CALL CHARGING
SOFTWARE SUBSYSTEM DESCRIPTION
NO. 3 ELECTRONIC SWITCHING SYSTEM

CONTENTS PAGE

CONTENTS PAGE

CONTENTS PAGE

Figures

CONTENTS PAGE

Tables

1. GENERAL

1.01 This section provides a functional description of the software required to perform telephone call charging in the No. 3 Electronic Switching System (ESS) office equipped with generic issues through Issue 4 of the SO-2 generic or the 3E3 generic. The areas discussed include:

- Local Automatic Message Accounting
- Centralized Automatic Message Accounting
- Coin Telephone Charging
- Message Rate Registers
- Traffic Service Position (System).

1.02 This section is reissued to incorporate any changes necessary to make it compatible to both the 3E3 generic and Issue 4 of the SO-2 generic. Since this is a general revision, change arrows have not been used.

PURPOSE

1.03 This section describes billing arrangements provided through Issue 4 of the No. 3 ESS SO-2 generic or the 3E3 generic. The major billing items provided for Issue 3 of the SO-2 generic include:

(a) Message Rate Charging

(b) Message Registers

(c) Coin

(d) Centralized Automatic Message Accounting (CAMA)

(e) Traffic Service Position System (TSPS)

The major billing items provided for Issue 4 of the SO-2 generic include:

(a) Automatic Message Accounting Recording Center (AMARC) dedicated loop option

(b) Coin

(c) Automatic Message Accounting (AMA) Statistics

(d) Message Registers

(e) CAMA, TSPS.

Refer to the appropriate issue of the program listing (PG-3H907) for additional information. Figure 1 depicts the interaction of the programs pertaining to call charging.

REFERENCES

1.04 Information contained in this section will aid in accessing the software listings which contain detailed program functions and coded software instructions for performing call charging. Table A contains the acronyms, names, and program listing numbers of each program referenced in this document.

1.05 Parts 8 and 9 contain a glossary of terms, abbreviations, and definitions necessary for comprehension of the information contained in this document.

1.06 The following documents provide background and more detailed information on some of the operations that are briefly described in this document.

SECTION	TITLE
233-122-100	Automatic Message Accounting Recording Center Data Link, Description of Theory and Operation, No. 3 ESS
233-122-110	Dial Tone Delay Alarm, Operations, No. 3 ESS
233-151-105	Call Processing Software Subsystem Description, No. 3 ESS
233-151-130	Basic Call Processing Software Subsystem Description, No. 3 ESS
233-151-135	Custom Calling Software Subsystem Description, No. 3 ESS
233-151-150	Translations Software Subsystem Description, No. 3 ESS
233-190-101	Charging Arrangements Feature Document, No. 3 ESS
233-190-112	Coin First Coin Service Feature Document, No. 3 ESS
233-190-123	Message Registers Feature Document, No. 3 ESS
233-190-131	Dial-Tone-First Coin Feature Document, No. 3 ESS.

2. CALL CHARGING FUNCTIONS

BASIC ARRANGEMENTS

A. Local Automatic Message Accounting (LAMA)

2.01 The LAMA is provided at a local central office and records associated with charge calls originated through this office are stored in an AMA buffer. Periodically, all billing data is transmitted, as a block, to a remote AMARC where the data is assembled and recorded.

B. Centralized Automatic Message Accounting (CAMA)

2.02 The CAMA is a means of recording telephone call information for all direct distance dialing (DDD) calls. The DDD calls are routed to a CAMA office in another location which performs the charging. If the No. 3 ESS office cannot identify the calling number because the call requires operator identification (multiparty lines, special toll billing lines, etc), a CAMA operator performs the identification. Dial "0" calls are routed to an operator position (3CL board) or to a TSPS operator.

AUXILIARY ARRANGEMENTS

A. Coin

2.03 Coin telephone charging performs charging for telephone service provided by a telephone which accepts coin deposits at some time during a call.

B. Message Rate Registers

2.04 Message rate charging is performed via software message registers in the memory of the No. 3 ESS, and/or hardware message registers on the customer premises. Hardware message registers are used by the subscriber (eg, a hotel, motel, hospital, etc) to calculate the call charge immediately upon disconnect. The software message registers are used to accumulate the total number of message units used per charging period.

3. CALL CHARGING TRANSLATIONS

ORIGINATION

3.01 Since both local and toll charge calls are initiated by line originations, translation information is required to define the line originating the call and the appropriate charging information.

3.02 The initial translations are necessary to translate a scanner identification into line characteristics. Translation programs and subroutines use the scan point number (SPN) to locate data in the translation tables and to retrieve it for use by the call processing programs.

3.03 Program XSLSPN contains subroutines which perform the initial translation processing. These subroutines form the proper address, using the master table index (MTI) plus the high seven bits of the SPN. The resultant address provides the location of a line subtranslator (Fig. 2). The address is passed to subroutine LNDATA which checks certain items in the subtranslator such as the billing/directory number, type of line (eg, PBX and multiparty), and whether a line is assigned. Subroutine LNDATA then loads this information into a scratch area and notifies subroutine ORGXLA in program XSLSPN that the proper data is in the scratch area and ready for processing.

3.04 Subroutine ORGXLA verifies line features and either loads data into the transient call record (TCR) or requests additional translation data. Subroutine ORGXLA also performs an item-by-item check on the type of line (ie, PBX, manual, coin, etc) and line information and checks for special features such as call forwarding, speed calling, hot line, motel, etc. (A detailed description of translations is available in Section 233-151-150.)

DIALED DIGIT TRANSLATION

3.05 After the line origination and a customer dial pulse receiver (CDPR) are connected, the system is ready for digit reception and interpretation. Program DIGPRO (10-ms Interrupt Program—Digit Receiving and Sending) receives dialed digits and DNTRP interprets and determines translations for the digits. DNTRP then furnishes the digits to translation program XSL3DG which translates the dialed digits into a charge index and a route index. The charge index is used by the charge expansion routine (CH-EXP) in program XSL3DG to develop charge information. The route index is used by the route index expansion routine (RI-EXP), also in XSL3DG, to determine routing and to identify whether the call is intraoffice or interoffice.

ROUTING OF CHARGE CALLS

3.06 The route index stored in the TCR is used to index into a route index expansion table and a 2-word entry is obtained. There are several different types of 2-word entries which may be obtained. Each of these types contain different data. For example, type one for intraoffice calls contains a route index which is the normalized office code. Types two through five and seven for 7- and 10-digit interoffice calls, with or without overlap outpulsing, contain a possible three digits which are used to prefix the digits that are sent. The entry also contains a delete number for the number of digits to be deleted, if any; a "free" bit indicating if there is to be charging; the trunk group number for a trunk to be used; and an "alternate route index provided" (ARP) bit to indicate an alternate route when all the members of the trunk group to be used are busy.

3.07 Dial "0" calls are routed to either a TSPS or a 3CL operator at another location and timing and charging are performed by the operator. "One prefix" calls are routed to a CAMA office at another location which provides timing and charging. If, however, the office is equipped with

Issue 4 of the SO-2 generic with the AMARC option, the No. 3 ESS performs the timing and charging of the toll call. Toll calls from multiparty lines (4- and 8-party lines), which cannot be identified by automatic number identification (ANI) or any special billing types of calls, are routed to a CAMA operator for number identification (ONI).

CHARGE INDEX EXPANSION

3.08 For coin and message rate only, charging for intraoffice calls is determined from data in the charge index expansion table. The charge index obtained from the screening table is used to index into a 1-word entry in the charge index expansion table. This entry provides the type of charging and the charging data.

4. CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING

TOLL CHARGING

4.01 Toll call charging is performed via an associated CAMA office. All issues of the generic programs for the No. 3 ESS can perform this function. An outgoing call to a CAMA office is performed in the same manner as a normal outgoing call except both the called party number and the billing number must be outpulsed. The 3-digit translation yields a route index that points to a CAMA trunk group and the charge index is normally one indicating a free call (ie, charging is not performed in the No. 3 ESS).

TRUNK SELECTION

4.02 The write index expansion information provides the trunk group to be used. An outgoing trunk is next selected via the GET_CKT subroutine in OUTCAL which, in turn, uses the trunk selection subroutine TRKSEL in the program EQPSEL to provide the address of the trunk group data block (Fig. 3) for the selected trunk. Should all circuits be out of service or when there are no working members in the group, a TTY message is printed and the call is failed. Routine AMA_CHK in OUTCAL tests the TSP_CAMA word in the trunk data group to see if this is an AMA call. If it is, the ANI bit is set in the terminal memory record (TMR).

4.03 After selecting the trunk, the type of outpulsing required is determined and the appropriate type of transmitter [dial pulse or multifrequency (MF)] is next selected by the GET_CKT subroutine in OUTCAL. A path is reserved from the trunk (called party) to the transmitter.

CALLED NUMBER OUTPULSING

4.04 Prefixing up to three digits or deletion of up to seven digits in the digit storage area of the TCR may be needed before outpulsing begins. The route index expansion words are examined for prefixing and deletion information and the digit storage area of the TCR is changed accordingly. In addition, leading 0 or 1 digits for 0+ or 1+ calls may be deleted. The outgoing digit counter (OUTDIGCT) in the TCR is set to point to the first digit to be outpulsed.

4.05 After this is accomplished, if MF outpulsing is used, routine ST_CODE_GEN in program OUTCAL is used to store the required start code in the last digit position of the TCR. The start signal is transmitted to indicate to the CAMA office when all digits have been outpulsed.

4.06 The CAMA office may require some amount of time to prepare for the reception of dialing signals on incoming trunks. Therefore, a start dial signal is sent from the CAMA office when ready to accept signals, and digit sending can begin. The start dial signal, a wink (momentary on-hook/off-hook/on-hook) signal, is detected during timed interrupts by the program FASTTK. Program OUTCAL receives an indication when the wink is received and the TCR timer is loaded with the maximum sending time. The BASEPM in the TCR is changed to the OGTOPE routine in OUTCAL for the sending time, the peripheral progress mark (PPM) is set to the sender function, and the digit pointer (OUTPLSCT) is initialized to the first digit to be outpulsed. Program DIGPRO performs all outpulsing functions during the timed interrupt. (See Section 233-151-145 for digit-sending functions.) When the outpulsing function is successfully completed, the OGTOPE routine in OUTCAL is invoked.

4.07 The subroutine OGTOPE first tests for APARTY abandon. If abandon has occurred, control reverts directly to the program DISCON. Subroutine OGTOPE next checks the ANI bit in the TMR to determine if ANI outpulsing is required. If this office is equipped with the CAMA option and not LAMA, all AMA recording of toll calls is

performed by the associated CAMA office. The ANI outpulsing provides the CAMA office with the billing number and a single information digit. If ANI outpulsing is required, the TCR is then set up similar to outpulsing of the called number.

AUTOMATIC NUMBER IDENTIFICATION OUTPULSING

4.08 The GETBIL subroutine in XSLSPN is used to obtain the billing number of the calling party. The trunk is scanned for the ANI start-pulsing signal (continuous off-hook). When it is received, START_ANI_OUTPULSING routine obtains control and prepares the billing number and the information digit, which must be sent prior to the billing number. The codes are used as follows:

- 0—Automatically identified with service nonobserved
- 1—Operator identification necessary with service nonobserved
- 2—Identification failure with service nonobserved
- 3—Automatically identified with service observed
- 4—Operator identification necessary with service observed
- 5—Identification failure with service observed
- 6—Hotel/Motel.

4.09 The next task, which varies depending upon the type of identification code, is setting SIGDIG in the TCR to a value which indicates when outpulsing must stop. If the calling customer billing number is to be outpulsed (ANI), SIGDIG must be 9. If only the information digit is sent, SIGDIG is set to 2. There are other tasks which must be performed such as initializing the TCR timer to a 6-second time-out. The BASEPM is set to OGTAME routine in OUTCAL for return of control after the outpulsing function is completed.

INFORMATION DIGIT RESPONSES

4.10 The billing number normally is obtained from the calling party originating translation. The billing number, when outpulsed, is preceded by the keypulse (KP) signal and the identification digit (ID) and followed by the start (ST) signal. The ID digit is transmitted to the CAMA office to indicate information relative to the calling party identity.

4.11 Normally, where the billing number is automatically identified, it is outpulsed to the CAMA office preceded by the KP signal and information digit 0 or 3 and followed by the ST signal. The call is made stable within the No. 3 ESS office and CAMA processes the call to completion. Figure 4 provides a flow diagram of calls to a CAMA office.

4.12 If the calling party is normally identifiable, but due to some difficulty with translation the billing number cannot be obtained, an information digit (2 or 5) is outpulsed to the CAMA office. This digit indicates to the CAMA office that (because of some difficulty at the No. 3 ESS office) the calling party was not identified. Only the KP signal, information digit, and the ST signal are outpulsed to the CAMA office. The calling party is connected to an ONI operator who verbally obtains the billing information. The call is then made stable to the CAMA office.

4.13 If the calling party is not normally identifiable [a multiparty line, a PBX line, or multiline hunt group (MLHG) without a bill-to-number], information digit 1 or 4 is outpulsed to the CAMA office. This causes the ONI operator to be connected with the calling party in order to verbally obtain the billing number. The call is then made stable to the CAMA office. Figure 5 shows the information outpulsed to the CAMA office.

4.14 The talk path is connected and supervision applied. The junctor is used for line supervision and a trunk ferrod for trunk supervision. The call is given a free charge index and the call is made stable after supervision is invoked for answer detection. After answer, OGTANSWR is invoked by TKPROC, which does nothing if the charge index is free (AMA calls are marked free in the No. 3 ESS office).

DISCONNECT

4.15 The DISCON program is responsible for acting on supervision received from a stable call. Information relating to the call is maintained in the TMR.

