LOCAL AUTOMATIC MESSAGE ACCOUNTING (LAMA)

NO. 2 ELECTRONIC SWITCHING SYSTEM

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FEATURE DEFINITION AND DESCRIPTION

1. DEFINITION

1.01 The ***Local Automatic Message Accounting (LAMA)*** feature is provided at a local central office and is used to record automatically on paper or magnetic tape (No. 2 ESS uses magnetic tape) certain telephone call information on calls being processed by that office. The recorded information is used for computing charges for customer-dialed billable calls and special studies performed by the operating companies.

1.02 In a No. 2 Electronic Switching System (ESS), LAMA is capable of recording approximately 9000 single or 2-party customer-dialed message rate or toll and local coin calls per hour. This recording capacity is available with Issue 4 of local office (LO-1) or the extended feature (EF-1) generic program in a No. 2 ESS. Four- and eight-party calls must be routed to a centralized automatic message accounting (CAMA) or traffic service position system (TSPS) office for the recording of information about these types of calls.

1.03 To incorporate the LAMA feature into a No. 2 ESS office, one single-bay (2-foot, 2-inch wide) (J2H021A) AMA frame and an office data administration (ODA) run are required. The office must also be traffic engineered for sufficient number of CAMA trunks or TSPS to transmit 4- or 8-party call information to the CAMA or TSPS offices for recording.

2. DESCRIPTION

A. Customer (User) Perspective

2.01 Local automatic message accounting is a means of recording accounting data on calls originated in the local class 5 office. This system automatically identifies each individual and 2-party customer whenever a call to be recorded is placed. The calling directory number or billing number is recorded together with the called number or message billing index and the time.

2.02 When LAMA is implemented into a No. 2 ESS office, a single and 2-party customer can directly dial toll calls and message rate calls without an operator identification. In addition, the AMA may be used for complaint observing on calls made from coin lines and lines with message rate service, and may be used to detail bill all message rate calls.

B. System Implementation

2.03 The AMA equipment in the local No. 2 ESS office provides an automatic recording service for toll calls, coin calls, and message rate calls. The AMA program assembles the AMA data to be recorded during the progress of an AMA recorded call and packs the data in a call store buffer. This AMA program also unloads the buffer during the input/output 25-millisecond interrupt (IO25) and transmits the entries to the AMA frame for recording on a 9-track magnetic tape recorder. The recorded tape is periodically replaced and sent to a Bell System regional data processing center for processing individual customer bills.

2.04 A multientry format is used in No. 2 ESS. This format is similar to the No. 5 crossbar in which ***initial, answer,*** and ***disconnect*** entries are made at appropriate stages in the progress of a call. Various other entries may be made from time to time as described in the following paragraphs.

2.05 Two complete AMA units are contained in a single-bay frame. The units are designated 0 and 1, and each unit consists of a tape transport and associated electronic circuit logic. Tape transport 0 is located in the lower half of the frame, and tape transport 1 is located in the upper half of the frame. The AMA circuits associated with each transport are located in circuit packs at the top and bottom of the AMA frame. Each tape transport can accept 7 or 10-1/2 inch diameter reels containing 1800 or 2400 feet of 1/2-inch wide iron oxide coated plastic tape. One reel of tape will hold several days of recorded information for a large No. 2 ESS office. Only one tape transport is actively recording information at any one time.

2.06 Each AMA unit is maintained in one of three states; the ***active*** state, the ***standby*** state, or the ***out-of-service*** state. One AMA is in the active state, while the other is either in the standby or out-of-service state. The state of each AMA unit is controlled by the AMA program. The following is the definition of each state.

- ACTIVE: The AMA unit is actively recording billing information for customer calls.

- STANDBY: The AMA unit is ready for service but not actively recording billing information.

- OUT OF SERVICE: The AMA unit has been removed from service. An AMA unit can be placed in this state by program due to a trouble condition. A unit can also be placed out of service by teletypewriter (TTY) request.

2.07 Lamps on each tape transport indicate the status of the AMA unit. In addition, there is a lamp dedicated to the AMA in the system status area of the Maintenance Center Control and Display Panel. This lamp is lighted whenever the standby unit is ***out of service.***

2.08 During the processing of calls, AMA recorded information is placed in a 128-word AMA buffer in the No. 2 ESS call store. The data is placed in the AMA buffer by the ***base level program*** as it becomes available. The AMA ***interrupt level program*** transfers the data out of the buffer to magnetic tape as soon as recording is possible. The AMA tape transport operates incrementally, stepping and recording each time data is received from the AMA buffer.

2.09 On a periodic schedule AMA operation is automatically transferred from the active to the standby tape transport. At this time, the tape reel containing the recorded information for the previous period can be removed and a new reel of tape installed. No. 2 ESS tape loading and unloading procedures are found in Section 232-112-301.

2.10 ***AMA Bit-Code Assignments***—AMA recording of data is made on magnetic tape in digital form. When the AMA program determines that a call is to receive AMA recording treatment, binary coded decimal (BCD) characters (Table A) are used to represent the data. This data is stored in the AMA buffer and recorded on magnetic tape in BCD character form. Two BCD characters, plus a parity bit (odd parity), comprise a magnetic tape character.

TABLE A

B C D CHARACTER ASSIGNMENTS

B C D CHARACTERS				
BIT 8	BIT 4	BIT 2	BIT 1	DECIMAL/LETTER EQUIVALENT
1	0	1	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	1	NCD*
1	1	0	0	V
1	1	0	1	W
1	1	1	0	X
1	1	1	1	Y
0	0	0	0	Z

* Noncheck dummy character

2.11 The BCD characters representing decimal digits 1 through 9 are equivalent in value to their respective binary characters. Decimal digit 0, however, is represented by binary 1010. This representation of decimal 0 is necessary to ensure that single bit errors will not cause the entire loss of the recorded data for a call. If decimal 0 was represented by binary 0000, the tape character 04, for example, would be subject to this danger. The loss of the single digit 1 in the BCD character representing decimal 4 (0100) would result in tape character 04 containing all zeros. Under this condition, it may be impossible for accounting center equipment to determine which tape character in a given entry is missing. The accounting center process would be out of step, and it would be necessary to discard the call and perhaps an entire group of calls. With the BCD code in Table A, at least three 1s (including parity) will always appear in every tape character. (Z is

only used in a tape character which contains another nonnumeric BCD character.)

2.12 In addition to the ten numeric BCD characters, Table A also shows five letter codes. These letters are used as identifiers or special start of entry characters.

2.13 ***AMA Tape Format***—AMA data is recorded magnetically on iron oxide coated plastic tape. The format used for recording is compatible with the American National Standards Institute (ANSI) and Bell System data processing centers.

2.14 Data is recorded in a 9-track format with each track corresponding to a BCD character bit position. During each AMA tape step, two BCD characters and a parity bit (9 bits) are recorded, forming one tape character. Data is recorded at a density of 200 bits per inch of magnetic tape. Tape characters are written in blocks averaging 504 tape characters. The initial data block on a new tape, and the final data block on a tape, may contain as few as 19 tape characters.

