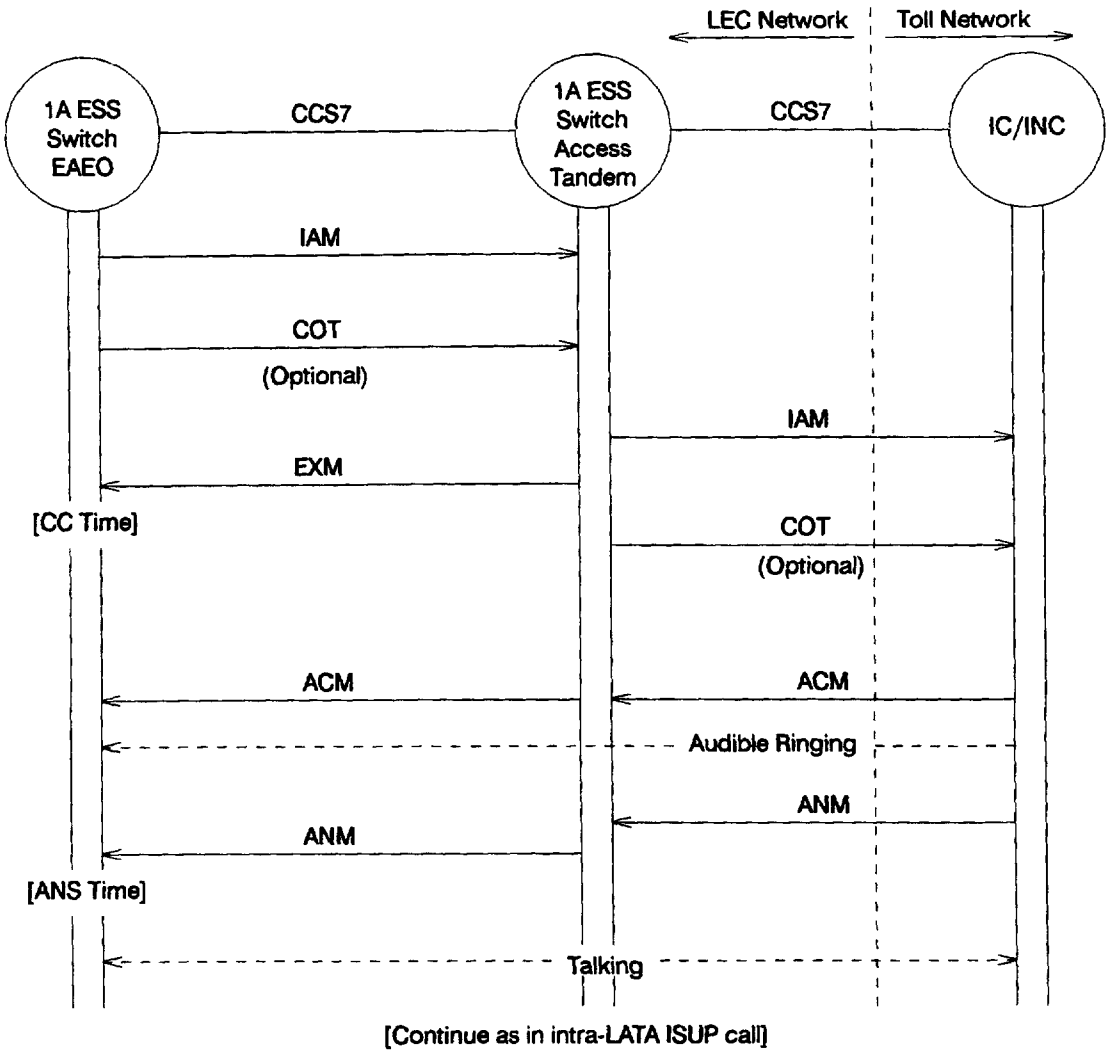


Legend:

⟶	Forward CCS7 Messages
⟵	Backward CCS7 Messages
- - - - -	Signals thru Voice Path
EAEO =	Exchange Access End Office
IC/INC =	Inter-LATA or International Carrier

IAM =	Initial Address Message
COT =	Continuity Message
ACM =	Address Complete Message
ANM =	Answer Message
CC Time =	Carrier Connect Time
ANS Time =	Answer Time

Figure 3. Basic Direct CCS7 CI Call Message Sequence (National/International)