4.16 Program DISCON receives control of the call because of an on-hook supervisory report detected by the input monitor. The off-hook reports are sent to program OUTCAL. For stable calls, the input monitor passes a stable TMR address and the encoded primary supervision to DISCON. Program DISCON selects and initializes a TCR and performs early supervisory screening. The outgoing trunk selection status bits are idled by DISCON which calls IDLECKT in program EQPSEL (see Section 233-151-105 Call Processing).

5. TRAFFIC SERVICE POSITION (SYSTEM)

5.01 There are special toll calls such as person-to-person, collect, credit card, and charge to third party for which the CAMA office cannot perform the charging. These calls are automatically routed to a TSPS operator who performs the charging (Fig. 6). The TSPS also provides for coin station, message rate reverting, 0 (dial 0), manual line calls, and calls requiring special toll billing (formerly known as QZ billing). Additionally, this arrangement aids in the completing and recording of local and toll dial assistance calls. Operator assistance is needed to aid in the completion of these calls to ensure recording correct charge data and to supervise coin deposits from coin stations. This assistance is furnished by operators under control of the TSPS.

5.02 When a customer goes off-hook to make a call via TSPS, the origination process begins just as with any other call. A TCR is selected to monitor the progress of the call, the SPN of the calling party is translated in order to identify the calling party, and the customer-dialed digits are stored in the TCR. The SPN translation yields the billing number associated with the calling party.

5.03 The dialed digits are translated to obtain the route index and charge index for the call. The route index is expanded to provide the TSPS trunk group number. The charge index will be set to 01 to indicate that the call is free within the No. 3 ESS and charging will be performed by TSPS. Control of the call is passed to program OPER.

5.04 After the outgoing TSP or TSPS trunk is selected, the call is prepared for transfer to OUTCAL. The OPER program zeroes the alternate route-allowed bit and inhibits the TCR outpulsing of keypulse-start signals for TSP trunks (because TSP cannot handle calls for 1+ noncoin calls). In addition, OPER passes to OUTCAL the route index, TCR address, and the trunk group data block. Then OUTCAL obtains a talk path, a transmitter, and a transmitter path and prepares for outpulsing.

5.05 First, the trunk seizure signal (off-hook) is sent to the TSPS to indicate that a call is in progress. An off-hook wink is returned from the TSPS to indicate that it is ready to receive MF pulses.

5.06 If the start-sending signal is received, the called number is returned from the TCR and outpulsed to the TSPS preceded by the KP signal and followed by the appropriate start code. The appropriate start code is selected on the basis of the first digit dialed by the customer and the type of line originating the call (coin or noncoin). The start code descriptions are in Table B.

5.07 When the called number information has been received by the TSPS, an ANI start signal (off-hook) is returned to the No. 3 ESS. Reorder tone is returned to the customer if this ANI signal is ***not*** received within 2 seconds. Upon reception of the ANI signal, the billing number must be retrieved from the TCR (this information was written into the TCR as a part of the originating translation) and outpulsed to the TSPS. The TCR also indicates whether or not special toll billing (QZ) is required.

5.08 The billing number is then outpulsed preceded by an information digit (based on the lines originating translation) and the KP signal and followed by the appropriate ST code. The information digit tells the TSPS what type of handling is required for the call. If information digit 1, 2, 4, or 5 is present, no billing number is available; therefore, only the KP, information, and ST digits are outpulsed. The call is made stable and the TSPS operator is responsible for obtaining the necessary billing information. The TSPS then controls the call to completion. The called and billing number outpulsing to the TSPS is performed in the same manner as for CAMA outpulsing.

5.09 If the calling party is a hotel or motel line, the TSPS is responsible for returning the charging information to the originating hotel so that the quest may be billed immediately for the call. For Issue 4 of the SO-2 generic, this is

information digit 6. For the 3E3 generic, the new information digit 7 is used for charge-a-call (coinless pay telephone).

6. LOCAL AUTOMATIC MESSAGE ACCOUNTING

INTRODUCTION

6.01 Offices equipped with Issue 4 of the SO-2 generic program have the option of handling charge calls via CAMA offices or by LAMA via a connection from the local central office to an AMARC where charging records are assembled and recorded (Fig. 7).

6.02 The LAMA is comprised of three programs (AMA, ABM, DATADM) and an AMA buffer in memory of the No. 3 ESS office. The hardware considerations are described in Section 233-122-100.

6.03 Billing information for calls originating through the No. 3 ESS is compiled by the No. 3 ESS and stored in an AMA buffer to await transmission to the AMARC. When the AMARC is ready to receive data from this particular No. 3 ESS office, it polls the No. 3 ESS via a 4-wire data link. The No. 3 ESS then responds by retrieving a block of billing information from the AMA buffer and transmitting it to the AMARC via the same data link. The AMARC receives the billing information, assembles it, and stores it on 9-track magnetic tape at 1600 bits per inch (bpi).

RECORDABLE CALLS

6.04 Included in the types of billable calls which may be recorded by LAMA are:

- OUTWATS—full business day and measured-rate
- local measured-rate (bulk or detail billed)
- station paid (toll)
- directory assistance.

The LAMA is also capable of recording charges for all local calls in cases where Usage Sensitive Pricing (USP) is in effect. This includes charges for calls made using the custom calling features such as threeway calling, call waiting, and call forwarding.

6.05 Call information for nonbillable calls may also be recorded. Call types in this category include:

- coin station-prepay and dial-tone-first (DTF)
- INWATS calls originating from within the No. 3 ESS service area
- call forwarding activations and deactivations
- calls made using call forwarding, call waiting, and threeway calling but charged on a flat rate basis.

Provisions are also available to provide capability for recording of call information on all locally originated calls to be used in studies such as subscriber line usage, conference trunk usage, and other traffic studies. Additionally, records may be maintained for purposes such as complaint observing and call tracing.

6.06 During the normal progression of calls, the call processing programs determine which calls require AMA recording. The AMA program assembles the data to be recorded for these AMA-related calls and prepares it for storage in the AMA buffer which resides in temporary storage. The AMA Buffer Management (ABM) program is responsible for controlling the flow of data into and out of the buffer. It also provides a timing check which ensures that any data retrieved from the buffer for transmission to AMARC is valid and up-to-date. The Data Administration (DATADM) program controls the flow of data to and from the AMARC via the data link. A simplified block diagram of the LAMA function is shown in Fig. 8.

6.07 During call processing, AMA information is stored in a 2800-word buffer in temporary storage. The data is placed in the AMA buffer by the ABM program as it becomes available. When the DATADM program recognizes that a polling command has been received from AMARC, it calls the ABM program to retrieve the AMA data to be transferred out of the AMA buffer (during base level), then DATADM initiates the transmission sequence. The DATADM interrupt level program then causes the AMA data to be transmitted to the AMARC. The AMARC assembles the triple entries into a single AMA magnetic tape entry by using the talk junctor number to link the entries.

CALL PROCESSING

6.08 When a customer originates a call, a TCR is selected to monitor the program of the call and the SPN is translated in order to identify the calling line. The 3-digit translation program examines the first three digits and furnishes a code index which, after further translation, leads to a charge index. The translations are performed in the same manner as for CAMA translations (see Fig. 9 and paragraphs 3.05 and 3.06). The charge index, which indicates the need for AMA recording and identifies the type of call requiring AMA recording, is stored in the TMR for future use. The available charge indexes and their descriptions are listed in Table C.

6.09 The program AMA contains the subroutines which are used in forming the entries to be loaded into the AMA buffer. Table D lists the calling sequences of the AMA subroutines; [XXX] shows an optional action dependent upon the type of call. Figure 10 depicts the interaction of the call processing programs with the AMA subroutines.

A. AMA Buffer Entries

6.10 A triple-entry format is used in the No. 3 ESS to store AMA information in the AMA buffer. These entries consist of initial, answer, and disconnect entries which are made at appropriate stages in the progress of a call. Various other entries may be made as required and are discussed elsewhere in this section.

Initial

6.11 During the call process, the call processing programs (OUTCAL, TERM, OPER, and CUSTOM) will execute a subroutine call at the appropriate stage of the call to the subroutine AMA_INI in program AMA to form the initial entry. Subroutine AMA_INI compiles information from the call processing programs and from translations to assemble the initial entry. The information necessary for the initial entry consists of the AMA call type (Table E) routing information, calling and called party telephone numbers, charging information, and the record time stamp. Figure 11 lists the data layout required for the initial entry.

6.12 Upon receiving control of the call, AMA_INI first determines if the office has the AMARS (AMA recording service) by examining the office option word. If the office does not have AMARS, control is returned immediately to the calling program. Subroutine AMA_INI next determines if the call is recordable by calling subroutine RECABL in AMA. RECABL checks whether the call is recordable by examining the call charge index, special study conditions, service observing bit, digit store of the call, custom calling bit, and other indicators. The call is then assigned an encoded call type indication. The number of initial entries is also determined for correct recording of the custom calling function. If the custom calling function (call forward) is invoked, there are other initial entries in the call forward chain to be made. For a detailed description of custom calling, see Section 233-151-135. The subsequent initial entries are dependent upon the type of forwarded call, local or toll. The initial entry formation and insertion routine (COMMON) in AMA is called by AMA_INI.

6.13 The GET_BTN subroutine is called to obtain the telephone number of the BPARTY. If the call is intraoffice, the digits are in DIGITBUF. For interoffice calls, the digits are in the DIGSTR of the TCR. If the call involves a call forward (CF) chain, subroutine GET_CBTN is used since the true called party is the APARTY of the last auxiliary TMR of the CF chain. The other called parties in the CF chain are the BPARTYs in the auxiliary TMRs. Subroutine COMMON collects all the entry information and calls AMA_IN subroutine in program ABM to insert the entry into the AMA buffer.

6.14 The AMA_PEG_INIT register for traffic statistics is pegged and a special charge index (01110) for charge indexes other than coin and message rate is inserted in the charge index. This charge index is an indicator for the AMA_ANS, AMA_DIA, AMA_DIT, and AMA_DIS routines to take a record. If the initial entry cannot be inserted, the call will be set to free and the AMA_PEG_LOST register is pegged. Control is returned to AMA_INI which passes control to the call processing program.

Answer

6.15 For toll calls, OUTCAL passes control to subroutine CHRG_TST in program RING. RING will accept supervision from the junctor "A" side and will also set the trunk to the trunk-charge state. Supervision is accepted from the outgoing trunk and the connect time is obtained.

The connect time, a 40-ms interval, is taken from the No. 3 ESS system clock. The connect time is passed to subroutine AMA_ANS in program AMA from the call processing program.

6.16 The AMA_ANS routine first checks for AMARS capability. If so, it checks for a charge-index of AMAREC (01110), which AMA_INI had previously inserted. It also checks for MR (message rate) or CN (coin). If the charge index is coin, in order to be recorded, it should be one of four cases—complaint observing, traffic sampling, service observing, and subscriber line usage. The CF chain is checked for more answer records and the AMA_PEG_COMP is pegged for statistical information. The system time which is passed to AMA_ANS is the correct connect time. Therefore, no time adjustment is needed. The contents of the answer entry includes the answer entry character (octal 70), the junctor number, and the record time stamp (Fig. 11). Subroutine AMA_IN is called to load the entry into the AMA buffer and control is passed to the calling call-processing program.

Disconnect

6.17 When the subscriber goes on-hook, the No. 3 ESS begins the normal disconnect process. Program DISCON receives control of a call because of a supervisory report detected by the input monitor or for an abandoned call via another call-processing program. There are three types of disconnect entries which could be made dependent upon the type of disconnect (Fig. 11).

- Calling party on-hook
- Called party on-hook, calling party off-hook (time release disconnect)
- Calling party abandoned disconnect.

6.18 If the calling party goes on-hook, program DISCON calls subroutine AMA_DIS in AMA and the regular disconnect entry is made. The system time is passed to AMA_DIS from DISCON. However, due to a scanning delay, the customer may be overcharged for 100 milliseconds, therefore, a transaction of milliseconds is justified. Subroutine AMA_DIS calls subroutine ADCOM in AMA to form the disconnect entry and to load it into the AMA buffer. The traffic register is not pegged and control is returned to DISCON to both hardware and software idle the associated line and circuit.

6.19 The next type of disconnect entry generates a status symbol which indicates the called party is on-hook, while the calling party is still off-hook (timed release disconnect). Program DISCON, upon an indication that the APARTY is off-hook while the BPARTY is on-hook, will call subroutine TCRWAIT in program TCRSCN to allow a 10-second delay before disconnecting the call. If the BPARTY goes off-hook before 10 seconds, the call is returned to stable; however, if the TCR times out, DISCON calls AMA_DIT to record the entry.

6.20 Subroutine AMA_DIT performs the same task as AMA_DIS, except the entry will indicate the BPARTY went on-hook first and the APARTY stays off-hook for the entire 10-second duration. The system time is not adjusted because the time being reported is the exact time when the calling party gets cut off. Control is returned to DISCON.

6.21 The routine AMA_DIA is called by DISCON if the APARTY goes on-hook before BPARTY goes off-hook. The abandon/attempt entry is generated showing the APARTY abandoned. The traffic register is not pegged and the timing is not crucial for charging. Control is returned to DISCON.

Custom Calling

6.22 There are several charging methods associated with AMARS that require special records to be generated for charging and traffic studies. The AMA program contains routines which are used to record data associated with the custom calling sequence which apply to charging. Recording for custom calling (call waiting, call forwarding, and threeway calls) can be performed by AMARS.

6.23 ***Call Forwarding:*** Call forwarding calls will generate as many records as the number of call forwarding actions involved in a single sequence (Fig. 12). This feature is facilitated by the mechanism of the auxiliary TMRs. Whenever there is a call made to a customer who had forwarded his number to another number, an auxiliary TMR is created showing the forwarding activity. This TMR is chained to the active TCR or TMR for AMA recording. The capability that an auxiliary TMR can be chained to another auxiliary TMR provides for repetitive forwarding activities without creating AMA recording errors.