2.15 After recording a block of tape characters, the system generates, in sequence, a 3-character gap (all zero bits), a longitudinal redundancy check character (LRCC), and an interblock gap (IBG). The LRCC is a tape character generated from the even 1s parity of each tape track. If track 4, for example, contains an odd number of 1s in a particular data block, bit position 4 of the LRCC for that block will contain a 1. An IBG consists of a blank space between data blocks of approximately 0.65 inches in length. The IBG serves as a stopping point for the accounting center computer while it is reading the AMA tape.

2.16 BCD character bits (Table A) comprising a tape character are not distributed across the 9-track tape format in numerical order. The bits of the first BCD character (a), and those of the second BCD character (b), are interspersed with each other. This arrangement is a standard tape format.

AMA Entry Formats

2.17 There are three basic formats with which the traffic engineer will be involved in the determination of the engineered capacity for the AMA equipment. They are the ***initial*** entry format, the ***answer,*** and ***disconnect*** entry format. The ***initial entry*** may be one of four (for LO-1) or five (EF-1) types (refer to 2.18). The type of initial entry format to be recorded for each call will be determined by line screening and the billing information associated in translations for the called numbering plan area (NPA) and/or office code (NNX). The ***answer entry*** is the same for all calls on which answer supervision is received. There are two types of ***disconnect entries*** depending upon whether the entry is made as the result of recognizing the disconnect from the calling or called party. A regular disconnect entry is made if the disconnect supervision is received from the calling party. This entry is identical in format to the answer entry. A timed release disconnect entry is made if the disconnect supervision is obtained from the called party while the calling party remains off-hook. The system automatically times for approximately 11 seconds (10.4-11.2) after receiving the disconnect before making the timed release disconnect entry on the AMA tape. A slight change in format is made in the timed release disconnect entry so that it can be recognized at the accounting center.

Initial Entries

2.18 In any No. 2 ESS installation, there are four LO-1 or five EF-1 basic initial entry AMA formats which are used to record calls. These formats are illustrated in Figure 1. The first format type (Figure 1a) is used to record message rate calls, the second type (Figure 1c) to record any call requiring detailed billing, the third type (Figure 1d) is used for detail billed message rate calls. The fourth type (Figure 1e) is used for directory assistance (charged) calls. In No. 2 ESS installations with the EF-1 generic program, a fifth entry type (Figure 1f) is used to record tie trunk and tandem tie trunk calls. In addition to the basic data which are recorded for each of these formats, the calling NPA may also be recorded for all calls. This is an office option entered into translations by the dial administrator.

2.19 It is important that the traffic engineer determine whether this option is required by consulting with the accounting department since the calling NPA requires two additional character pairs for each initial entry. A message rate call entry which includes the calling NPA is illustrated in Figure 1b. All other entry formats would be similarly modified to include the calling NPA, if

required. The answer and disconnect entries (Figure 1g) have the same format for all calls.

2.20 All initial entry formats are basically similar, the main difference being the quantity of data required to fully define the call. For example, in the message rate type entry (Figure 1a) a mnemonic called a message billing index (MBI) is used to identify one or more office codes which will receive the same billing in the form of message units. Since the called number is not recorded on the AMA tape, this type of entry can only be used when bulk billing for all message units is used. If the called directory number (DN) and NPA are required to correctly bill a call, then the detail billed type entry (Figure 1c) is required. The type of entry required for each office code or NPA from which routing of the call is determined, is entered into translation by the dial administrator. Instructions for making these assignments are contained in the Translation Guide, TG-2H. The various parts of an AMA entry will be described in the following paragraphs, followed by the various types of entries.

Call Identity Index

2.21 A call indentity index (CII) is assigned to every AMA recorded call. Since the initial, answer, and disconnect entries for a single call are usually interspersed with similar entries for other calls, the CIIs serve to identify the entries for each AMA call. The CII remains unique to a call as long as the call is in progress and is selected as described in 2.22 and 2.25.

2.22 ***CII Selection (LO-1 Only)***—In a No. 2 ESS equipped with LO-1 generic, the CII is a number which represents the junctor used in the call. If the junctor is changed during the progress of a call after the initial entry has been made, a special entry is made on the AMA tape indicating a change in the CII. The CII may range in value from 0000 to 2999. Therefore, the B digit of the entry identifier indicates the thousands group of the junctor (W-0000 to 0999, X-1000 to 1999, V-2000 to 2999). The hundreds, tens, and units digits of the CII are included in character pairs 3 and 4. There is a maximum of 3000 CIIs which can be used to identify a call on the AMA tape in the No. 2 ESS having an LO-1 generic program. As previously mentioned, each CII identifies the junctor used on the call. This means that when LAMA recording is to be accomplished in a No. 2 ESS, a maximum of 3000 junctors may exist in the system. This, therefore, restricts the system to a maximum of 11 line trunk networks (LTNs). A single LTN has the capacity to terminate 512 junctors, each of which has 2 LTN terminations. There is, therefore, an average of 256 junctors per LTN (512 ÷ 2 = 256). Dividing the maximum quantity of junctors (3000) by 256 results in 11.7 LTNs; however, since each LTN is assigned the full complement of junctors, only 11 LTNs are allowed.

2.23 ***Change Call Identity Index Entry (LO-1 only)***—The change CII entry format illustrated in Figure 1h is used during the processing of a call whenever it is necessary for the system to change the junctor being used for the talking connection of a call. Such is the case when a third party served by the same office makes a call to a line with call waiting service and the line with call waiting service had been involved in either end of a billable call. All three parties are connected to a conference circuit causing the junctor serving the billable portion of the call to be changed requiring a change in the CII. This entry is also used for Threeway Calling and call forwarding calls when a junctor change is required.

2.24 The first character pair contains the entry identifier WY which is the identifier for an information entry. The second character pair always includes the information index 05 which identifies the entry as change CII. The third and fourth character pairs contain the old CII. Note that the thousands digit of the CII are the BCD equivalents of 0, 1, or 2 in this enty rather than W, X, or V as used in the initial and timing entries. The new CII is recorded in character pairs five and six in the same format used for the old CII.