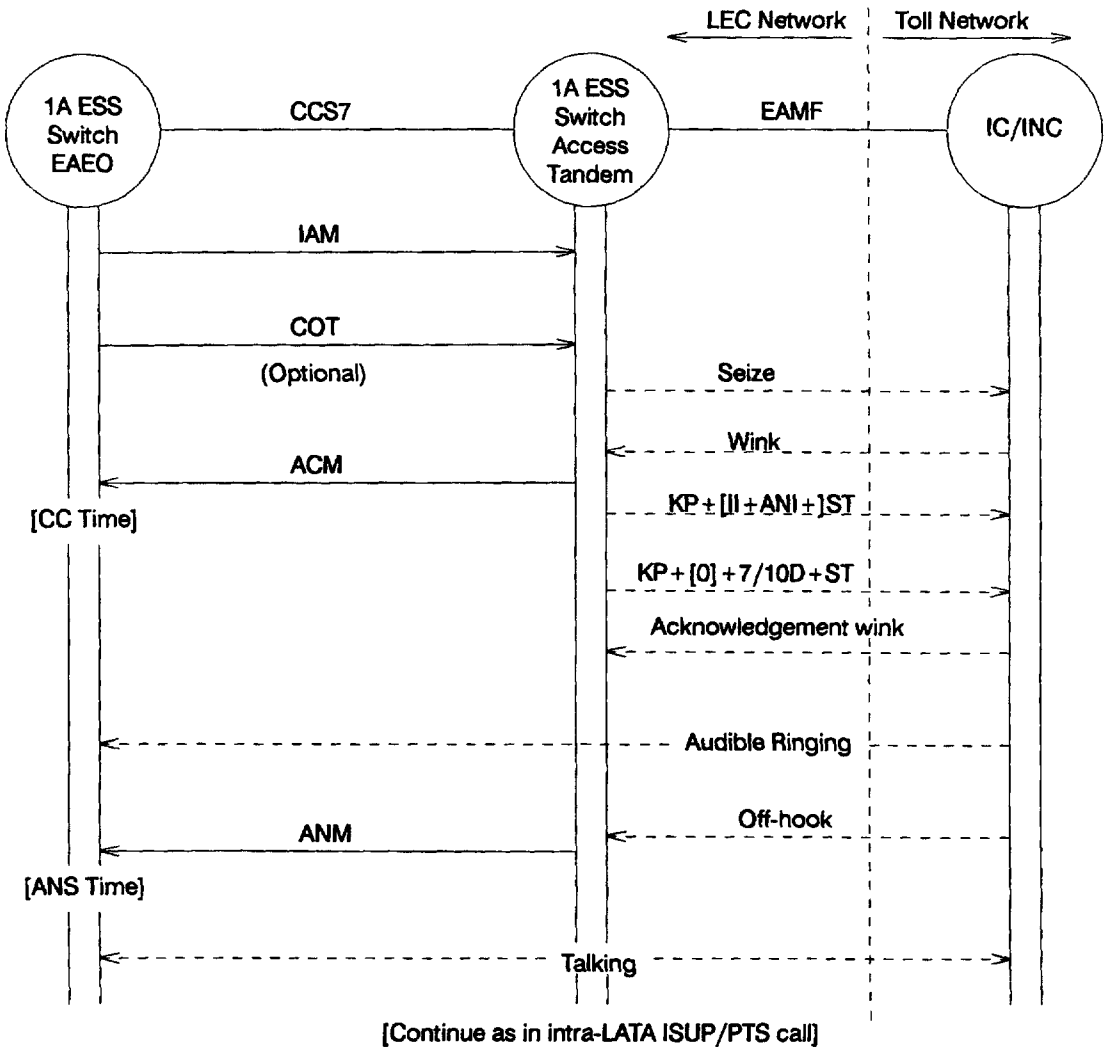


Legend:

Forward CCS7 Messages
Backward CCS7 Messages
Signals thru Voice Path
EAEO = Exchange Access End Office
IC/INC = Inter-LATA or International Carrier

IAM = Initial Address Message
COT = Continuity Message
EXM = Exit Message
ACM = Address Complete Message
ANM = Answer Message
CC Time = Carrier Connect Time
ANS Time = Answer Time

Figure 4. Basic Indirect CCS7 NI Call Message Sequence (National/International)