6.24 Subroutine AMA_CFA in AMA is called by CUSTOM to form the call forward activation entry (Fig. 13) and calls AMA_IN in ABM to enter the entry into the AMA buffer. Similarly, AMA_CFD is called to form the call forward deactivation entry. Control is returned to CUSTOM.

6.25 ***Threeway Calls:*** Threeway calls will be charged to the customer who initiates the threeway activity. Since the actual moving into the conference call stage will not take place until the subscriber flashes again, the accurate timing is achieved through the junctor change statement when the call was physically moved from the ordinary talk path to the threeway set up (Fig. 14). The same junctor type charge record is used to record moving out of the threeway call.

6.26 When threeway is compounded with a call forward chain, the first link will be recorded as threeway. The subsequent links will be recorded on call forward status (Table E). The threeway call status code identifies those threeway calls which add an interoffice customer (toll). The call forward toll status identifies the final link when going into the toll network. Programs CUSTOM and TREWAY call several AMA routines which form the custom calling entries stated in the preceding paragraphs.

6.27 The AMA_JCI routine in AMA forms the entry showing a call progressing into the threeway (Fig. 13). TREWAY calls this routine, an entry is made, and control is returned to TREWAY. This program also calls AMA_JCO routine to form the junctor change entry leaving threeway. Figure 15 shows the network configuration for threeway calls.

6.28 ***Call Waiting:*** Call waiting provides an arrangement by which a short alerting tone is applied to a busy station whenever another call to that station is attempted. Upon hearing this tone, the customer may flash in order to place the original call on hold and to establish a connection with the third party. The call-waiting customer may then alternate between the remaining two parties by flashing. The AMA recording is performed normally for each call. Figure 16 shows the action taken by the customer and by AMARS.

Statistical Data

6.29 There is a routine in AMA called AMA_SSM which retrieves the statistical data and inserts the information into the AMA buffer. This entry (Fig. 13) contains statistical information such as total line origination in the No. 3 ESS office, AMA traffic count, initial count, and lost revenue count. This entry is inserted into the AMA buffer and relays this information to AMARC when polled.

OUTWATS

6.30 For OUTWATS calls, the No. 3 ESS automatically supplies the OUTWATS billing number required for AMA recording. This billing number consists of a 3-digit numerical code and a 4-digit number in the form of 0/1XY-XXXX. The first digit of the code (0 or 1) indicates whether the customer has full business day (0) or measured-rate (1) service. The second digit (X) is reserved for assignment by the operating company. (Usually a different digit is assigned to each state for identification purposes.) The third digit (Y) designates the service area or band subscribed to by the customer. (Digits 1 through 5 represent interstate calls and digits 0, 7, 8, and 9 are available for assignment by the operating companies for intrastate calls. Digit 6 is reserved for future interstate application.) The remaining four digits (XXXX) represent the specific billing number for the line.

Flat Rate Recording

6.31 Normally only calls which require billing are forwarded to the AMARC. However, there are situations where flat rate customers must have calls recorded by the AMARC (ie, calls that are being sampled or calls involved in traffic studies). These calls must have the correct flat rate indication and any necessary sample or charging information (such as the FM bit and the information bits A and B).

B. AMA Buffer Management

6.32 The program ABM performs the insertion and retrievals of call records from the AMA buffer. ABM consists of three subroutines: AMA_IN, AMA_OUT, and AMA_CAN. Subroutine AMA_IN receives control via a call from any of the entry-generating routines in the AMA program. An entry is loaded into the buffer according to

the buffer pointer. The loading area size of the buffer is computed and reduced by one. This ensures that the last byte of the buffer is not loaded to guard against pointer crossover. If crossover occurs, the full buffer could be lost. When the entry is inserted, a traffic register is pegged and control is returned to the calling program.

6.33 The subroutine AMA_OUT retrieves entries from the AMA buffer and stores them into a user-designated private buffer for transmission to AMARC. The program DATADM calls AMA_OUT to obtain the records after the No. 3 ESS has received a polling command from AMARC. The retrieving of records from the buffer is also controlled by pointers computed to point to the next record to be retrieved. After the AMA buffer is cleared or the private buffer is full, no fractional entry is allowed in the private buffer, the AMA_PEG_BLK counter is pegged, and control is returned to the calling program.

6.34 The subroutine AMA_CAN is called repeatedly by the DATADM program upon the blockage of both the primary and backup routes. The entries which have been in the buffer longer than 9 minutes will be deleted. A cancel message is then inserted into the AMA buffer only when one or more records are deleted to notify AMARC of the cancel condition.

ERRORS

A. Stable Clear

6.35 The No. 3 ESS may experience a stable clear condition in which the memory records for all stable calls (TMRs) are lost. If this condition should occur, all stable calls are terminated and the stable clear entry (Fig. 13) is written into the AMA buffer. Upon reception of this message, AMARC cancels the billing records for all affected calls.

B. Transient Clear

6.36 The No. 3 ESS may be also experience a transient clear condition in which the memory records for all transient calls (TCRs) are lost. If this occurs, the billing records for all calls which have not reached the answer state are terminated and the nonstable clear (NSC) entry (Fig. 13) is written into the AMA buffer. When AMARC receives this message, it marks all calls in progress with an indication that an NSC has occurred. On subsequent entries from the No. 3 ESS, if a call (which was in progress at the time of the NSC) completes normally, it is billed normally. However, if the sequence of a call in progress (at the time of the NSC) is destroyed, the call is billed for the minimum charge.

AMARC INTERFACE

6.37 Program DATADM is the interface between the AMARC and the No. 3 ESS. DATADM, after a transmit command from AMARC, calls program ABM to retrieve the records from the AMA buffer. Program DATADM also computes the time stamp and controls the transmission of the records to AMARC. There are several command messages transmitted to and from AMARC. Section 233-122-100 contains the detailed information explaining the commands and responses of the No. 3 ESS.

COMPLAINT OBSERVING

6.38 Complaint observing is an arrangement by which detailed billing may be provided, upon request, for local calls made by measured-rate customers. The No. 3 ESS offices utilizing LAMA may provide this service in one of two ways. A line option may be activated at the No. 3 ESS which causes the information bit B in the initial entry to indicate the need for complaint observing on that particular line. Complaint observing may also be provided by entering the customer line in a 400-entry table resident in the AMARC. This table will be scanned before assembling the No. 3 ESS call records.

7. LOCAL CHARGING

7.01 There are two types of local charging which can be performed by the No. 3 ESS office, coin and message rate. Also, each of these types can be either untimed or timed according to the local office options.

COIN

7.02 The coin-first coin stations are wired to close a dc path between the ring and tip conductor when the handset is removed from the switchhook. When the initial deposit is made, a resistance ground is placed on the tip conductor.

This is detected by the line ferrod which is wired for ground operation. If the coin station is dial-tone-first, no coin is needed to receive dial tone. The scan point number and line translations (paragraphs 3.02 and 3.03) identify the line by its originating major class as a coin-first line or dial-tone-first. A CDPR is connected and dial tone is returned.

7.03 After the prefix digit and/or first three digits have been dialed, the 3-digit translation determines the route index and charge index information (paragraphs 3.05 and 3.06). Dial "0", "0+", and "1+" calls are routed to a TSPS or 3CL operator who handles further routing and any charges which may apply.

A. Local Coin

7.04 A local coin call is a call within the coin subscriber local calling area which can be either timed or untimed. No time limit on the call exists when overtime charging is not required. The charge index in translation indicates whether timing is required for the call.

7.05 The program TERM checks the called line for the idle state. If idle, any auxiliary circuits that may be associated with the called line are idled. The called-line major class is examined to check for a free call. If the called line is free and the calling party is a line or a trunk not required to charge on calls to free lines, the charge index is set to free. The calling party is now tested for coin or message rate. If it is coin line and terminates to a non-free line, a coin present test is made. If the coin is not present, the coin line is set up to a coin announcement. When the coin is present, the call proceeds as a normal call. See Section 233-190-112.

7.06 If the office has LAMA and the coin line is being traffic-sampled, AMA entries will be loaded into the AMA buffer.

7.07 When program RING receives control (BPARTY off-hook supervision is the called party answer report), RRING must set up the talking connection. Before changing the network connection, any circuits and junctors used in the call have their ignore bits set to preclude any future supervisory report until all work involving the network is completed. The ringing circuits and paths are idled and the talk path is set up. Finally, the charge index is examined. If the call is free, the TMR is set to stable, the TCR is cleared, and control is returned to the input monitor. If the call is not free, control of the call is passed to the local charging program.

7.08 The CHRG_TST routine in program RING examines the route index for the free or charge indication. The junctors and trunk circuits involved are set to allow supervision and the charge bit is set to indicate the call is to be charged. The connect time is obtained from the ANSTIME word in the TCR and a call to AMA_ANS is made. If the call is a charge call, a branch is made to DLY_TIME in program LCLCHG.

Untimed

7.09 The DLY_TIME routine performs charge timing for coin and message register initial timing. After a 2-second charge delay timing, the charge index is loaded and a call is made to CH_EXP in program XSL3DG. Upon return to LCLCHG, there are indicators for coin or message-rate type of charging which provide the initial charge, length of initial period, overtime charge, and the length of the overtime period (Fig. 17). The timing period and initial time are examined. If this indicates that overtime charging is not in effect and the calling party is a coin line, the call is made stable and no further action is needed until disconnect.

7.10 If message rate, message registers are pegged appropriately as indicated for the initial period by the charge index. The call is then made stable and no further charging action is taken.

7.11 Upon disconnect, program COIN is invoked by DISCON after all paths have been idled. For all coin lines, a coin collect or return function is performed on the line. Program COIN first sets any auxiliary line circuit that may be associated with the line and the appropriate voltage is applied to clear any coin from the coin chute to the hopper. After the preparatory work, COIN selects an idle coin control circuit and a path from the line to the select circuit and sets up the network connection via the PACT macro. It then determines whether to collect or return the coin. If, when COIN is invoked, it is known that the coin should be returned, bit "ABNDN" in the TCR is set to one. If the bit is set to zero, COIN checks the charge index for free or charge. The coin is collected or returned

by setting the coin control circuit into the appropriate collect state.

Overtime

7.12 This type of coin call is processed the same as untimed coin call until the routine DLY_TIME in LCLCHG is entered. When overtime charging is in effect, the time is converted into seconds and stored in the TMR.

7.13 The overtime timer is obtained and decremented by 30 seconds to permit collecting of the coin 30 seconds before the end of the initial timing period. The TCR is cleared, the TMR is set for timing the initial period, and control is returned to the base level monitor.

7.14 Routine LOCCHG in LCLCHG is the entry point for OVERTIME charging for coin. If there has been a TMR timer time-out, it is handled here. The coin is collected for the initial talking period. After collecting, a delay of 30 seconds will be given to provide time for the customer to make an additonal deposit for more talking time.

7.15 The coin is collected by selecting the desired type of coin circuit connection (CCC). A connection is established to the line via the no-test vertical to perform the desired function. In generic 3E3, a normal service circuit to line connection is used (ie, the no-test vertical is not used). When making a coin presence test, the CCC is set to test for the presence of a coin. This takes two distribute orders to the CCC, a delay of 600 ms, and then a scan of the CCC to test for the coin. The result is stored in the coin in hopper (CIH) bit of the TCR.

7.16 If the coin presence test is successful, the TMR is set to stable and the TCR is idled. If the coin was not present, an overtime announcement is given. If a coin is not present after the announcement is given and after a 30-second delay, the connection is dropped and the coin line is set to the high and wet state.

7.17 In generic 3E3, a DTF line is returned to dial tone. A CF line requires a deposit to receive dial tone.

B. Toll Coin

7.18 Provisions for completing toll coin calls are handled by a 3CL or TSPS operator. When a customer places a toll call from a coin station, the No. 3 ESS will connect the call to a TSPS trunk (see paragraph 5.05). The calling and called number is forwarded to the TSPS. The TSPS operator handles the charging, monitors the coin deposits, and then signals the ESS to collect the deposit. The LCLCHG program is entered at routines OPERATOR and COINFCTN which collect or return the coins under the operator instruction. In generic 3E3, routine COINFCTN is in the COIN program. If the operator fails to collect the deposit, it is automatically collected by the ESS after the customer goes on-hook.

7.19 Person-to-person calls, collect calls, bill-third-party calls, and credit card calls are performed in a similar manner with the operator remaining on the call as necessary to supervise the progress of the call.

C. Fraud

7.20 The DLY_TIME routine in LCLCHG will check for APARTY being a trunk. If a trunk, a trunk delay is used to prevent "Black Box Fraud." If the called party attempts to circumvent the charging apparatus by selectively applying off-hooks followed by on-hooks to the line, the trunk delay timing will abort the call after the second sequence. The off-hook interval is 2 seconds.

D. Stuck Coin

7.21 A stuck coin test is only performed after disconnect during coin clean up. After the collect/return action at the coin station, a coin presence check is made. If a coin is still present, a second collect/return action is initiated and the coin present check is made again. If the second collect/return action was successful, no further action occurs; but if the coin is still present, a stuck coin printout is made on the maintenance TTY, call status information is loaded into the error analysis buffer (this condition may indicate a bad coin control circuit), and the line is idled and given permanent signal treatment.

MESSAGE REGISTERS

7.22 There are two types of message registers, hardware and software. Hardware message registers are located on the customer premises and provide the charge information (in terms of message units used) to compute the actual charge of the individual message-rate call. Both hardware and software registers are optional. The No. 3 ESS contains a software message register which accumulates message units for the incoming PBX trunk or the individual line. When LAMA is provided, software message registers are not allowed. A line may have a hardware message register with LAMA.