2.25 ***CII Selection (EF-1 Only)***—In the offices equipped with the EF-1 generic program, the CII selection is based on the A-party terminal equipment number (TEN). This eliminates the need for CII change entries, as well as the limitation of 11 networks in a No. 2 ESS. The 15-bit TEN ($N_3N_2N_1N_0G_2G_1G_0C_2C_1C_0S_2S_1S_0L_1L_0$) is divided into three portions. The $G_0C_2C_1C_0S_2S_1$ portion of the TEN is used to select 1-out-of-64 groups of call store words. The G_1 is used to specify left or right half words. Then a search is made for an idle half word in this group of half words. If one is found, then $N_3N_2N_1N_0G_2S_0L_1L_0$ is stored in

FIGURE 1-a
MESSAGE RATE ENTRY
(ENTRY CODE 16)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (W)*
2	Entry Code — (T)	Entry Code — (U)
3	CII — (H)	CII — (T)
4	CII — (U)	1st Info Digit
5	2nd Info Digit	Svc Fea Digit (T)
6	Svc Fea Digit (U)	Calling BN 1st Dig
7	Calling BN 2nd Dig	Calling BN 3rd Dig
8	Calling BN 4th Dig	Calling BN 5th Dig
9	Calling BN 6th Dig	Calling BN 7th Dig
10	MBI — (T)	MBI — (U)

FIGURE 1-b
MESSAGE RATE WITH CALLING NPA ENTRY
(ENTRY CODE 16)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (W)*
2	Entry Code — (T)	Entry Code — (U)
3	CII — (H)	CII — (T)
4	CII — (U)	1st Info Digit
5	2nd Info Digit	Svc Fea Digit (T)
6	Svc Fea Digit (U)	Calling NPA 1st Dig
7	Calling NPA 2nd Dig	Calling NPA 3rd Dig
8	Calling BN 1st Dig	Calling BN 2nd Dig
9	Calling BN 3rd Dig	Calling BN 4th Dig
10	Calling BN 5th Dig	Calling BN 6th Dig
11	Calling BN 7th Dig	MBI — (T)
12	MBI — (U)	Zero (1010)

FIGURE 1-c
DETAIL BILLED ENTRY
(ENTRY CODES 01, 08, 09, 11, 15, 99)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (W)*
2	Entry Code — (T)	Entry Code — (U)
3	CII — (H)	CII — (T)
4	CII — (U)	1st Info Digit
5	2nd Info Digit	Svc Fea Digit (T)
6	Svc Fea Digit (U)	Calling BN 1st Dig
7	Calling BN 2nd Dig	Calling BN 3rd Dig
8	Calling BN 4th Dig	Calling BN 5th Dig
9	Calling BN 6th Dig	Calling BN 7th Dig
10	Called NPA 1st Dig	Called NPA 2nd Dig
11	Called NPA 3rd Dig	Called DN 1st Dig
12	Called BN 2nd Dig	Called DN 3rd Dig
13	Called DN 4th Dig	Called DN 5th Dig
14	Called DN 6th Dig	Called DN 7th Dig

Fig. 1—No. 2 ESS AMA Entry Formats (Sheet 1 of 3)

FIGURE 1-d
DETAIL BILLED MESSAGE RATE ENTRY
(ENTRY CODES 18, 22, 25)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (W)*
2	Entry Code — (T)	Entry Code — (U)
3	CII — (H)	CII — (T)
4	CII — (U)	1st Info Digit
5	2nd Info Digit	Svc Fea Digit (T)
6	Svc Fea Digit (U)	Calling BN 1st Dig
7	Calling BN 2nd Dig	Calling BN 3rd Dig
8	Calling BN 4th Dig	Calling BN 5th Dig
9	Calling BN 6th Dig	Calling BN 7th Dig
10	Calling NPA 1st Dig	Called NPA 2nd Dig
11	Called NPA 3rd Dig	Called DN 1st Dig
12	Called DN 2nd Dig	Called DN 3rd Dig
13	Called DN 4th Dig	Called DN 5th Dig
14	Called DN 6th Dig	Called DN 7th Dig
15	MBI — (T)	MBI — (U)

FIGURE 1-e
DIRECTORY ASSISTANCE ENTRY
(ENTRY CODE 30)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (W)*
2	Entry Code — (T)	Entry Code — (U)
3	CII — (H)	CII — (T)
4	CII — (U)	1st Info Digit
5	2nd Info Digit	Svc Fea Digit (T)
6	Svc Fea Digit (U)	Calling BN 1st Dig
7	Calling BN 2nd Dig	Calling BN 3rd Dig
8	Calling BN 4th Dig	Calling BN 5th Dig
9	Calling BN 6th Dig	Calling BN 7th Dig

FIGURE 1-f
TIE TRUNK AND TANDEM TIE TRUNK ENTRY (EF-1 ONLY)
(ENTRY CODE 27)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (W)*
2	Entry Code — (T)	Entry Code — (U)
3	CII — (H)	CII — (T)
4	CII — (U)	1st Info Digit
5	2nd Info Digit	Svc Fea Digit (T)
6	Svc Fea Digit (U)	Calling BN 1st Dig
7	Calling BN 2nd Dig	Calling BN 3rd Dig
8	Calling BN 4th Dig	Calling BN 5th Dig
9	Calling BN 6th Dig	Calling BN 7th Dig
10	Called DN 1st Dig	Called DN 2nd Dig
11	Called DN 3rd Dig	Called DN 4th Dig
12	Called DN 5th Dig	Called DN 6th Dig
13	Called DN 7th Dig	Called DN 8th Dig
14	Called DN 9th Dig	Called DN 10th Dig
15	Called DN 11th Dig	Called DN 12th Dig
16	Called DN 13th Dig	Called DN 14th Dig
17	Called DN 15th Dig	Called DN 16th Dig
18	Called DN 17th Dig	Called DN 18th Dig
19	Called DN 19th Dig	Called DN 20th Dig
20	Called DN 21st Dig	Called DN 22nd Dig
21	Called DN 23rd Dig	Called DN 24th Dig

Fig. 1—No. 2 ESS AMA Entry Formats (Sheet 2 of 3)

FIGURE 1-g
ANSWER AND DISCONNECT ENTRY

CHARACTER PAIR	A DIGIT	B DIGIT
Answer and Normal Disconnect 1	Timing Entry Iden — (W)	CII — (H)
2	CII — (T)	CII — (U)
3	Seconds — (T)	Seconds — (U)
Timed Release Disconnect 1	CII — (H)	Timing Entry Iden
2	CII — (T)	CII — (U)
3	Seconds — (T)	Seconds — (U)

FIGURE 1-h
CHANGE CALL IDENTIFY INDEX ENTRY (LO-1 ONLY)

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (Y)
2	Info Index — 0	Info Index — 5
3	Old CII — (Th)	Old CII — (H)
4	Old CII — (T)	Old CII — (U)
5	New CII — (Th)	New CII — (U)
6	New CII — (T)	New CII — (U)

FIGURE 1-i
INITIAL ENTRY COUNT ENTRY

CHARACTER PAIR	A DIGIT	B DIGIT
1	Entry Identifier — (W)	Entry Identifier — (Y)
2	Info Index — 0	Info Index — 4
3	IEC — (HTh)	IEC — (TTh)
4	IEC — (Th)	IEC — (H)
5	IEC — (T)	IEC — (U)
6	Info Index — 0	Info Index — 4
7	IEC — (HTh)	IEC — (TTh)
8	IEC — (Th)	IEC — (H)
9	IEC — (T)	IEC — (U)
10	Info Index — 0	Info Index — 4
11	IEC — (HTh)	IEC — (TTh)
12	IEC — (Th)	IEC — (H)
13	IEC — (T)	IEC — (U)
14	Info Index — 0	Info Index — 4
15	IEC — (HTh)	IEC — (TTh)
16	IEC — (Th)	IEC — (H)
17	IEC — (T)	IEC — (U)
18	Info Index — 0	Info Index — 4
19	IEC — (HTh)	IEC — (TTh)

Legend:

HTh — Hundred Thousands Digit
TTh — Ten Thousands Digit
Th — Thousands Digit
H — Hundreds Digit
T — Tens Digit
U — Units Digit
CII — Call Identity Index
Info — Information
Svc — Service
Fea — Feature
Dig — Digit
BN — Billing Number
MBI — Message Billing Index
NPA — Numbering Plan Area
Iden — Identifier
DN — Directory Number
IEC — Initial Entry Count
* — Could also be an X and V. These are used in conjunction with the CII.