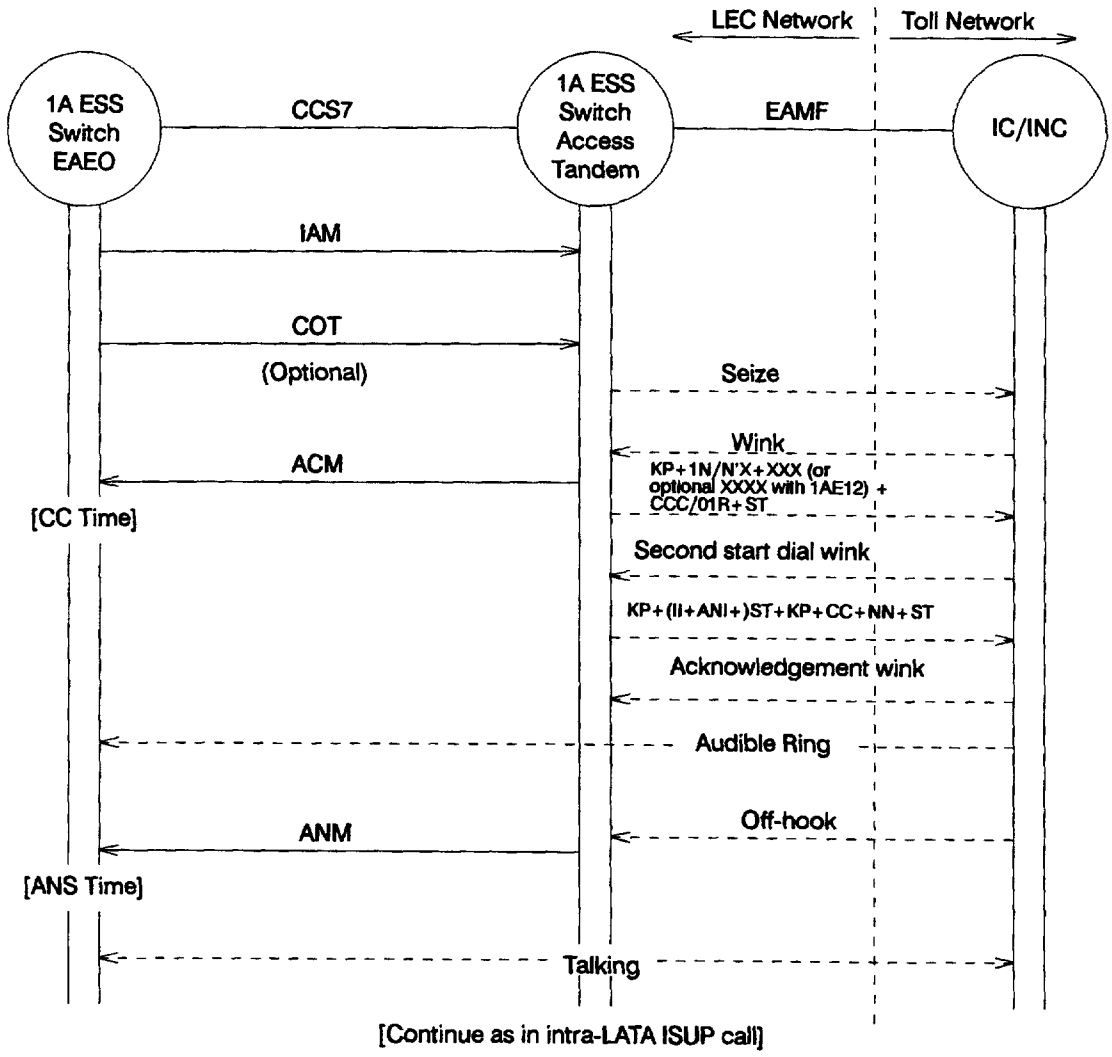


Legend:

→ Forward CCS7 Messages
← Backward CCS7 Messages
- - - Signals thru Voice Path
EAEO = Exchange Access End Office
IC/INC = Inter-LATA or International Carrier

IAM = Initial Address Message
COT = Continuity Message
ACM = Address Complete Message
ANM = Answer Message
CC Time = Carrier Connect Time
ANS Time = Answer Time

Figure 5. Basic CCS7 NI to EAMF Call Message Sequence (National)