7.23 When the customer with the message register goes off-hook, the call is handled the same as any call. After the CDPR is connected to the customer line and the first three digits are dialed, the 3-digit translation program examines them and furnishes an associated code index. The code index is expanded to furnish a screening table address and a direct route index.

7.24 The route index expansion is performed to determine the type of call, whether intraoffice or interoffice. If intraoffice, the 4-digit translation program must be utilized in order to identify the called line and complete the talk path.

7.25 When the talk path is completed, ringing is applied to the called line and audible ringing is returned to the calling line by program RING. Normally, when the called line answers, the TCR is released and the TMR is used to hold information pertaining to the stable call; however, for charging calls, a 2-second waiting period must expire to verify that the called party has actually answered. Control of the call is passed to LCLCHG for initial and overtime charging. Control will then be passed to routine DLY_TIME in program LCLCHG, the same as for coin calls. Subroutine DLY_TIME will obtain the charging information for the message-rate call such as the length of the initial period and overtime period and the number of message units charged for the initial and overtime periods.

7.26 The subroutine MR_CHG in program XSLSPN is called to check if the line has an associated hardware message register on the subscriber premises. If so, MR_CHG returns the number of message units. The distributor triplet address word needed to peg the register is obtained from the TCR.

A. Untimed

7.27 After the 2-second delay used for charge calls, the charge table is accessed via the charge index in the TMR for incrementing the software and hardware (if applicable) message registers to reflect the number of message units to be charged for the initial time period. The initial time period, in minutes, is retrieved from the charge table so that timing can begin. If the initial time period is listed as 0 minutes, the call is identified as an untimed message-rate call and no overtime charging or timing is required. At this point, the call is considered stable and the TCR is cleared. The timing bit in the TMR is set to 0, indicating untimed message rate, and supervision for on-hook is begun.

B. Timed

7.28 If the initial time in the charge table is listed as being between 1 and 7 minutes, the call is identified as a timed message-rate call. The call is now considered stable, the timing bit in the TMR is set to 1 (indicating a timed message-rate call), timing of the initial period is begun, and the TCR is released.

7.29 Supervision is maintained during the initial timing period. If the call is completed and on-hook occurs before the period ends, a TCR will be selected to begin the normal disconnect process. If the initial time expires and the call remains stable, a TCR is selected to charge for the overtime period.

7.30 Progress mark LOCCHG_ in LCLCHG is entered to perform the overtime charging. The charge index is retrieved from the TMR and is expanded to determine the message unit charge and the length of the overtime period. The hardware and software message registers are then incremented to reflect the message units charged for the overtime period. The TMR is set to time the overtime period, the call is made stable, and the TCR is released.

7.31 Supervision is continued during the overtime period to recognize when the call is to be disconnected. If on-hook occurs before the end of the overtime period, a TCR will be selected to

begin the normal disconnect process. If the overtime period expires and on-hook has not yet occurred, a second overtime period is required.

7.32 The second overtime period is processed identically to the first, and additional overtime periods are processed, if necessary, until on-hook occurs. At that time, the normal disconnect procedure will be followed.

C. AMARC Considerations

7.33 If the No. 3 ESS office is equipped with LAMA option, message register charging is handled differently. After the call has been identified as a message register charge call, an initial entry is made into the AMA buffer. The AMA_INI routine checks the charge index via calls to other associated routines to obtain the message billing information (MBI) index. The custom calling indicator bits are also checked to see if this call is involved in either a call forward chain or a threeway call. The MBI is converted into two binary coded decimal (BCD) characters. The status is changed to local and the BPARTY telephone number is obtained from DIGSTR if an intraoffice call. The F_M (flat rate or measured rate) bit to indicate type of charging is set.

7.34 The answer and disconnect entries will also be made for the message-rate call by calling the AMA subroutine via the call processing programs. These entries are transmitted to AMARC in the same manner as the toll call records. There AMARC will compute the measured rate change. The handling of the hardware message registers is the same as described in paragraph 7.26.

8. GLOSSARY

8.01 Terms and definitions used frequently in this document follow.

APARTY—The calling party

BACTION Bit—Bit in TCR which is set to indicate base level action is needed

Base Level—Major software loop including all functions not done during interrupt level

Bit—The binary unit of information which is represented by one of two possible conditions, such as the digits 0 and 1, high potential or low potential, on or off

BPARTY—The called party

Clear—To restore a storage device to the "Zero" state

High and Wet—State in which the trunk or line is monitored for an on-hook only

Hot Line—A line with direct access to a party for which no dialing must be done

Immediate Start Trunk—A trunk which does not wait for a signal before beginning to send dial pulses (usually from a step-by-step office)

Interoffice Call—A call switched between different central offices

Intraoffice Call—A call from one subscriber assigned to a central office to another subscriber within the same office

10-Ms Interrupt—A hardware-initiated interrupt which interrupts the base level loop every 10 ms for a period of time necessary to perform frequently required functions

Junctor—A circuit associated with the switching network which provides a path for a call through the network

Line—Anything that connects to a network terminal that is not classified as a trunk or service circuit; usually a pair of wires that serves to connect a customer telephone to a terminal on the network

Macro—A sequence of operations called by an abbreviated notation

Nonoverlap Outpulsing—The outpulsing of digits after all digits have been received

Operator Trunk—One of five types of trunks (TSP, TSPS, toll switching, recording completing, operator office trunk)

Outpulsing—Generation of pulses to match the stored digit information and of the proper type to be used by the distant switching office

Overlap Outpulsing—The outpulsing of digits as received instead of waiting until all digits have been received before beginning to outpulse

Program—A set of instructions assembled as one unit under a program name

Progress Marks—Areas in TCR which indicate next software routines to be executed for the call

Scan Point—Ferrod sensor used in scanners for supervisory purposes

Signal Digit—Area in the TCR to indicate the location of the digit to be received before base level is alerted for more base level action

Series Completion—Allows calls to be routed to any designated directory number within the same office code if the original number is busy

Set—To make a storage device equal to the "one" state

Stable Call—A call that has reached the talking state and no further action is needed until supervision is received from one of the parties in the call

Subroutine—A sequence of instructions which performs a well-defined function and is called by another section of instructions

Word—A set of characters which occupies one location in storage and is treated by the system as a unit.

9. ABBREVIATIONS

9.01 Abbreviations used frequently in this document follow.

AMA—Automatic Message Accounting

AMARC—Automatic Message Accounting Recording Center

AMARS—AMA recording service

ANI—Automatic number identification

ARP—Alternate route index provided

BCD—Binary coded decimal

BPI—Bits per inch

CAMA—Centralized Automatic Message Accounting

CCC—Coin circuit connection

CDPR—Customer dial pulse receiver

CF—Call forward

CIH—Coin in hopper

CN—Coin

DDD—Direct distance dialing

DTF—Dial-tone-first

ESS—Electronic Switching System

ID—Identification digit

KP—Keypulse

LAMA—Local Automatic Message Accounting

MBI—Message billing information

MF—Multifrequency

MR—Message rate

MTI—Master table index

NSC—Nonstable clear

ONI—Operator number identification

OUTDIGCT—Outgoing digit counter

PPM—Peripheral progress mark

SPN—Scan point number

ST—Start

TCR—Transient call record

TEN—Terminal equipment number

TMR—Terminal memory record

TSPS—Traffic Service Position System

USP—Usage sensitive pricing.

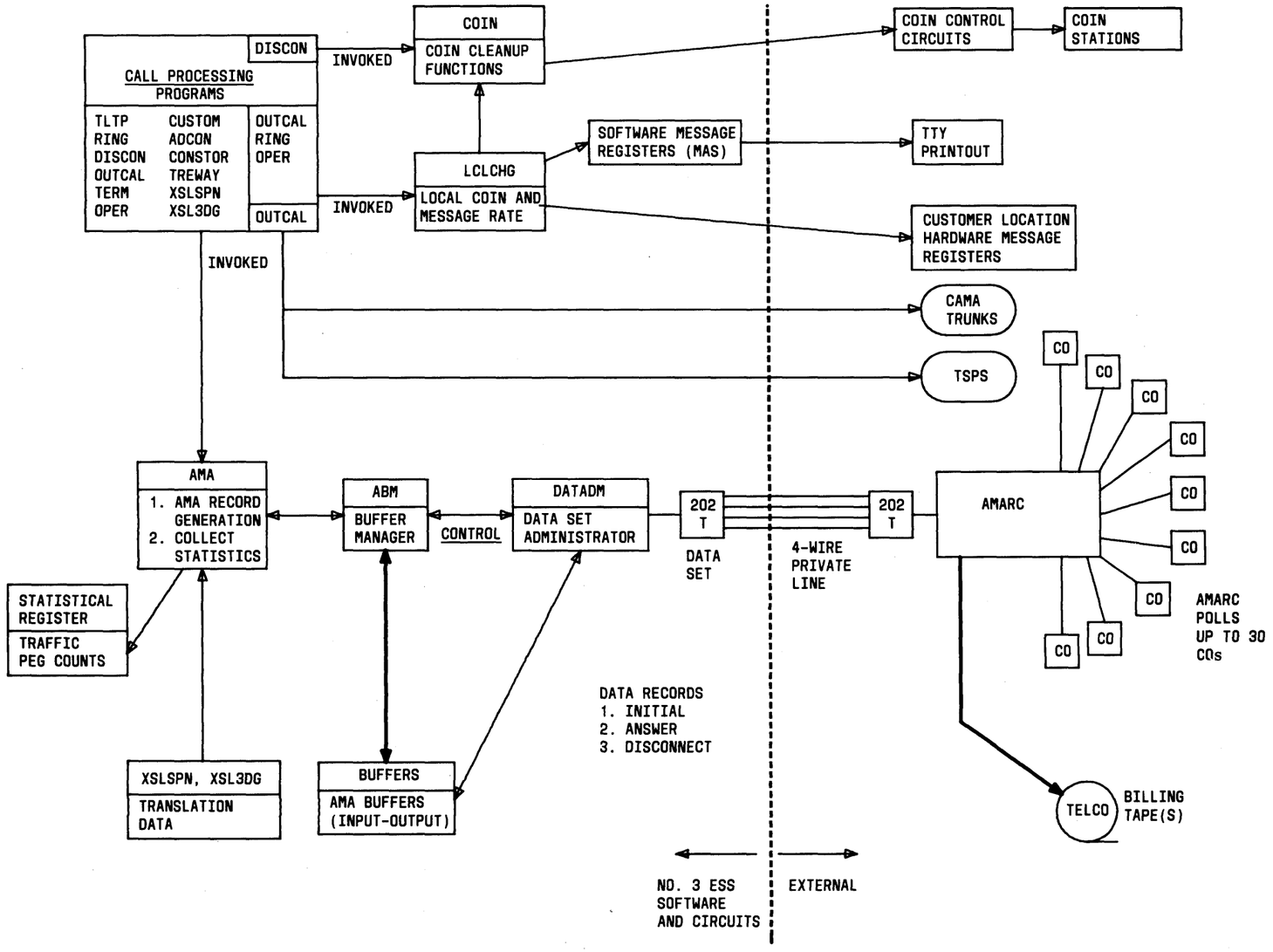
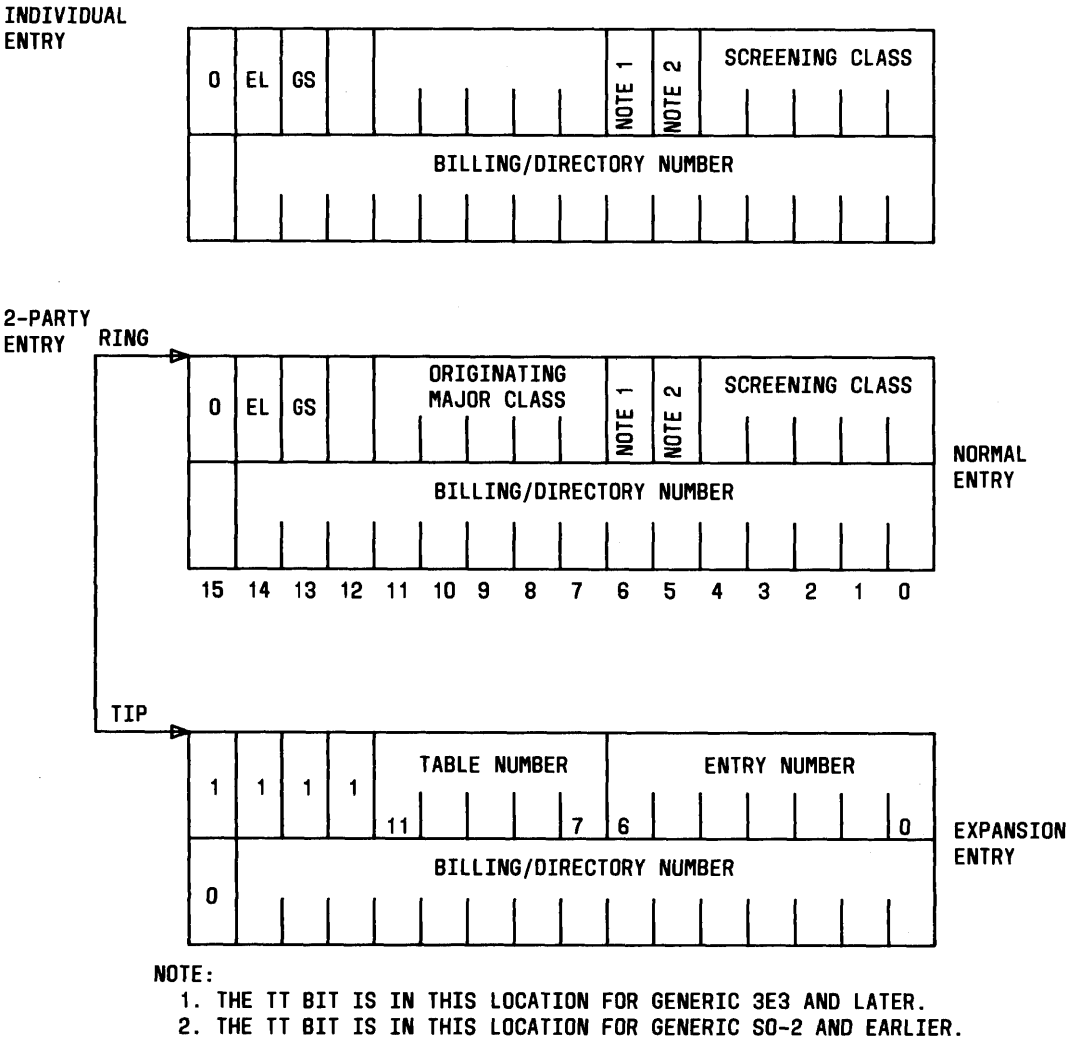
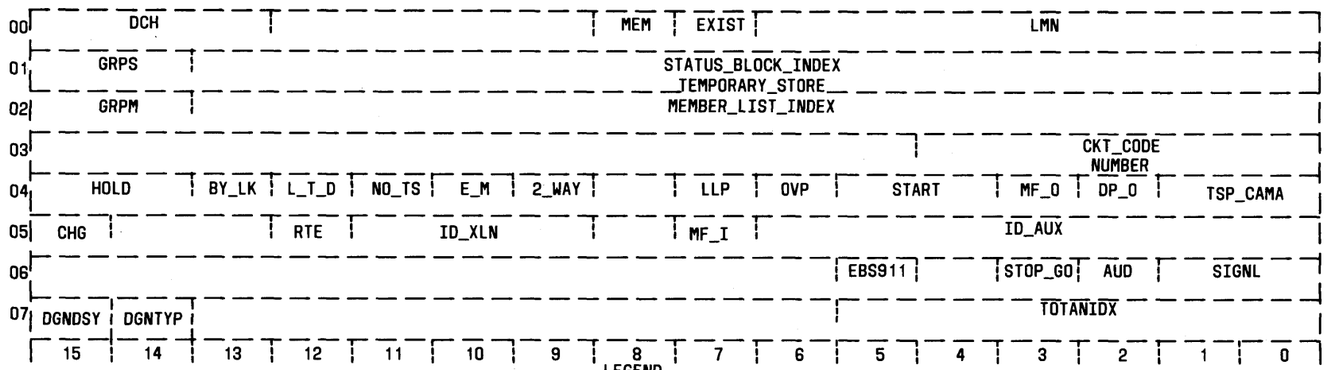