Fig. 1—No. 2 ESS AMA Entry Formats (Sheet 3 of 3)

the half word and the CII is based on the location of the half word. This 8-bit contraction of the TEN is used at answer or disconnect time to find the CII used for the call. (See Figure 6.)

2.26 If the half words in this group are all busy, a common overflow area of 2-word entries is searched for an idle CII. When one is found, the full 15-bit TEN is stored in word 0 of the entry. The CII is again based on the location of the entry. (See Figure 6.)

2.27 The second word of a 2-word entry is also used for additional CIIs required for up to a total of three billed legs on a call forwarded call. A flag bit is set in word 1 of the entry for each additional CII, and the value of this CII is calculated by adding a constant to the CII determined by the location of the entry. The first billed leg encountered by the AMA processing program results in the selection of a 2-word CII entry because this is a call forwarded call and additional legs may have to be billed.

2.28 CII change entries are not used in the EF-1. Once a CII is selected, it is used for the duration of the call. If the A party changes during the call because of a custom calling action, the original half-word entry is busied out with an all 1s code, a 2-word entry is selected, and the TEN of the new A party is stored in word 0. A pointer back to the original half-word entry is stored in word 1.

AMA Entry Codes

2.29 The entry code is used to indentify the call type. The available entry codes in No. 2 ESS are as follows:

Entry Code	Call Type
01	Station Paid (LO-1 and EF-1) Centrex FX (Both Most Economical Routing-MER, and non-MER (EF-1 only)
08	DTWX Station Paid (Fig. 1d)
09	CCSA (MER and non-MER) (EF-1 only) (Fig. 1c)
11	WATS measured and unmeasured (Usually NO CHARGE if unmeasured) (Fig. 1c)
15	Detail message rate (no MBI) (Fig. 1c)
16	Message rate timed (with MBI) (Fig. 1h)
18	Detail message rate with MBI (complaint observed lines) (Fig. 1d)
22	Detail message rate with MBI (all message rate lines) (Fig. 1d)
25	WATS-Centrex-Most Economical Routing Only—Detail Billed (EF-1 only) (Fig. 1d)
27	Tie Trunk and Tandem Tie Trunk (cut thru) Calls (EF-1 only) (Fig. 1f)
30	Directory assistance (Fig. 1e)
99	Test call (Fig. 1c)

Information Digits

2.30 The first information digit is used to indicate whether a call is AMA recorded for a traffic sample. A zero in this character position indicates that the call is not traffic sampled. A BCD 4 in this position indicates that the call is for a traffic sample only and should not be charged. This information is entered in translations as a type of AMA entry for special types of lines (for example, full-time WATS lines). The second information digit is always zero in No. 2 ESS. It indicates that the call is neither operator dialed, identified, nor time charged. These are not functions of a class 5 office.

Service Feature Digits

2.31 The two service features digits indicate whether the AMA recorded call originated from a coin line, from a hotel-motel line with a message register, or from a line using a specific

custom calling feature. These digits will indicate one of the following:

Code	Service Feature
00	All calls other than the following:
01	Coin call
02	Hotel-motel with message register
10	Threeway Calling call
12	Call forwarding call.

Calling Party Billing Number

2.32 Without the requirement to record the calling NPA (Figure 1a), the calling billing number is in the B digit of character pair 6 and in the A and B digits of character pairs 7 through 9. If the calling NPA is required (Figure 1b), it precedes the billing number and requires two additional character pairs for the complete entry. The number entered for the billing number is the calling DN unless a special billing number is entered in translations for the line. This may be the case for a multiline hunt group where a common billing number is assigned to all members for single party business lines, etc.

Message Billing Indexes

2.33 The message billing index is entered in the tenth character pair without the calling NPA or in the eleventh and twelfth character pairs if the calling NPA is included in the format. This number is a coded entry which indicates to the data processing center whether a call is free (no charge), or the number of message units to charge for the initial period, etc. It is used in lieu of entering the complete called NPA and DN. In other words, it is used as a code representing the charge to be made by the accounting center and is an office parameter specified on the charging input forms, ESS 2302.

Message Rate (Bulk) Billed Entry

2.34 The message rate entry type illustrated in Figure 1a and 1b is used for timed message rate calls when the calling number and a message billing index, in addition to the answer and disconnect times, are all that are required to bill one or more message units to a telephone number. This entry type requires 10 character pairs if the calling NPA is not required and 12 character pairs if the calling NPA is required by the accounting center. The message rate format illustrated in Figure 1a and 1b is for entry code 16 only.

2.35 The first character pair is an entry identifier. The A digit always contains the binary equivalent of a W which identifies the entry as a multientry type. The B digit of the entry identifier contains a W, X, or V. This character also represents the thousands digit of the call identity index. The CII is used in the multientry system to tie together the initial, answer, and disconnect entries.

Detail Billed Initial Entry

2.36 The detail billed type AMA entry illustrated in Figure 1c is used for all calls which require detail billing information. In this format, the called NPA and called DN are entered in character pairs 10 through 14 instead of a message billing index. All other character pairs are the same as those entered in the message rate format. This type entry is used for entry codes 01, 08, 09, 11, 15, and 99. All coin calls that are to be complaint observed will be AMA recorded using this entry type and an entry code of 01. Other calls requiring complaint observing are recorded per 2.37.

Detail Billed Initial Entry with MBI

2.37 The detail billed initial entry illustrated in Figure 1d is used for calls which require detail billing information plus a message billing index. All of the character pairs are the same as those entered in the detail billed initial entry format with the addition of the MBI. Entry code 25 is entered into translations per instructions in the TG-2H. The following two entry types are only used when specifically requested via a TTY message.

- ***Complaint Observed Message Rate Calls:*** This request causes all message rate calls from message rate lines with the complaint observed indicator set in translations to be detail billed with the called NPA and DN in addition to the message billing index. The AMA initial entry format illustrated in Figure 1d will be used. Only those message rate calls which would normally be recorded are entered on the tape. This type entry contains entry code 18.

- ***Detail Bill All Message Rate Calls:*** This request causes all normally recorded message rate call entries to include the called NPA and DN in addition to the message billing index. The format illustrated in Figure 1d is used. This entry contains entry code 22.

Directory Assistance

2.38 The directory assistance type AMA entry illustrated in Figure 1e is only used to record calls to directory assistance. This format uses the same character pairs as those entered in the message rate format with the exclusion of the message billing index.