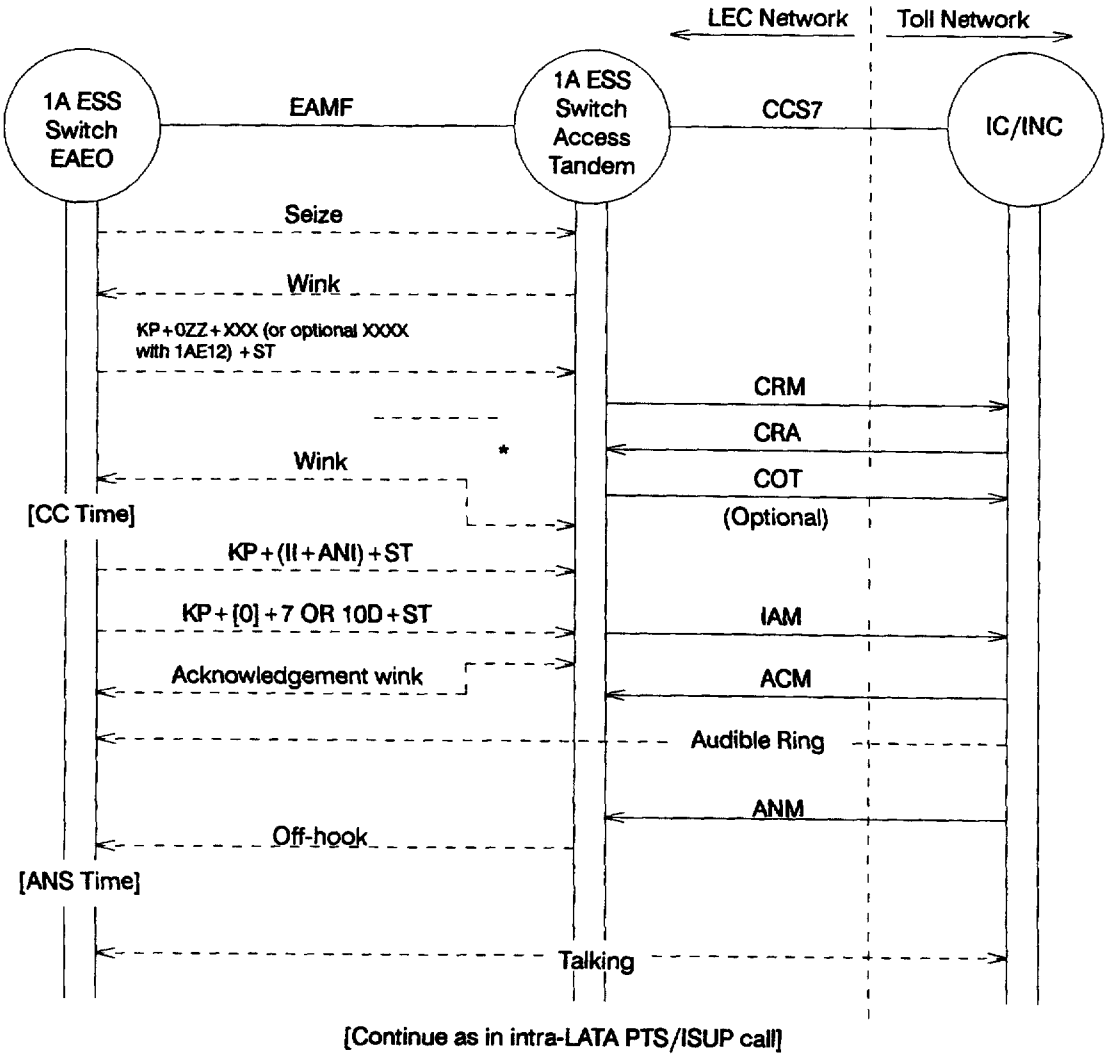


Legend:

Forward CCS7 Messages
Backward CCS7 Messages
Signals thru Voice Path
EAEO = Exchange Access End Office
IC/INC = Inter-LATA or International Carrier

IAM = Initial Address Message
COT = Continuity Message
ACM = Address Complete Message
ANM = Answer Message
CC Time = Carrier Connect Time
ANS Time = Answer Time

Figure 6. Basic CCS7 NI to EAMF Call Message Sequence (International)