Fig. 1—Call Charging Arrangements



NOTE:
1. THE TT BIT IS IN THIS LOCATION FOR GENERIC 3E3 AND LATER.
2. THE TT BIT IS IN THIS LOCATION FOR GENERIC SO-2 AND EARLIER.

Fig. 2—Line Subtranslator—Data Format



LEGEND

LMN	LARGEST MEMBER NUMBER
EXIST	THE GROUP EXISTS
MEM	GROUP HAS AT LEAST ONE WORKING MEMBER
DCH	TRAFFIC SCHEDULE
STATUS_BLOCK_INDEX	(TEMPORARY STORE)
GRPS	HIGH 2 BITS OF GROUP NUMBER
MEMBER_LIST_INDEX	
GRPM	HIGH 2 BITS OF GROUP NUMBER
CKT_CODE	NUMBER
TSP_CAMA	00 = REGULAR TRUNK GROUP 01 = CAMA TRUNK GROUP 10 = TSP TRUNK GROUP 11 = TSPS TRUNK GROUP
DP_O	1 = DIAL PULSE OUTPULSING
MF_O	1 = MF OUTPULSING
START	00 = IMMEDIATE START 01 = DELAYED DIAL 10 = WINK START - WAIT 350 MS FOR END OF WINK 11 = WINK START - WAIT 1000 MS FOR END OF WINK
OVP	1 = OVERLAP OUTPULSING PERMITTED
LLP	1 = LONG LOOP PULSING REQUIRED
2_WAY	1 = 2-WAY TRUNK 0 = 1-WAY TRUNK
E_M	1 = E & M TRUNK 0 = LOOP TRUNK
NO_TS	1 = NO-TEST TRUNK
L_T_D	1 = TRUNK FROM OR TO LOCAL TEST DESK
BY_LK	1 = TRUNK FROM STEP-BY-STEP OFFICE
HOLD	00 = REGULAR TRUNK GROUP 01 = JOINT HOLD (RECORDING COMPL. OPERATOR) 10 = SERVICE HOLD [TOLL SWITCH TSP(S), OR NO TEST] 11 = CUSTOMER HOLD (NONOPERATOR INTERCEPT TRUNKS)
ID_AUX	AUXILIARY INFORMATION REQUIRED FOR INITIAL DIGIT TRANSLATION
MF_1	1 = MF INPULSING EXPECTED FROM FAR OFFICE INCOMING DIGIT
ID_XLN	INCOMING DIGIT TRANSLATION CODE WHICH DIRECTS THE INITIAL TRANSLATION AS FOLLOWS: 000 = TRUNK IS 1 WAY OUTGOING 001 = USE 4-DIGIT TRANSLATION ON 1ST FOUR DIGITS RECEIVED 010 = IGNORE FIRST DIGIT AND USE 4-DIGIT TRANSLATION ON NEXT FOUR DIGITS 011 = USE 1-DIGIT TRANSLATION ON 1ST DIGIT RECEIVED 100 = USE 3-DIGIT TRANSLATION ON 1ST THREE DIGITS RECEIVED 101 = FORM 4-DIGIT NUMBER FROM MOST SIGNIFICANT (1000s) DIGIT PROVIDED BY ID_AUX AND 3 RECEIVED DIGITS. THEN USE 4-DIGIT TRANSLATION
RTE	REMOTE TEST EQUIPMENT 0 = DEDICATED FACILITIES ARE PROVIDED FOR LOCAL TEST DESK 1 = NONDEDICATED FACILITIES ARE PROVIDED. REMOTE TEST EQUIPMENT FACILITIES ARE PROVIDED. AUTOCONNECT PROCEDURES ARE USED.
CHG	1 = CALLS TO GROUP ARE TO BE CHARGED (INCOMING CALLS ONLY)
SIGNL	00 = NO SIGNAL 01 = MF INBAND SIGNALING 10 = MULTIWINK SIGNALING 11 = MF EXPAND INBAND SIGNALING
AUD	1 = RETURN AUDIBLE (OUTGOING TO 23 INTERCEPT SYSTEM)
STOP_GO	1 = INTERRUPTION OF PULSING IS PERMITTED ON OUTGOING TRUNKS
EBS911	0 = NOT A 911 TRUNK USE INB FOR FLTBLK OF SIGNALING 1 = SINGLE WINK (PRESENTLY USED ONLY BY 911 SERVICE FOR RING BACK)
TOTANIDX	TERMINAL OFFICE TEST ACCESS NUMBER INDEX 0 = AUTO PROGRAM TEST NOT AVAILABLE 1-63 = TEST ACCESS INDEXES
DGNTYP	0 = RUN OFFICE-TO-OFFICE TEST 1 = RUN CONTINUITY TEST
DGNDSY	0 = RUN DIAGNOSTICS VIA DAISY CHAIN 1 = DO NOT RUN DIAGNOSTICS VIA DAISY CHAIN

Fig. 3—Trunk Group Data

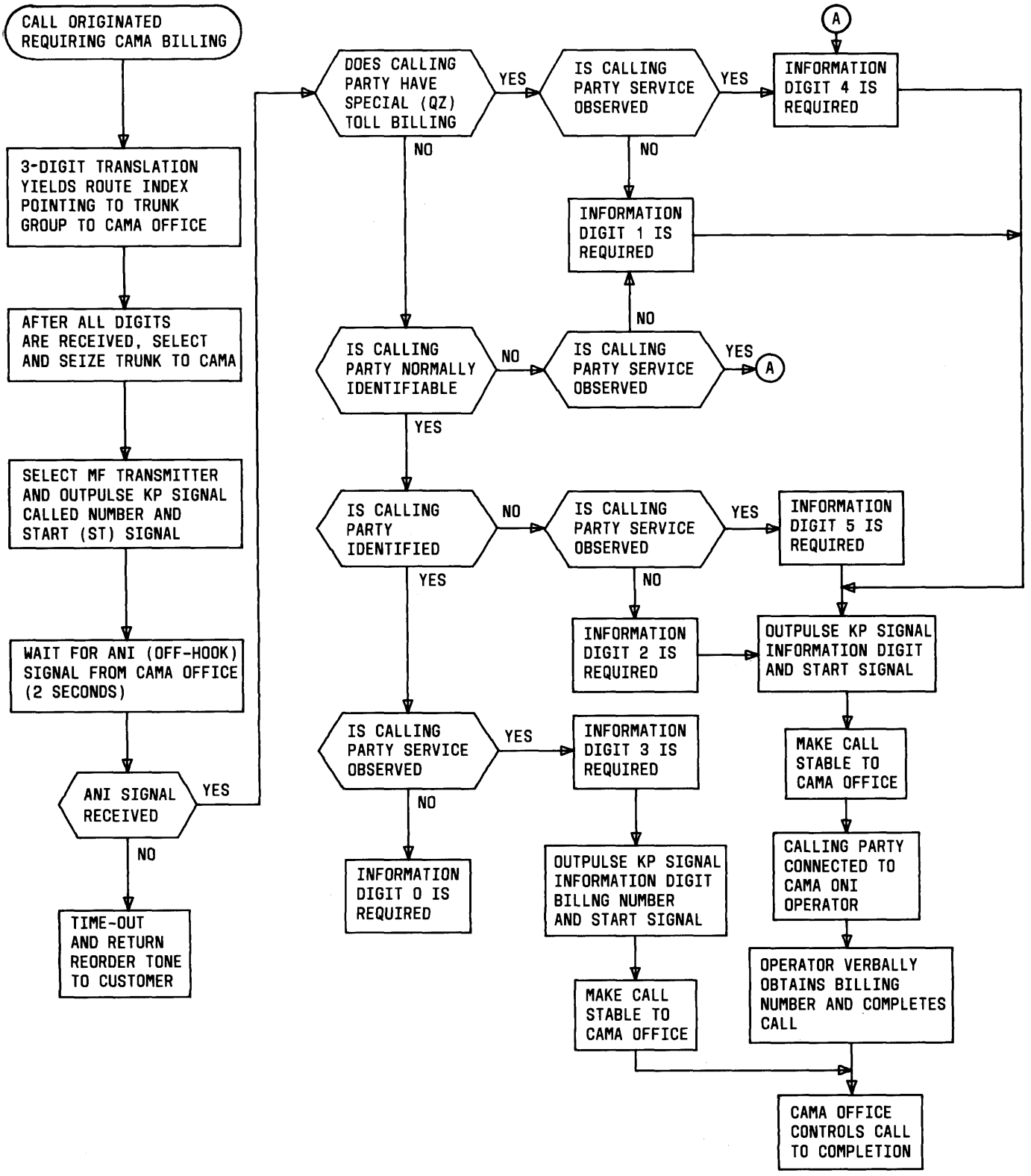
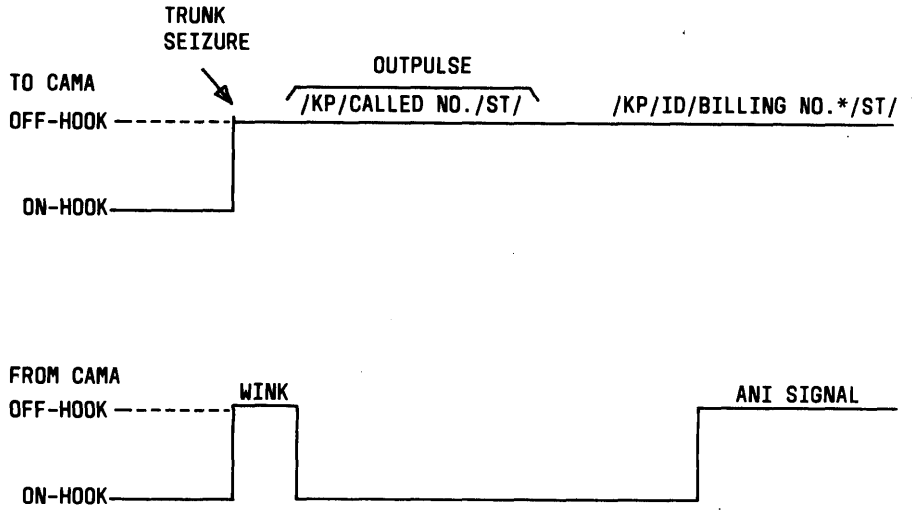


Fig. 4—Flow Diagram for Calls Routed to a CAMA Office



ANI - AUTOMATIC NUMBER IDENTIFICATION
ID - INFORMATION DIGIT
KP - KEYPULSE SIGNAL
ST - START CODE
WINK - START SENDING SIGNAL
* - BILLING NUMBER NOT SENT WHEN ID = 1 OR 2