Tie Trunk and Tandem Tie Trunk

2.39 The tie trunk and tandem tie trunk entry illustrated in Figure 1f is only available in the extended feature (EF-1) generic. This entry is used to record tie trunk and tandem tie trunk calls. The character pairs are nearly the same as those entered in the detail billed format except that the called DN may be as many as 24 digits long. Noncheck dummy characters are used to pad the called DN to 24 digits if the number of dialed digits is less than 24.

Answer And Disconnect Entries

2.40 The answer and disconnect entries illustrated in Figure 1g are similar in format. As previously indicated, the CII is used to link the initial entry to the answer and disconnect entries. The first character pair consists of a timing entry identifier and the hundreds digit of the CII index. The timing entry identifier in the A-digit position serves two purposes. It identifies the entry as a timing entry and also represents the thousands digit of the CII. The same three characters, W, X, and V are used in this entry as are used in the B digit of the initial entry identifier. In the timed release disconnect entry, the A and B digits are reversed to distinguish between this entry and an answer or regular disconnect entry. The second character pair contains the tens and units digits of the CII. The third character pair contains the tens and units digits of the number of seconds after the last minute. The seconds are all that are required in this entry because each minute the system enters the hour (00-23) and the minute (00-59) on the AMA tape. The minute entries do not have to be included when computing AMA capacity.

Special Classes and Entries

2.41 ***Coin Line and Administrative Calls***—AMA entries are required on some coin calls for division of revenue and for tax purposes. Coin calls follow the normal 3-entry pattern with additional information in the initial entry for coin identification. Certain administrative entries are required for purposes such as fraud prevention on information calls. The format for these calls follows the normal 3-entry pattern with appropriate identifier codes in the initial entry.

2.42 ***Transfer Labels***—A transfer label or entry can be one of the following types:

- ***Regular Transfer Label:*** See Tables B and C for an example of the transfer label. This label is recorded during an AMA unit transfer as scheduled in the call store traffic work table. The time and date of the transfer, an office identity code, tape format identifier, and a label identifier code are included in the entry on both tapes. Noncheck dummy characters (NCDs) are used in the label as fill characters to ensure a minimum block length of 19 tape characters. The number of initial entries recorded since the last regular transfer or no-transfer label precedes the regular transfer label on the ***idle tape*** (previously active). A zero count, signifying the start of an initial entry count for the next 24-hour period, follows the label on the newly ***activated tape.***

- ***No-Transfer Label:*** This label is also controlled by the call store traffic work table and may be recorded on the active AMA every 24 hours. A no-transfer label is recorded if an AMA transfer is not scheduled in the traffic work table. The no-transfer label also contains all of the entries included in the regular transfer label.

- ***Irregular (Trouble) Transfer:*** This label is recorded in the event of a TTY-initiated or trouble-initiated AMA transfer during the normal 24-hour operating interval. An entry is made, if possible, on the failing tape. A count of all initial entries recorded during the current 24-hour period prior to the irregular transfer precedes the label on the failing tape. The same count follows the label on the active tape. The irregular transfer label also contains all of the entries included in the regular transfer label.

TABLE B

FORMAT FOR THE MULTIENTRY COMBINED LABEL EF-1 OR LO-1

1. Label identifier — first digit (V = 1100)
2. Label identifier — second digit
3. Multientry type indication (0010)
4. Format modifier (generally 0000)*
5. Month — tens
6. Month — units
7. Day — tens
8. Day — units
9. Hour — tens
10. Hour — units
11. Minutes — tens
12. Minutes — units
13. Tape transport system number (0 or 1)
14. Tape transport number (0 or 1)
15. Office tape identification number — first digit
16. Office tape identification number — second digit
17. Office tape identification number — third digit
18. Office tape identification number — fourth digit
19. Office tape identification number — fifth digit
20. Office tape identification number — sixth digit

} Generally, these digits contain the NPA and an NNX.

21. NCD
22. NCD
23. Office type — tens
24. Office type — units
25. Tape format identifier — thousands
26. Tape format identifier — hundreds
27. Tape format identifier — tens
28. Tape format identifier — units

} These indicate to accounting center the set of formats contained on the magnetic tape.

29. NCD
30. NCD
31. NCD
32. NCD
33. NCD
34. NCD
35. NCD
36. NCD
37. NCD
38. NCD

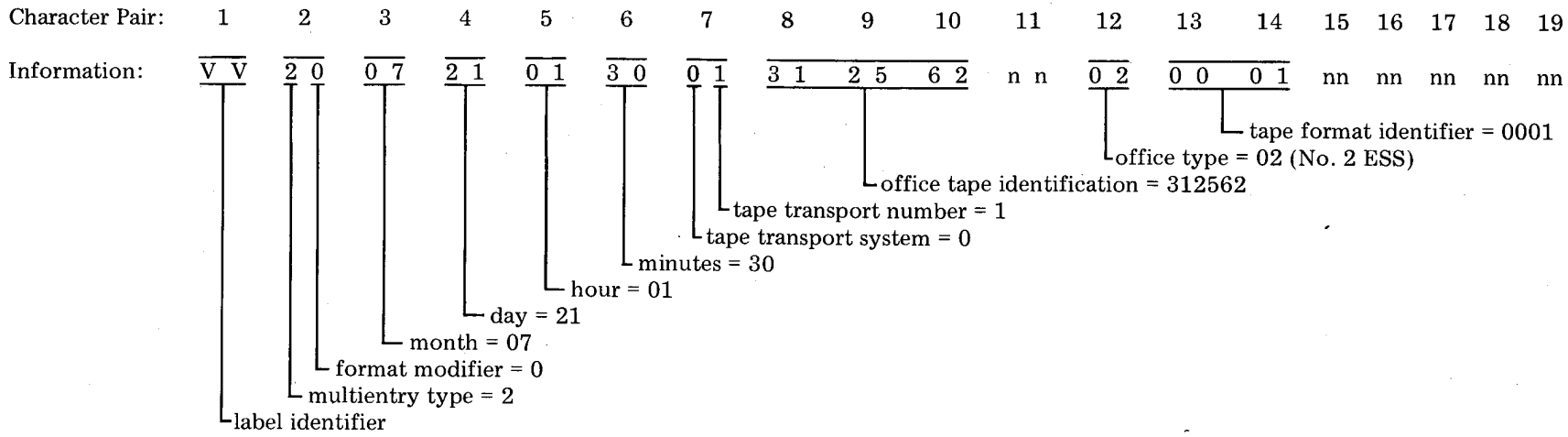
* This is a label format with one of the following digits coded in BCD:

BCD	
1010 (zero)	— No modification
0001 (1)	— Calling NPA included
0010 (2)	— Government call class included
0011 (3)	— Both calling NPA and Government call class included

TABLE C

TYPICAL MULTIENTRY COMBINED LABEL

(Example of an actual transfer label)



n = noncheck dummy character

2.43 ***Time Change Entry***—The time change entry is recorded on the active AMA tape in the event of a TTY-initiated change to system time. This entry allows the accounting center to correctly calculate AMA call elapsed time. The time change entry includes an identifier code, the old time, and the new time.