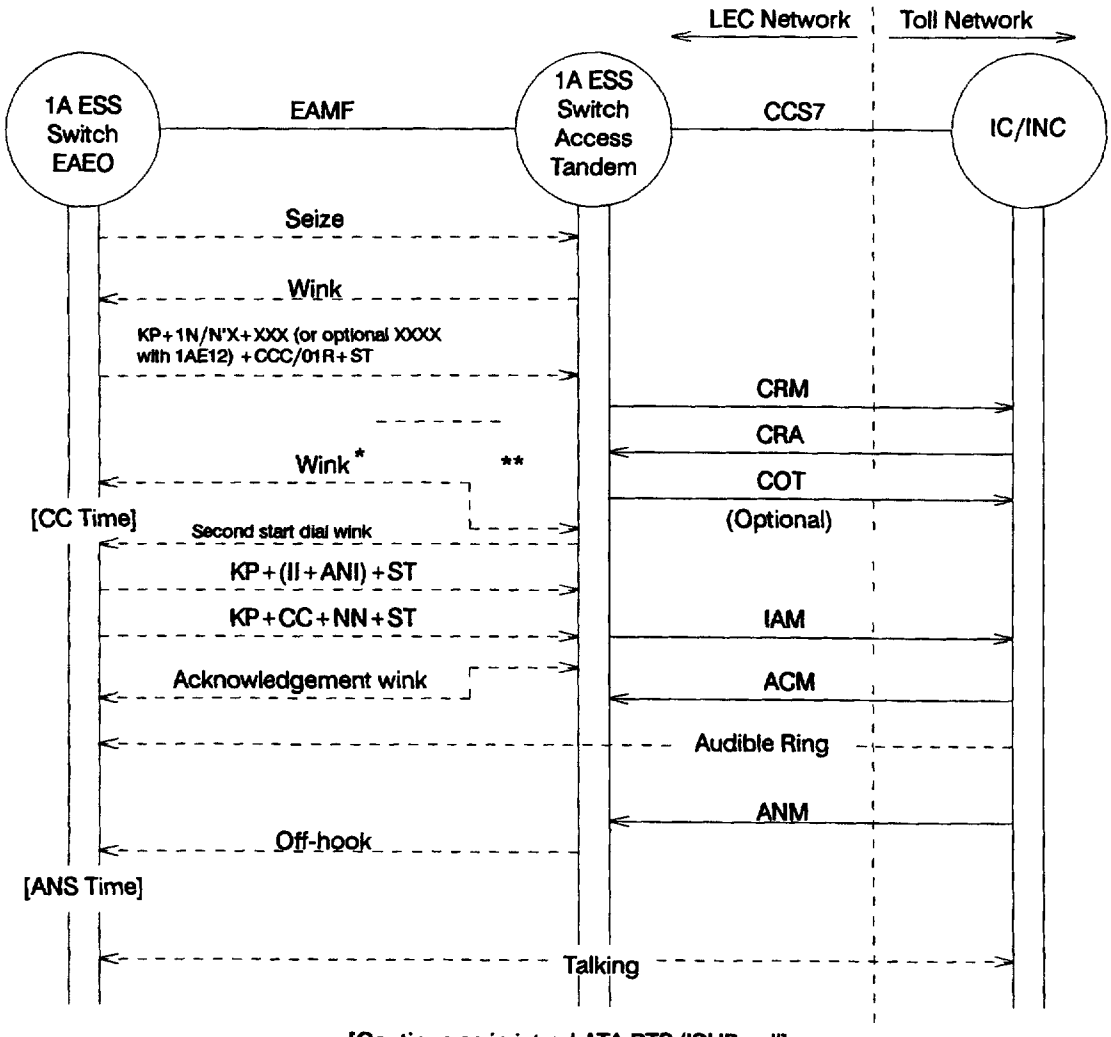
Legend:

Forward CCS7 Messages
Backward CCS7 Messages
Signals thru Voice Path
EAEO = Exchange Access End Office
IC/INC = Inter-LATA or International Carrier
CC Time = Carrier Connect Time

IAM = Initial Address Message
COT = Continuity Message
CRM = Circuit Reservation
CRA = Circuit Reservation Ack.
ACM = Address Complete Message
ANM = Answer Message
ANS Time = Answer Time

* No retries on OGT after this point.