Fig. 5—Information Outpulsed to CAMA Office

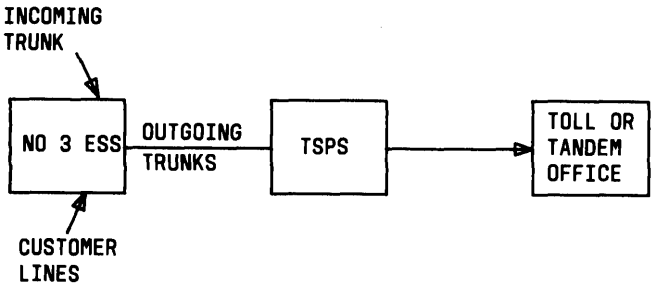


Fig. 6—Connection Between No. 3 ESS and TSPS

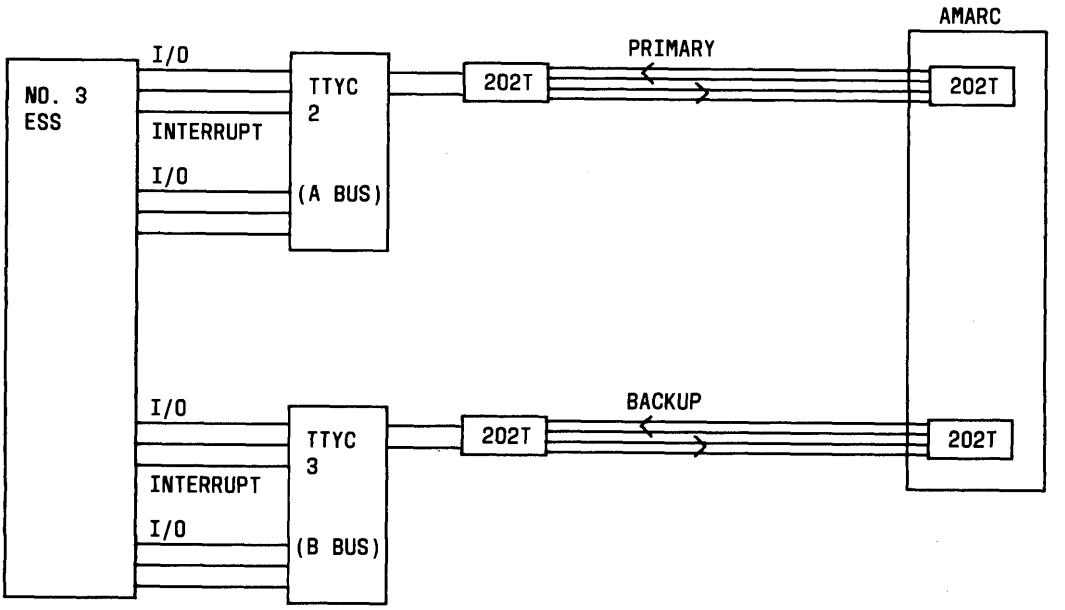


Fig. 7—No. 3 ESS AMARC Connection

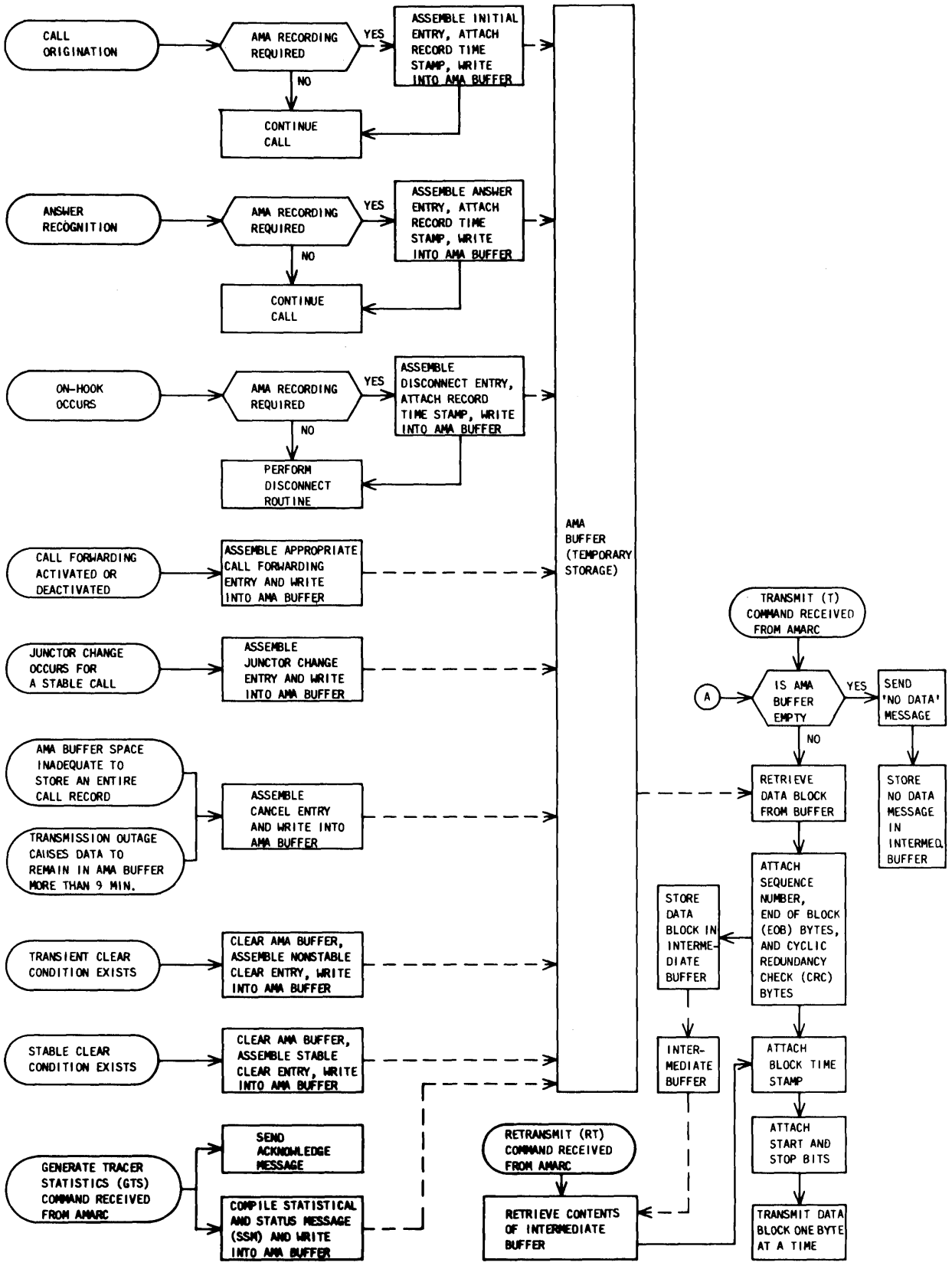


Fig. 8—Function Flow Diagram of LAMA

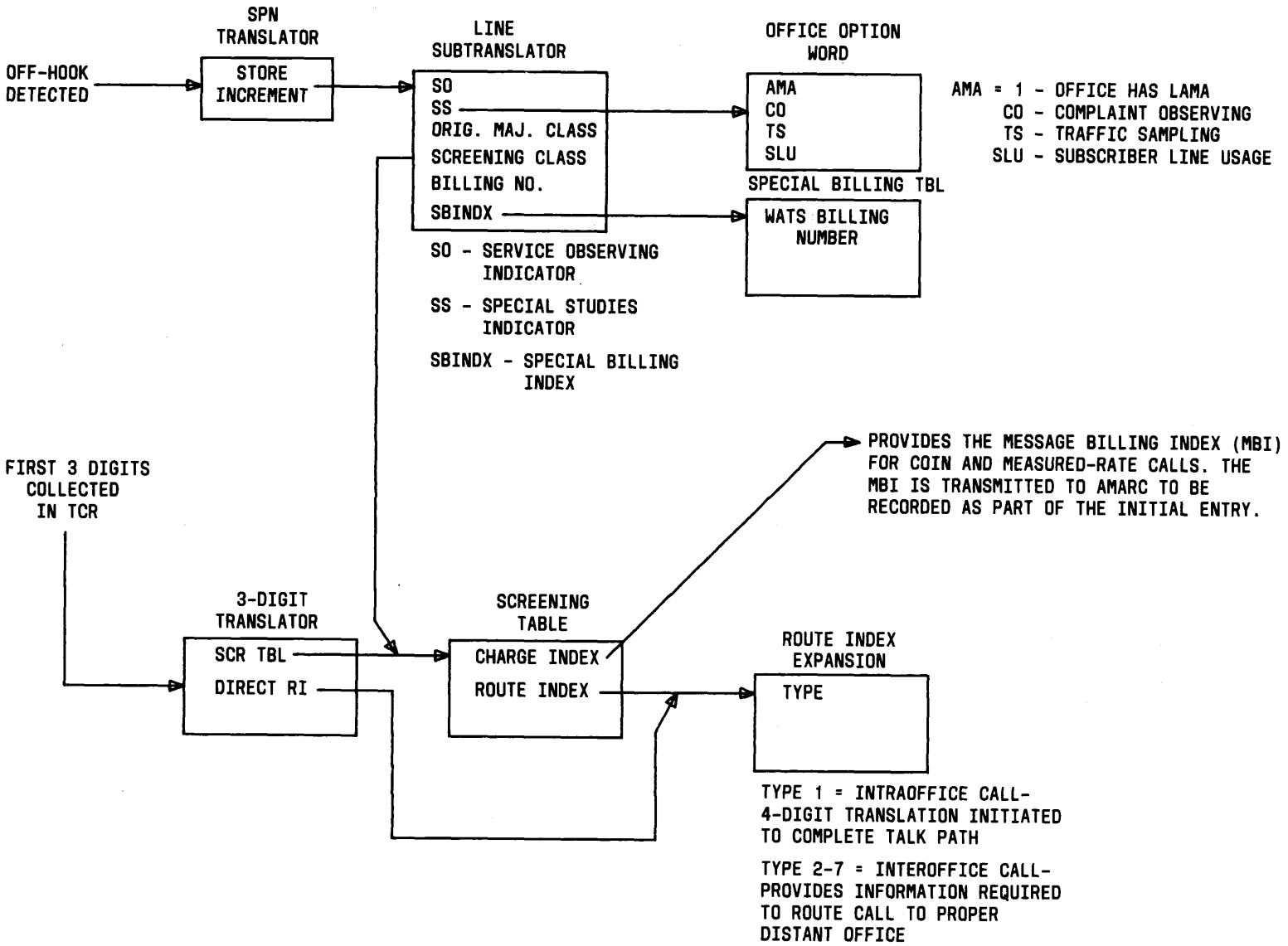


Fig. 9—Translation Layout for AMARC

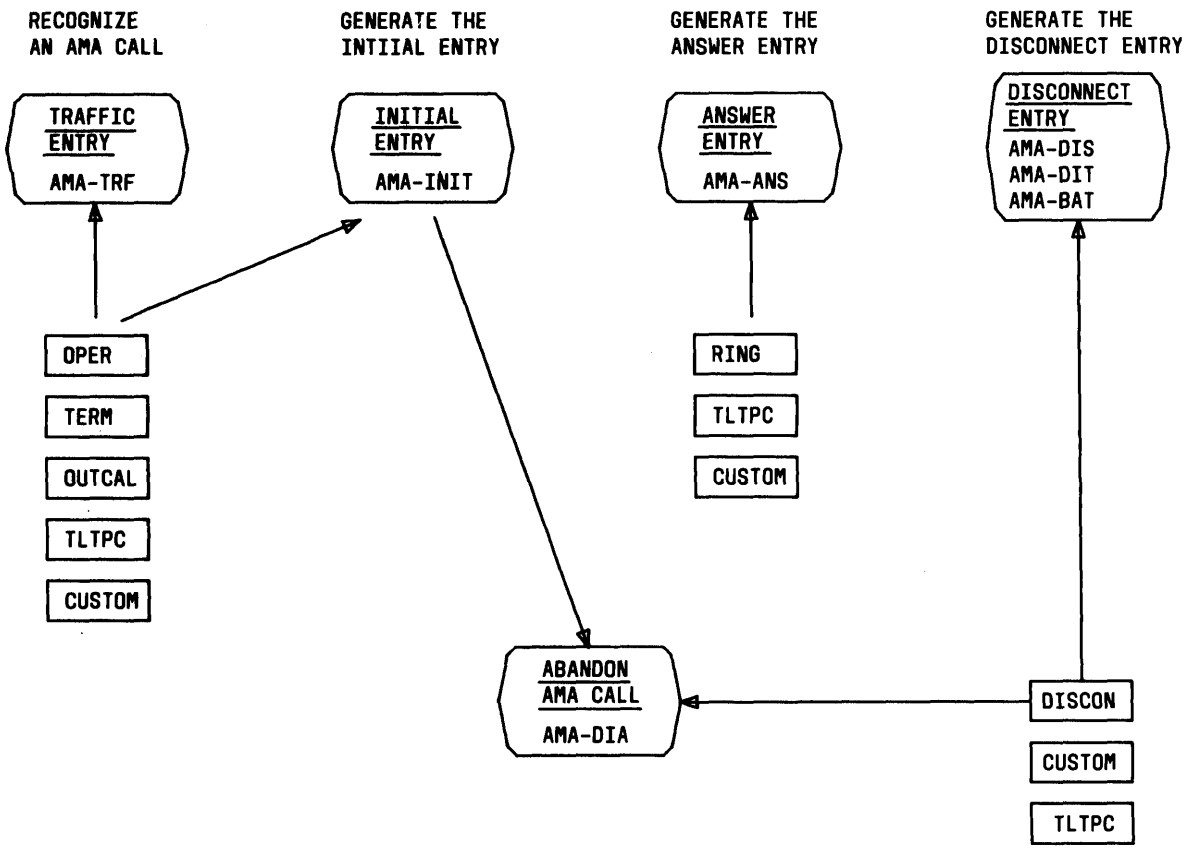
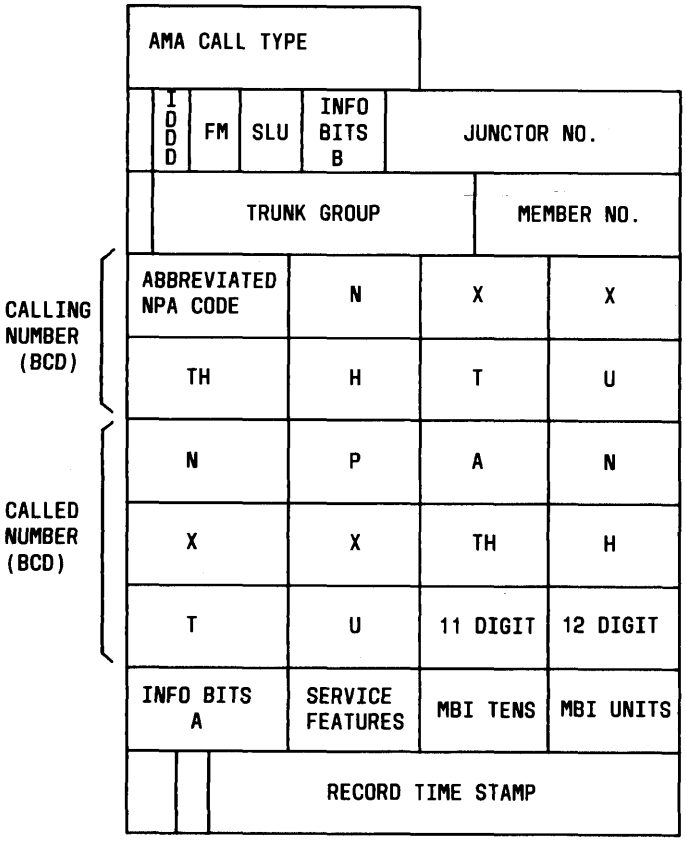
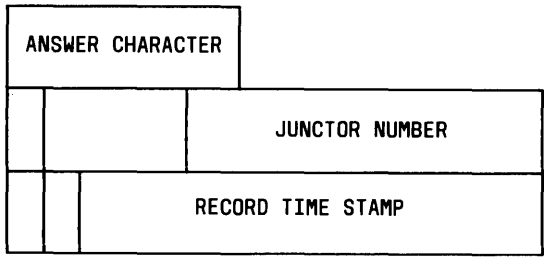