2.44 ***Initial Entry Count Entry***—An Initial Entry Count entry (Figure 1i) is recorded with both transfer labels during an AMA transfer. An initial entry count precedes and follows a no-transfer label. The entry consists of an identifier code and a count of initial entries recorded since the start of the current 24-hour billing period. Since this entry is often at the beginning of a new tape or following a short data block on an idled tape, the count is repeated to give the entry a tape length of 19 characters. In the EF-1 generic, an initial entry count TTY message is printed out on the maintenance TTY with each type of transfer label except when the count is zero.

2.45 ***Apology Code***—Immediately after encountering a trouble during writing, an apology code is recorded (if possible) on the active AMA tape. The apology code consists of one or more tape characters composed of two Y BCD characters (YY). If an entry is in progress when an AMA trouble is detected, the recording of that entry is discontinued. An attempt is made to write the apology code on the failing tape. An attempt is made to rewrite the failing entry during minor recording failures. If a retry is not possible, a transfer of AMA units is initiated by the program.

Operation During Call Processing

Base Level Program

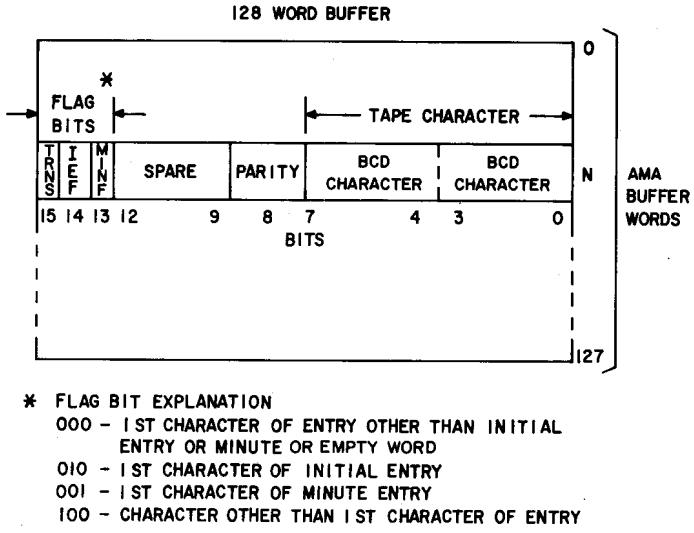
2.46 The AMA base level program determines whether an originating call requires AMA recording. System translation information provides the means by which this is determined.

2.47 After determining that a call requires AMA recording, the program assembles the necessary information for an initial entry. The entry is packed into the 128-word call store buffer (AMA buffer). A total of five retries are attempted if the buffer is full on the first attempt. If all retries fail, and the active AMA is operating normally, a detailed billed call is stopped and sent to overflow. A bulk-billed (message rate) call under this condition is allowed to complete free of charge. If the buffer is full, or closed, as the result of an AMA trouble condition, all AMA calls are allowed to complete free of charge. When the initial entry for an AMA call has been placed in the buffer, a bit is set to indicate that answer and disconnect entries are required. This is placed in the terminal memory record (TMR).

2.48 ***AMA Buffer***—The AMA buffer is 128 words in length. The AMA capacity for EF-1 and LO-1, Issue 4.1 and subsequent generic programs is 170,000 character pairs per busy hour. This is an increase of 50,000 character pairs per busy hour from earlier LO-1 issues. This increase was made, in part, by program efficiencies made possible through the expanded AMA buffer and the additional information stored in the buffer.

2.49 Each word in the 128-word AMA buffer (Figure 2) consists of 16 bits. A single word stores two BCD characters in bits 7-0 (one tape character). Bit number 8 is the parity bit for the character pair which is precalculated by the base level program. Special flag bits are attached to each buffer word in bits 15-13 as the word is loaded into the buffer. These bits indicate if the character pair is the first pair of an initial entry, minute entry or some other entry other than the first pair of an entry. In addition these bits and the parity bit allow certain efficiences during the IO interrupt program that tend to decrease the real time cost of the recording process. An AMA entry (initial, answer, or disconnect) uses several buffer words. Entries are written into the AMA buffer from left to right (bit 7 to bit 0). An entry is sent to the active AMA in parallel form at a rate of two BCD characters and a parity bit (one buffer word) at a time.

2.50 The AMA buffer incorporates an indexing system to load and unload AMA entries. This system is necessary in order to maintain an entry intact in the buffer until it is recorded on tape and verified. Otherwise, an entry—and consequently an entire call—may be lost due to a recording trouble. Three indexes are used to load and unload an entry; the ***entry*** index, the ***word*** index, and an ***end*** index. The indexes are stored in a separate control area called the AMA overhead area. The entry index points to the beginning of the entry currently being transferred from the buffer to the active AMA. The word index points to the CS word currently being transferred to the



* FLAG BIT EXPLANATION
000 - 1 ST CHARACTER OF ENTRY OTHER THAN INITIAL ENTRY OR MINUTE OR EMPTY WORD
010 - 1 ST CHARACTER OF INITIAL ENTRY
001 - 1 ST CHARACTER OF MINUTE ENTRY
100 - CHARACTER OTHER THAN 1 ST CHARACTER OF ENTRY

Fig. 2—Call Store AMA Buffer

AMA. The end index points to the next unused word in the AMA buffer that can be loaded by the base level program.

Interrupt Level Program

2.51 The AMA interrupt level program moves entries from the call store AMA buffer to the active AMA a character pair at a time. The entry index is checked by the program to see if any entries are in the AMA buffer. If an entry is presently in the buffer, the interrupt level program begins unloading it one buffer word at a time. The program attempts to send the entry to the active AMA at the rate of one to three words every 1025-millisecond interrupt (depending on the flag bits in each buffer word). The number of character pairs transferred during a 25-millisecond interrupt depends on the duration of the interrupt. Advantage is taken of the increased duration of the IO interrupt during heavy traffic to transfer a second and even a third character pair.

2.52 Before a tape character can be sent to the active AMA, the interrupt level program must check the previous tape character to ensure that it was recorded properly. This is done by checking various AMA ferrods in the No. 2 ESS trunk scanner [master scanner (MS) frame or universal trunk and junctor (UTJ) frame]. For reliability, ferrods for AMA 0 are located in trunk scanner 0 and those of AMA 1 are located in trunk scanner 1. In addition to recording checks, the ferrods convey operating mode and alarm conditions.

2.53 If a major failure is detected, transmission of data is suspended to the active AMA. A working mode maintenance program is entered in an attempt to find a working equipment configuration by transferring to the standby AMA. A minor recording failure, such as failure to write a single bit, will not cause an AMA transfer. Instead, an apology code is sent to the active AMA and a retry is attempted. Data transmission is also suspended at the end of a data block and after receiving an end-of-tape (EOT) indication. If an entry is in progress in these cases, the program allows it to complete.

2.54 Transfer labels and interblock gaps (IBGS) are processed by the interrupt level program. An EOT trouble condition, TTY request, as well as the traffic work table schedule can cause an AMA transfer. During normal recording, an IBG is initiated after 500 steps are counted and the current entry is complete. This gives an average block length of 504 character pairs.