Figure 7. Basic EAMF to CCS7 NI Call Message Sequence (National)



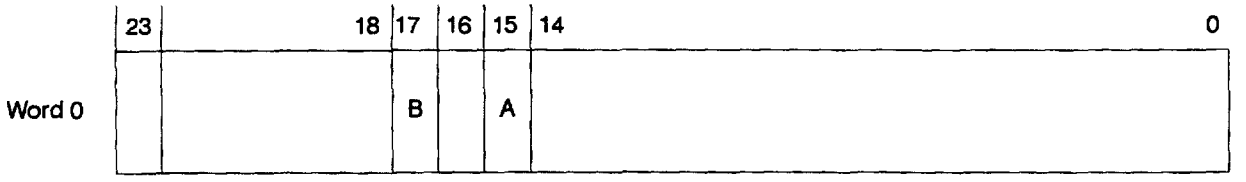
Legend:

→ Forward CCS7 Messages
← Backward CCS7 Messages
EAEO = Signals thru Voice Path
IC/INC = Exchange Access End Office
Inter-LATA or International Carrier
CC Time = Carrier Connect Time

IAM = Initial Address Message
COT = Continuity Message
CRM = Circuit Reservation
CRA = Circuit Reservation Ack.
ACM = Address Complete Message
ANM = Answer Message
ANS Time = Answer Time

* This wink is optional. If not sent; the SSD is sent immediately.
** No retries allowed on OGT after this point.

Figure 8. Basic EAMF to CCS7 NI Call Message Sequence (International)



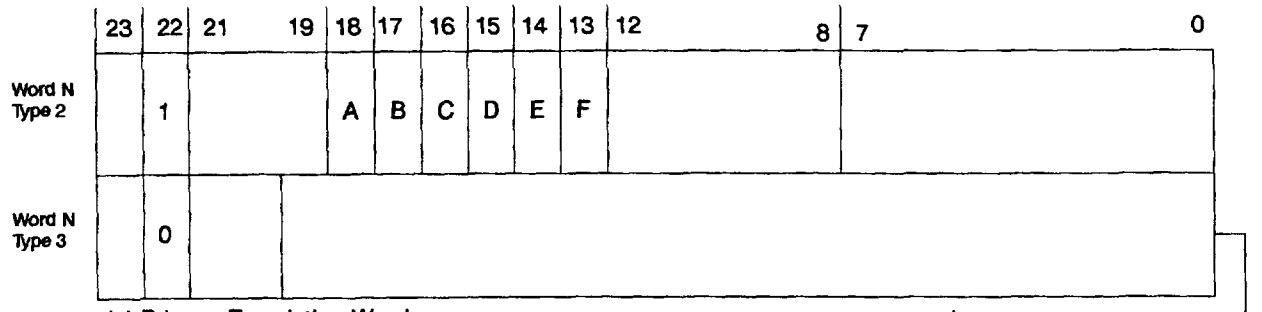
Note: All blank fields remain unchanged. Only the modified field(s) are indicated.

Legend:

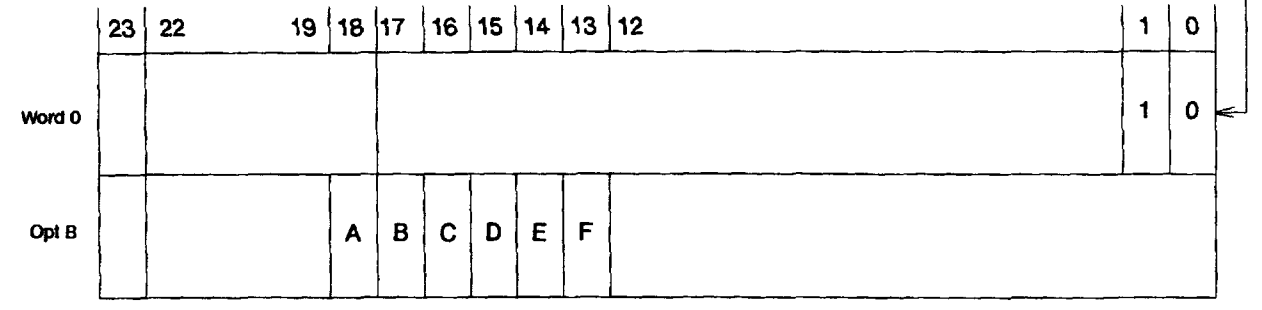
A - ICSCPN (IC/INC subscription to calling party number). If set to "1", the particular IC should be provided the calling party directory number of the originating party. Otherwise, if set to "0", the particular IC should not be provided the calling party directory number of the originating party.

B - CNI (IC/INC subscription to the carrier selection information parameter). If set to "1", the particular IC should be provided the carrier selection information parameter. Otherwise, if set to "0", the particular IC should not be provided the carrier selection information parameters.