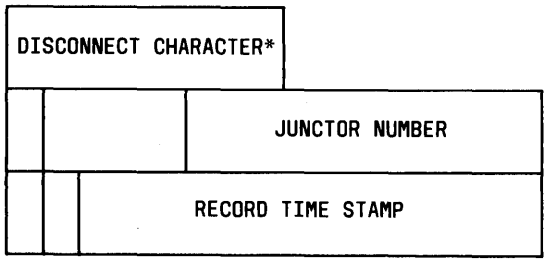
Fig. 10—AMA Record Functions



A. INITIAL ENTRY



B. ANSWER ENTRY



C. DISCONNECT ENTRY

* DISCONNECT = OCTAL 50

DISCONNECT (ABANDON/ATTEMPT) = OCTAL 134

DISCONNECT (TIMED RELEASE DISCONNECT) = OCTAL 147

LEGEND:

INFO BITS B - 00 = REGULAR CALL
01 = TEST CALL
10 = ONI
11 = COMPLAINT OBSERVED

SLU - 1 = SUBSCRIBER LINE USAGE

IDDD - 1 = IDDD, 0 = DOMESTIC

FM - 1 = FLAT RATE (WATS FULL BUSINESS DAY)
0 = MEASURED RATE

CALLING NO. - 1 BCD ABBREVIATED NPA CODE,
7 BCD NXX - TH, H,T,U

CALLED NO. - 12 BCD DIGITS REPRESENTING NPA - NXX - TH, H,T,U
DIGITS 11 AND 12 RESERVED FOR FUTURE USE

MBI - MESSAGE BILLING INDEX - 2 BCD DIGITS REPRESENTING TENS AND UNITS

SERVICE FEATURES - 0001 = PREPAY COIN, 0010 = HOTEL/MOTEL
0011 = PICTUREPHONE, 0100 = DTF COIN

INFO BITS A - 1010 = NOT SERVICE OBSERVED NOR TRAFFIC SAMPLED
0001 = SERVICE OBSERVED
0010 = TRAFFIC SAMPLED - CHARGE
0011 = SERVICE OBSERVED AND TRAFFIC SAMPLED - CHARGE
0100 = TRAFFIC SAMPLED - NO CHARGE
0101 = SERVICE OBSERVED AND TRAFFIC SAMPLED - NO CHARGE
0110 = SERVICE OBSERVED NOT TRAFFIC SAMPLED - NO CHARGE
0111 = NOT SERVICE OBSERVED NOT TRAFFIC SAMPLED - NO CHARGE

Fig. 11—AMA Call Records

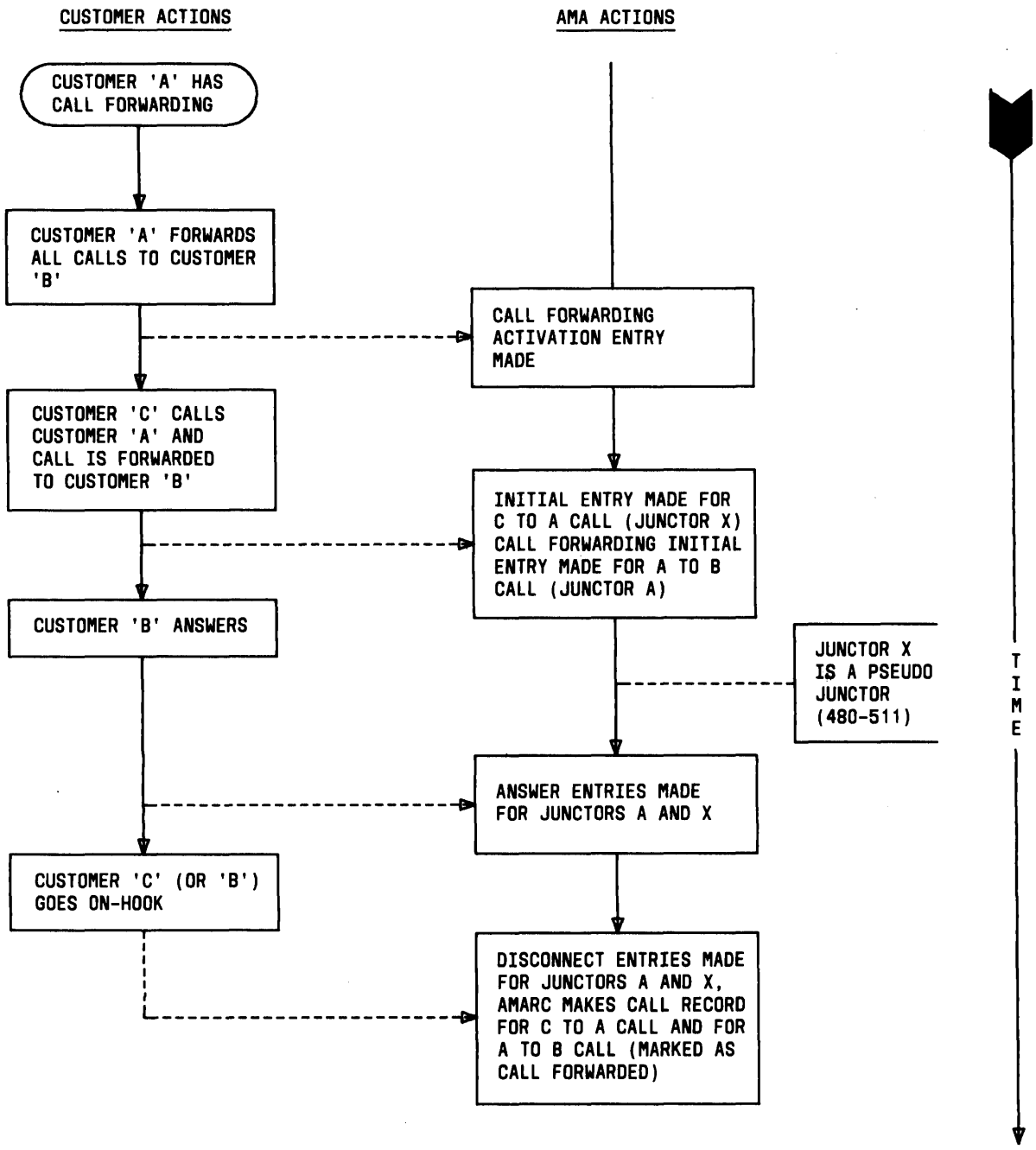


Fig. 12—AMA Operations—Call Forwarding

CALL FORWARDING ENTRY (SEE NOTE 1)				
CALLING NPA CODE	N	X_1	X_2	CALLLING NUMBER (BCD)
TH	H	T	U	
N	P	A	N	"FORWARD-TO" NUMBER (BCD)
X_1	X_2	TH	H	
T	U	11th DIGIT	12th DIGIT	
1 | 1_{DD} | FM | SLU	INFO BITS B | S_{PARE} | S_{PARE}	INFO BITS A	SERVICE FEATURES	

NOTE 1: CALL FORWARDING ACTIVATION = 01011110 (OCTAL 136)
CALL FORWARDING DEACTIVATION = 01011111 (OCTAL 137)

A. CALL FORWARDING ENTRY FORMAT

0 1 1 0 0 1 0 0 ← SSM INDICATION (OCTAL 144)			
ISSUE NO. THOUSANDS	ISSUE NO. HUNDREDS	ISSUE NO. TENS	ISSUE NO. UNITS
CNT 1 THOUSANDS	CNT 1 HUNDREDS	CNT 1 TENS	CNT 1 UNITS
CNT 2 TENS	CNT 2 UNITS	CNT 1 HUNDRED THOUSANDS	CNT 1 TEN THOUSANDS
CNT 2 HUNDRED THOUSANDS	CNT 2 TEN THOUSANDS	CNT 2 THOUSANDS	CNT 2 HUNDREDS
CNT 3 THOUSANDS	CNT 3 HUNDREDS	CNT 3 TENS	CNT 3 UNITS
CNT 4 TENS	CNT 4 UNITS	CNT 3 HUNDRED THOUSANDS	CNT 3 TEN THOUSANDS
CNT 4 HUNDRED THOUSANDS	CNT 4 TEN THOUSANDS	CNT 4 THOUSANDS	CNT 4 HUNDREDS
CNT 5 THOUSANDS	CNT 5 HUNDREDS	CNT 5 TENS	CNT 5 UNITS
CNT 6 TENS	CNT 6 UNITS	CNT 5 HUNDRED THOUSANDS	CNT 5 TEN THOUSANDS
CNT 6 HUNDRED THOUSANDS	CNT 6 TEN THOUSANDS	CNT 6 THOUSANDS	CNT 6 HUNDREDS
CNT 7 THOUSANDS	CNT 7 HUNDREDS	CNT 7 TENS	CNT 7 UNITS
		CNT 7 HUNDRED THOUSANDS	CNT 7 TEN THOUSANDS

LEGEND:
CNT 1 - ORIGINATING PEG COUNT
CNT 2 - AMA TRAFFIC COUNT
CNT 3 - NUMBER OF INITIAL ENTRIES MADE
CNT 4 - NUMBER OF ANSWER ENTRIES MADE
CNT 5 - RECORD COUNT
CNT 6 - BLOCK COUNT
CNT 7 - NUMBER OF INITIAL ENTRIES NOT MADE
EACH ISSUE NO. OR CNT BLOCK REPRESENTS 1 BCD DIGIT.

F. STATISTICAL AND STATUS MESSAGE (SSM) ENTRY FORMAT

0 1 1 0 0 0 0 1 ← (OCTAL 141)

ONE BYTE

B. STABLE CLEAR ENTRY FORMAT

0 1 1 0 0 0 1 0 ← (OCTAL 142)

C. NONSTABLE CLEAR ENTRY FORMAT

0 1 1 0 0 0 1 1 ← (OCTAL 143)