2.55 The interrupt level program transmits a 4-bit control character (Table D) to the active AMA with each tape character. The control characters initiate AMA circuit action for step and write operations.

TABLE D

CONTROL CHARACTER FUNCTIONS

REQUEST	BINARY* WORD	FUNCTION
Step and Write	0110	Step Tape Transport and Write Tape Character
Step and Don't Write	0101	Step Tape Transport only
Step and Write Longitudinal Redundancy Check Character	1001	Step Tape Transport and Reset Head Current (Even Parity) after Completing a Data Block
Start Inter-Block Gap	0011	Start IBG Oscillator

* Bits 12-9 (left to right) of Peripheral Unit Address Bus

Base Level Maintenance Program

2.56 Any AMA failure indication at the interrupt level calls in the AMA base level diagnostic program after a working mode has been established. This program may also be called in by TTY request.

2.57 After the working mode maintenance program has transferred AMA units following a major failure, diagnostics are performed on the failing AMA. An AMA diagnostic consists of first testing AMA circuit logic functions, and then writing a test pattern on the magnetic tape. Logic functions are tested by sending control commands and then checking appropriate ferrod scan points. IBGs precede and follow the magnetic tape test pattern. Tape transport manual modes of operation (fast forward and rewind) are not tested during AMA diagnostics.

Circuit Operation

2.58 The following description along with Figure 3 gives the functional circuit operation of the AMA system:

(1) The active AMA unit receives data from the on-line control unit (CU) (0 or 1) in parallel form via the peripheral unit address bus (PUAB). A complete through channel from the cable receiver amplifier to the write head driver is contained on one circuit board for a single channel. Nine of these boards make up the nine write channels.

(2) Information from the peripheral address bus comes directly into the write amplifiers from the cable receiving transformers. Peripheral address bus pairs 0 through 8 are connected to cable receiving transformers which are connected to the nine write amplifiers. The same bus and transformer arrangement exists for both bus 0 and 1.

(3) One of the input buses is selected by an ENABLE pulse from the CU (0 or 1) which selects the bus from which the write amplifiers receive data. This pulse also unlocks the four control registers that are connected to the active PUAB in the active AMA unit.

(4) Status control (active, standby, out of service) is transmitted via the central pulse distributor (CPD) points from each CU to each AMA. The commands are received by the peripheral decoder which implements status changes. The peripheral decoder receives an initialization command to reset the AMA to a starting condition. This command resets the busy, beginning, end of tape, reel motion, and one and only one-step counter flip-flops and the four control bit registers.

(5) The nine input registers (channels 0 through 8) receive binary coded tape characters in

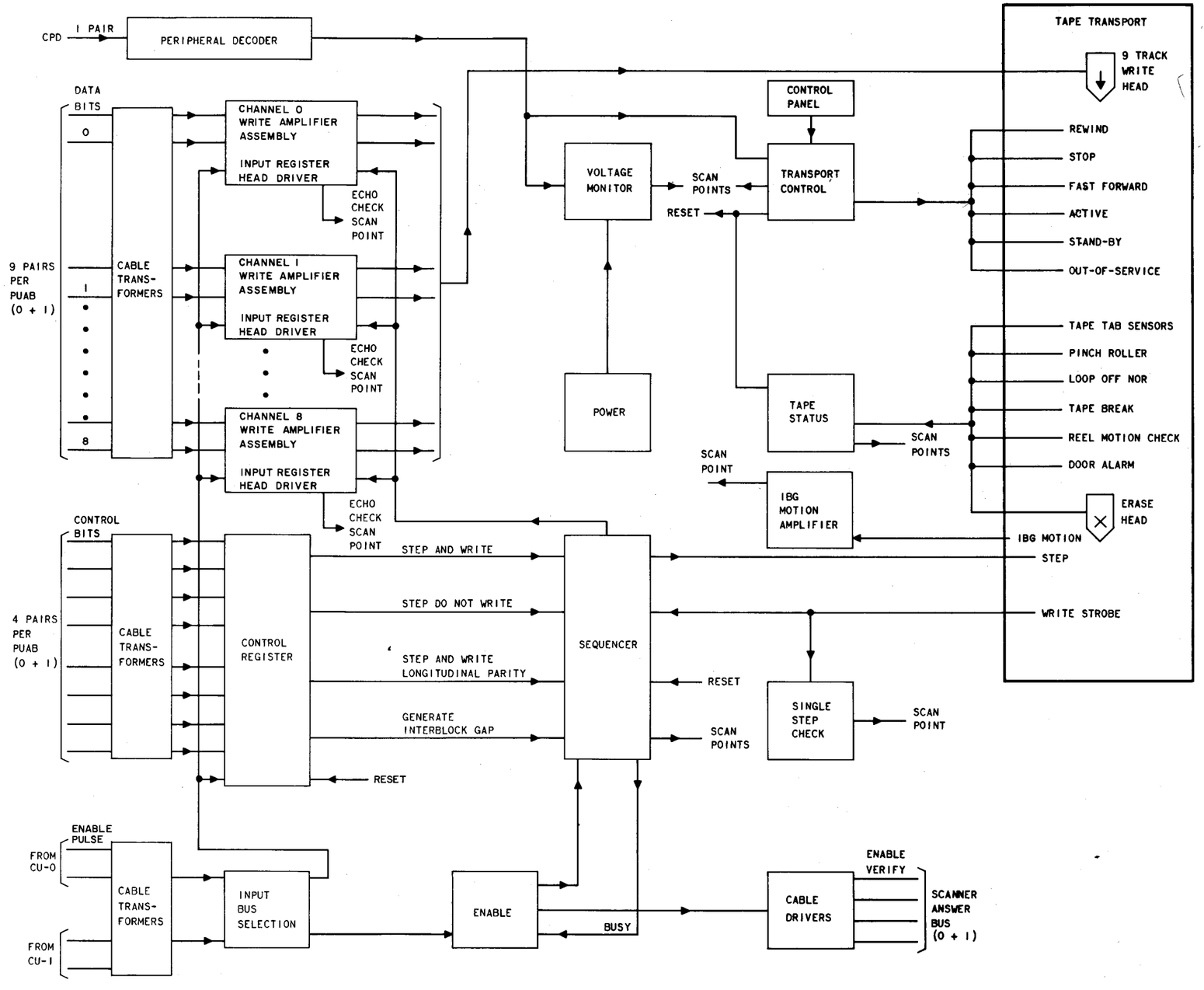


Fig. 3—Block Diagram of a Complete AMA Unit

parallel from the on-line CU. A binary 1 received from te CU sets an enabled input register.

(6) A ***step-and-write*** control character is received by the active AMA with every tape character. This control command energizes the incremental stepping motor in the tape transport. The incremental stepping motor moves the AMA tape. As the motor steps, a "write strobe" is generated in the transport and is sent to the AMA sequencer logic. As the tape moves, iron oxide particles in each track are magnetically aligned according to the direction of current in the corresponding write head segment.