Figure 9. Example of Modified IC Information Translator Common Block–Word 0



(a) Primary Translation Words



(b) CCS7 Feature Trunk Group Option Auxiliary Block

Note: All blank fields remain unchanged. Only the modified field(s) are indicated.

Legend:

A - GLRIND (CCS7 glare method indication). If set to "1", use all/none method of glare resolution. Otherwise, if set to "0", use odd/even method of glare resolution.

B - GLRCTRL (all/none glare control indication). If set to "1", this office's trunk group has control in glare situations. Otherwise, if set to "0", this office's trunk group does not have control in glare situations. The GLRIND indicator must be set to "1" for this indicator to have meaning.

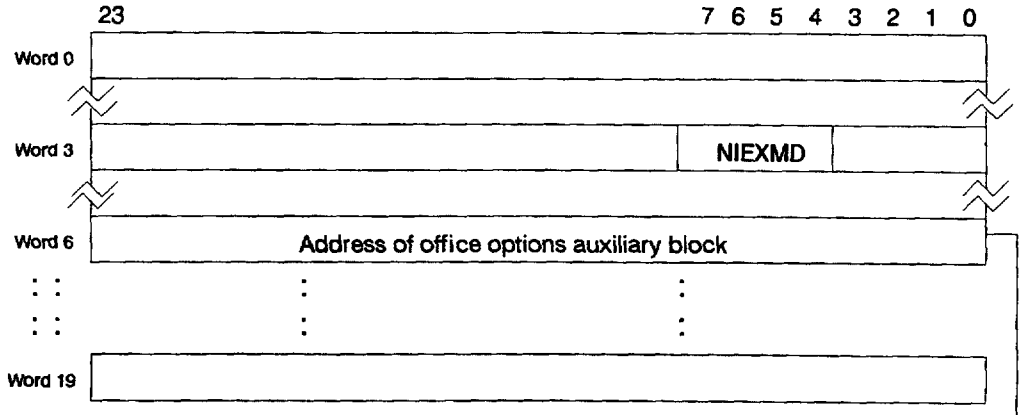
C - TLSALL (inter-network tone/announcement indicator for calls which arrived using CCS7 signaling all the way). This bit is used for terminating LATA subtending screening failures. If set to "0", a CCS7 release message will be returned. Otherwise, if set to "1", an inband tone/announcement will be provided.

D - TLSNOT (inter-network tone/announcement indicator for calls which arrive not using CCS7 signaling all the way). This bit is used for terminating LATA subtending screening failures. If set to "0", a CCS7 release message will be returned. Otherwise, if set to "1", an inband tone/announcement will be provided.

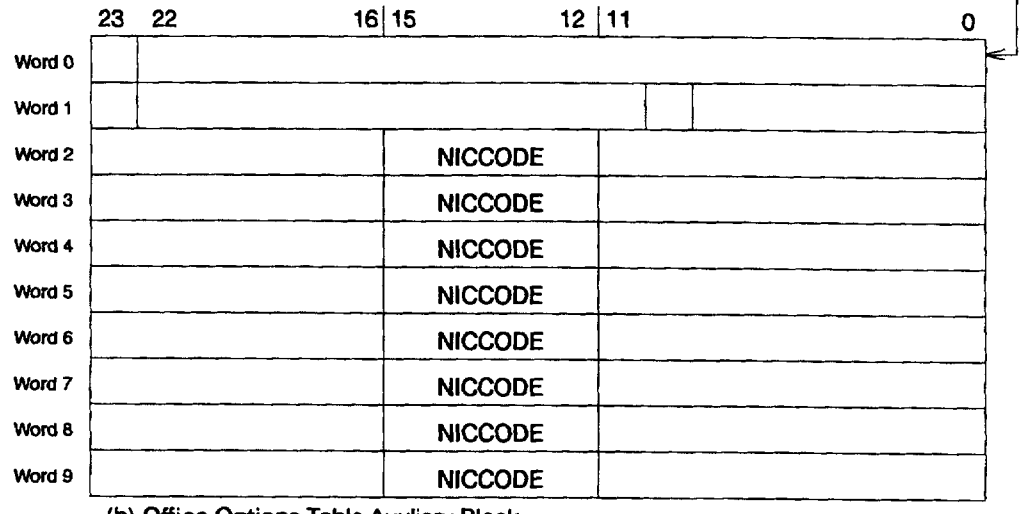
E - ATPA (access transport parameter allow indication). When set to 0, the parameter is not sent from an access tandem to either an originating or terminating LATA when received from an IXC. When set to 1, the parameter is allowed to be passed.