D. CANCEL MESSAGE ENTRY FORMAT

0 1 1 0 0 1 1 0 ← (OCTAL 146)			
1	RCT | SCT	SPARE	OLD JUNCTOR
1	SPARE		NEW JUNCTOR
1	S_{PARE}	RECORD TIME STAMP	

RCT = 1 - CONFERENCE TRUNK RELEASE
SCT = 1 - CONFERENCE TRUNK SEIZURE

E. JUNCTOR CHANGE ENTRY FORMAT

Fig. 13—Miscellaneous and Statistical Entries

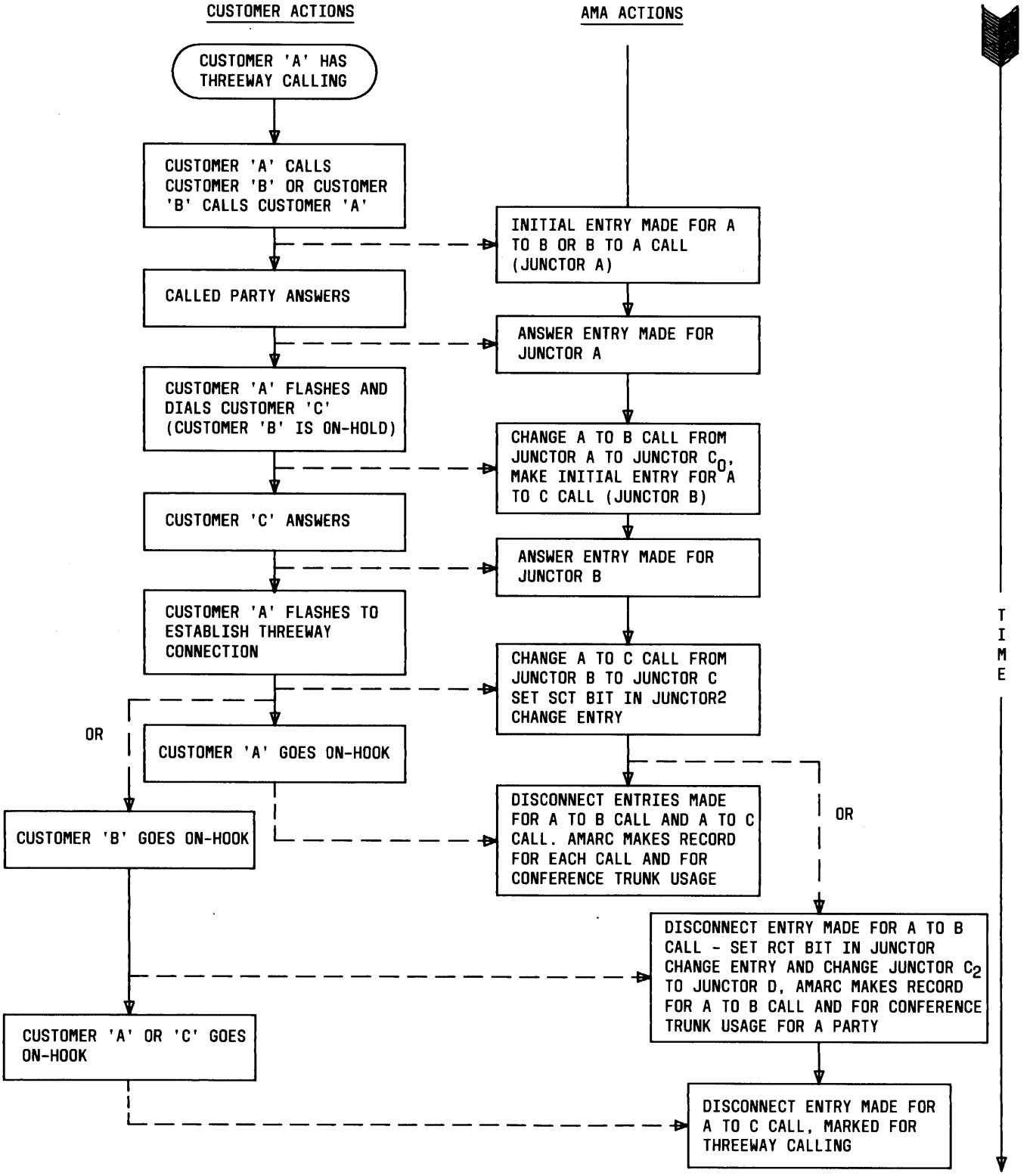
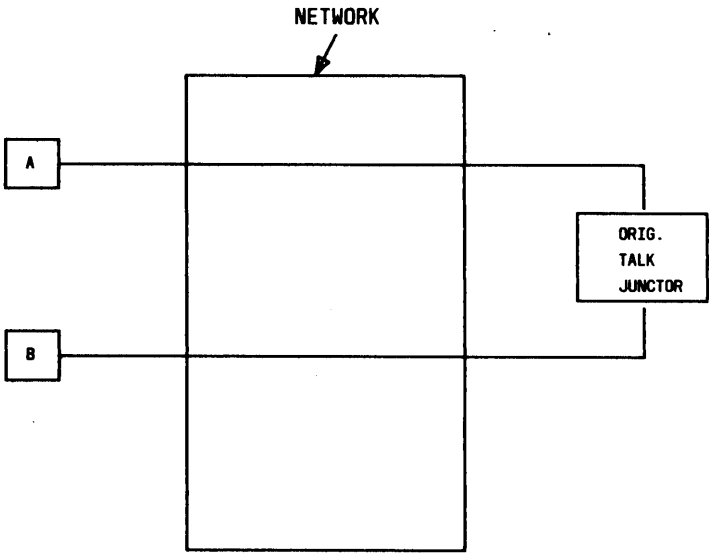
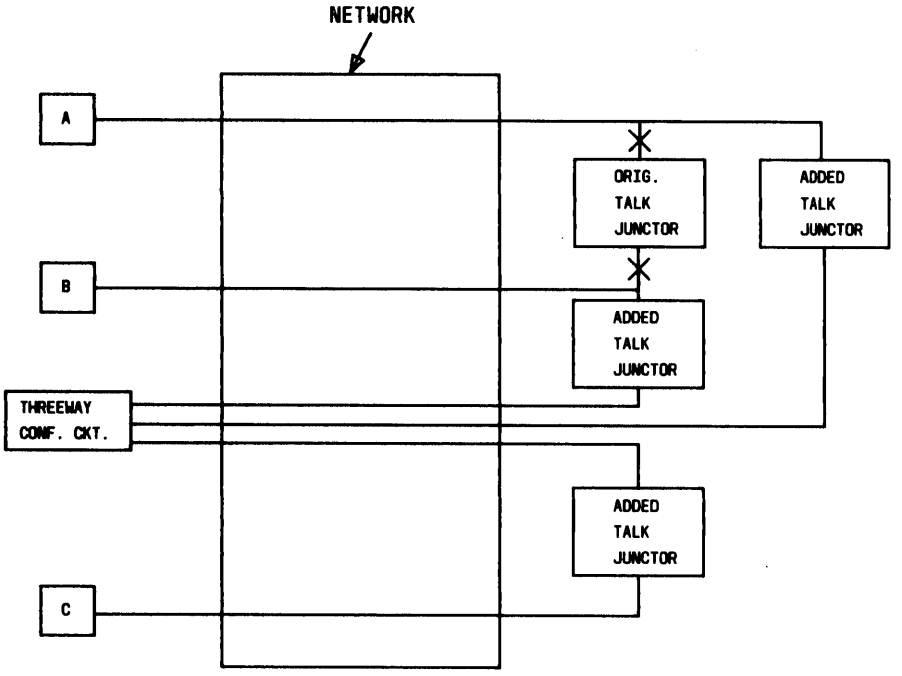


Fig. 14—AMA Operations—Threeway Calling



ORIGINAL TWO-WAY CALL CONNECTION



MODIFIED THREEWAY CONFERENCE CALL CONNECTION

Fig. 15—Conference Call Connection

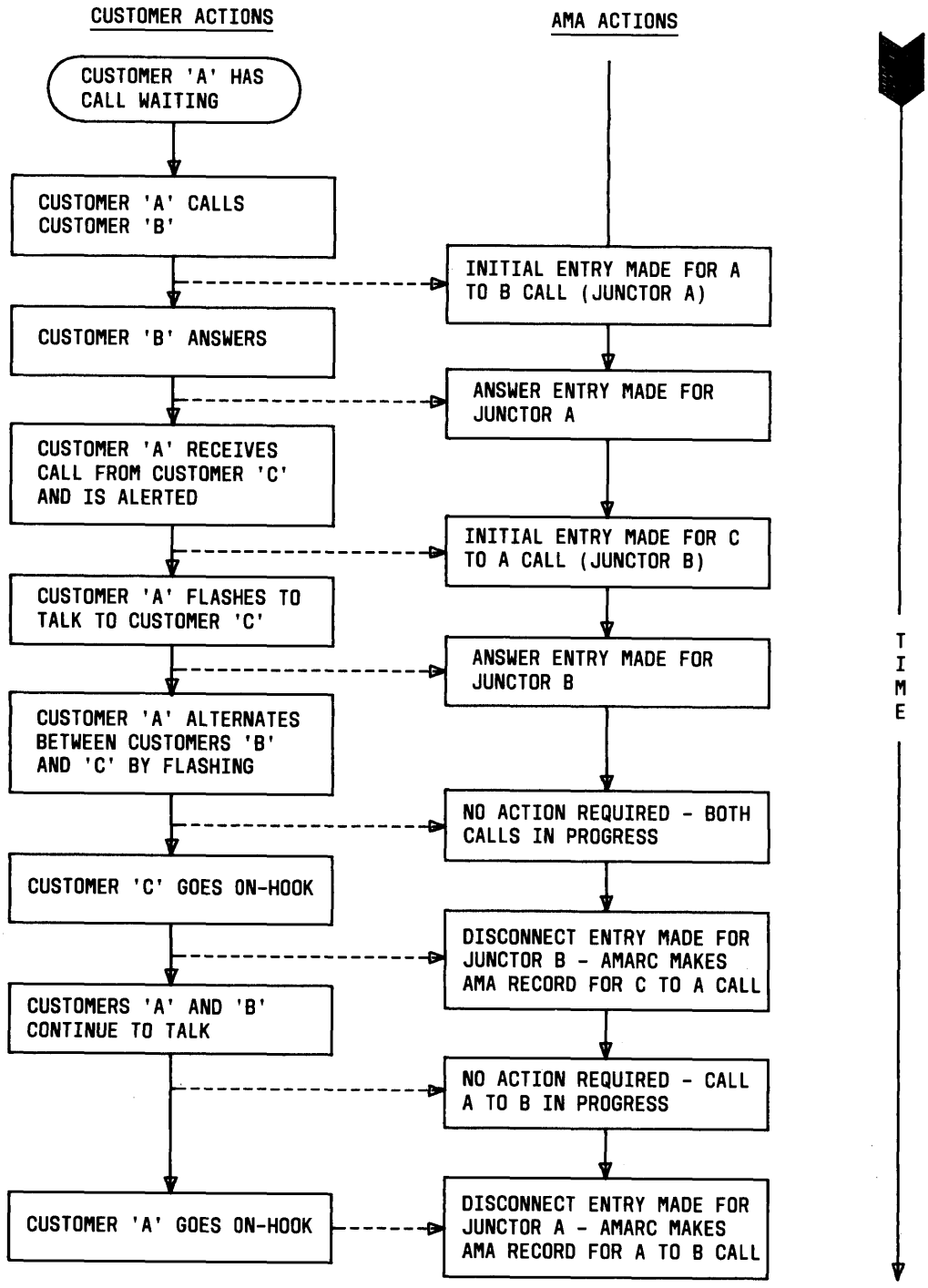


Fig. 16—AMA Operations—Call Waiting

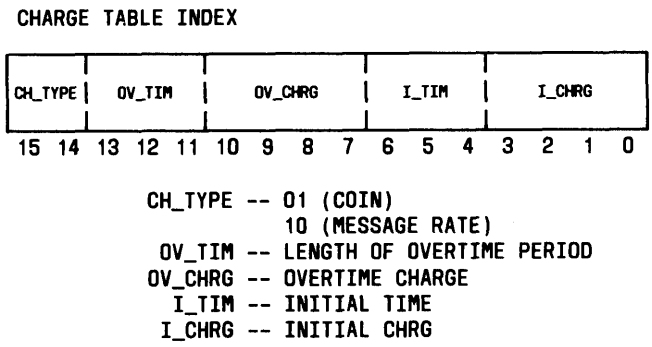


Fig. 17—Charge Index Expansion

TABLE A

PROGRAM REFERENCES

PIDENT	PR-NUMBER	PROGRAM FUNCTION
AMA	PR-3H187	Automatic Message Accounting Program
ABM	PR-3H186	AMA Buffer Management Program
COIN	PR-3H150	Coin Cleanup Functions
CUSTOM	PR-3H152	Custom Calling Program
DATADM	PR-3H262	Data Administration Program
DISCON	PR-3H154	Disconnect Progress Mark
LCHCHG	PR-3H161	Local Charge, Coin and Message Register
OPER	PR-3H164	Operator Call Program
OUTCAL	PR-3H165	Outgoing Call Program
RING	PR-3H172	Ring and Answer, Completion of Interoffice Calls
TERM	PR-3H175	Completion of Incoming and Intraoffice Calls
TLTPC	PR-3H317	Nonresident Trunk and Line Test Panel Maintenance Program

TABLE B

START CODE DESCRIPTIONS

START CODE	DESCRIPTION		
	OPERATOR ASSISTED	LINE TYPE	FIRST DIALED DIGIT
ST	YES	COIN	1, 2-9
ST1P*	YES	COIN	0
ST2P	NO	NONCOIN	1, 2-9
ST3P	YES	NONCOIN	0

* Sometimes labeled STP

TABLE C

CHARGE INDEX DESCRIPTIONS

CHARGE INDEX	BINARY EQUIVALENT	DESCRIPTION
0	00000	Illegal
1	00001	Free
2	00010	WATS Band 0
3	00011	WATS Band 1
4	00100	WATS Band 2
5	00101	WATS Band 3
6	00110	WATS Band 4
7	00111	WATS Band 5
8	01000	WATS Band 6
9	01001	WATS Band 7
10	01010	WATS Band 8
11	01011	WATS Band 9
12	01100	Usage Sensitive Pricing (USP)
13	01101	Internal Use
14	01110	Internal Use
15	01111	Station Paid (TOLL)
16—31	1XXXX	Coin or Measured Rate (Assignable) — The low four bits (represented by XXXX) will appear in the initial entry as the Message Billing Index (MBI)

TABLE D

AMA SUBROUTINE CALLING SEQUENCES

NORMAL CALL	ABANDONED CALL	TEST CALL	CHARGE INDEX CHECK	CALL FORWARD	CALL FORWARD DEACTIVATION	STATISTICAL DATA
AMA_TRF AMA_INI [AMA_BAT] [AMA_JCI] [AMA_JCO] [AMA_JCN] AMA_DIS [AMA_DIT]	AMA_TRF AMA_INI AMA_DIA	AMA_TST AMA_ANS AMA_DIS [AMA_DIA]	AMA_REA	AMA_CFA	AMA_CFD	AMA_SSM

Note: [XXX] shows an optional action dependent upon the call progress.

TABLE E

AMA CALL TYPE DESCRIPTIONS

OCTAL CHARACTER	DESCRIPTION
105	Station Paid (TOLL)
106	Local (Measured — Rate)
107	OUTWATS
113	Directory Assistance
127	Threeway Call 2nd Link (Local)
130	Call Forwarded (Local)
131	Threeway Call 2nd Link (Station Paid)
132	Call Forwarded (Station Paid)