F - UUIA (user-to-user information parameter allow indication). When set to 0, the parameter is not sent from an access tandem to either an originating or terminating LATA when received from an IXC. When set to 1, the parameter is allowed to be passed.

Figure 10. Example of Modified CCS7 Features Trunk Group Translator



(a) Office Options Table



(b) Office Options Table Auxliary Block

Note: All blank fields are left unchanged. The modified fields are indicated.

Legend:

NIEXMD - Network Interconnect Exit Message Timer Delay. A 4-bit value used by Network Interconnect to contain the delay time, at the AT, before an EXM message is returned after sending out an IAM. Allowable ranges for the timer are 100 - 1200 ms. The field should have values of 1 - 12. Initially, this field will be 1000 ms.

NICCODE - Network Interconnect Circuit Code. A 4-bit value used by network interconnect for CCS7 signaling to provide CCS7 initial address message circuit code equivalent of the ZZZ code stored in items Z1, Z2, Z3. Circuit code values must be assigned uniquely.

Figure 11. Example of Modified Office Options Table Translator

Table A. Cause Location Mappings

Location in Release Message Received From Interexchange Carrier (User)	Location in Release Message Sent on Connected Circuit (User)
User	**User**
Local Private Network	Remote Private Network
Local Local Network	Remote Local Network
Transit Network	Transit Network
Remote Local Network	Remote Local Network
Remote Private Network	Remote Private Network
Local Interface	Transit Network
International Network	International Network
Unknown	Unknown
Spare (None of the above)	Unknown

Table B. NI CCS7 Trunk Circuits

Schematic Drawing	Circuit Program Index	Trunk Type
SD-1A165	002	Universal, Outgoing, Local and Tandem, Reverse Battery
SD-1A166	004	Universal, Incoming, Local and Tandem, Reverse Battery
SD-1A252	007	Universal, 2-Way, E&M, Multifrequency
SD-1A236	021	Miscellaneous, 2-Way, E&M, Multifrequency, 4-Wire
SD-1A237	022	Miscellaneous, 2-Way, E&M, Dial Pulse, 4-Wire
SD-1A266	025	Universal, Incoming, Reverse Battery, Delay
SD-1A163	049	Miscellaneous, 2-Way, E&M
SD-1A266	051	Universal, Incoming, Local and Tandem, Reverse Battery Delay Dial With Hold Off-Hook
SD-1A166	161	Universal, Incoming, Local and Tandem, Reverse Battery
SD-3C329	171	Digital Carrier (except foreign exchange)

Table C. CCS7 Feature Group 9SBNI

Feature Groups Required	Feature Packages Required	1AE11 Generic Program Size
9SBNI	9FBNI	14,016
9SISUP	9FISUP 9FSCG 9FCC67S	45,280 1,952 512
9SMIP	9FMIP	3,168
9SVMI1	9FVMI1	13,568
9SAPS	9FAPS 9FAPSCSN 9FAPSPRC 9FAPSUTL 9FAPS20	960 0 0 32 0
9SCARI	9FCARI	2,784
9SDRPC	9FDRPC	1,248

Table D. NI Recent Change Messages

Translator	Message
Point Code	RC:POINTC RC:TG RC:TKCONV RC:TGMEM
Point Code/ Internal Point Code	PC:POINTC
CCS7 Trunk Group	RC:TG
HCGA-CIC Range	RC:TMBCGA RC:TKCNV7
SCGA-CIC Range	RC:SCGA
TNN-TGN	RC:TKCNV7 RC:TGMEM
Intra-LATA Carrier	RC:ICCB

FEEDBACK FORM

Document Title: 1A ESS™ Switch
Network Interconnect
Common Channel Signaling System 7
Feature Document

Document Number: 231-390-521

Issue Number: 6

Issue Date: April 1998

Lucent Technologies welcomes your feedback on this document. When commenting on specific items within this document, please include the section/chapter, paragraph, and page numbers in question. If you choose to complete the "Submitted by" information at the bottom of this form, a Lucent Technologies representative will respond to your comments.

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Submitted by (optional):

Name: _____

Company/Organizations: _____

Address: _____

Telephone Number: _____

Date: _____

Return to:

Document Preparation Group
c/o M. W. Auter
Lucent Technologies Inc.
Network Software Center
2600 Warrenville Road
Lisle, IL 60532
or FAX 630-224-7180