(7) The write strobe serves to gate binary counters connected to the output of each input register. If a binary 1 is stored in an input register, the associated binary counter is incremented on reception of the write strobe. When the counter increments, current is reversed in the corresponding write head segment. Thus, a binary 1 is recorded during a tape step as a ***change*** in magnetization. No change in tape magnetization signifies a binary 0 recorded.

(8) The write strobe also serves as a single step verification. A single step check circuit counts the write strobes as they are generated. The check circuit is connected to a scan point which is interrogated by the on-line CU after an AMA step cycle. If the tape has stepped more than once, or did not step at all, the single step check circuit indicates this.

(9) Control character commands are sent to the active AMA to initiate additional functions (Table D). A ***step-and-don't write*** command steps the incremental motor and moves the AMA tape. The write strobe, however, is inhibited from gating the input register binary counters. This command is sent three times after a data block to generate the 3-character gap on the active AMA tape.

(10) A step-and-write ***longitudinal redundancy check character (LRCC)*** command is sent at the end of the 3-character gap. The input register binary counters must be reset to a reference state at the beginning of a data block. The LRC command resets any binary counter that was not reset at the end of a data block indicating an odd number of 1s in that channel. A 1 is written on each tape track that experiences a binary counter reset during an LRCC.

(11) The start ***interblock gap (IBG)*** command initiates the 0.65 inch (approximate) blank space following the LRCC. This command initially steps the tape transport, and, at the same time, starts the IBG oscillator in the sequencer circuit. The output of the IBG oscillator is 450 pulses per second. The oscillator runs continuously during the IBG interval (approximately 300 milliseconds), generating tape transport stepping commands at the rate of 450 per second. At the end of the IBG, an initialization command is sent to the peripheral decoder. The 4-bit control register is reset, turning off the IBG oscillator. The AMA interrupt level program times the IBG by counting 12 system 1025-millisecond interrupts.

3. FEATURE FLOW DIAGRAM

3.01 A functional flow diagram of the AMA program is shown in Figure 4.

4. INTERACTIONS

4.01 In general, AMA recording of calls is an adjunct to existing features and does not affect the operation of other features. The following are exceptions:

(1) Calls that are call forwarded and require AMA recording are limited to three AMA recorded legs in the EF-1 generic. Call forwarding is not permitted in LO-1 generic if AMA recording is required on the call forwarded leg.

(2) If both AMA recorders are out of service all calls are completed without recording.

(3) If calls cannot be recorded due to high traffic, message rate calls are completed without recording, and detailed recorded calls (toll calls) are connected to reorder tone.

ATTRIBUTES

5. STATION/SYSTEM

5.01 Each No. 2 ESS equipped for AMA has one AMA frame per office containing two AMA recorders (KS-20017, L3) and associated circuitry. The system also contains peripheral communications

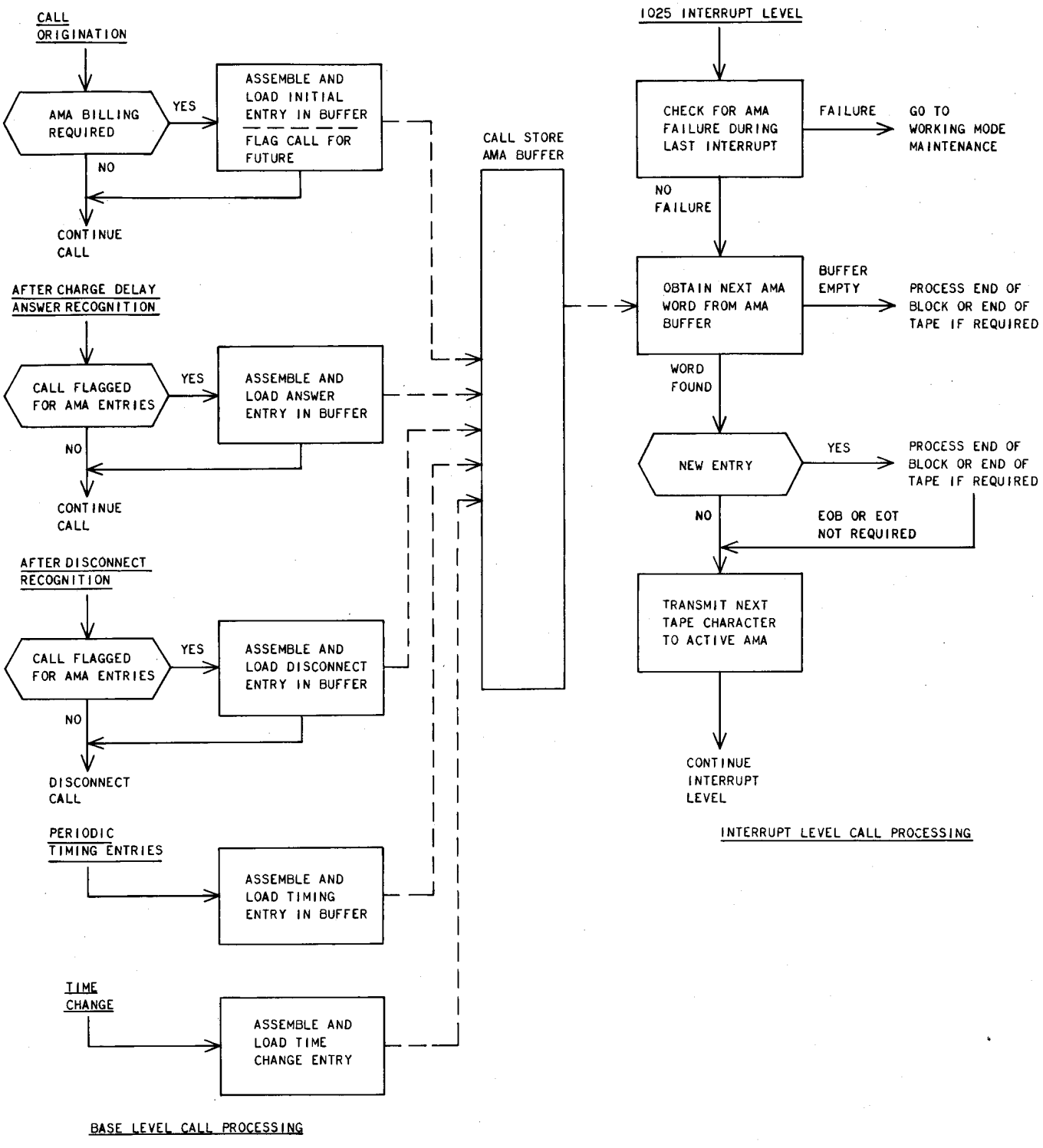


Fig. 4—Functional Flow Diagram of AMA Program

bus transformers and terminal strips which provide a means for connecting the bus to other appropriate frames in the office.

6. LIMITATIONS

6.01 The No. 2 ESS office has a maximum of one AMA frame with two recorders and associated circuitry. Each recorder accepts up to 2400 feet of half-inch magnetic tape which enables one recorder to hold several days of recorded information for the largest No. 2 ESS office (approximately 250,000 direct distance dialing or message rate calls). The AMA equipment is optional for new installations.

6.02 There is a recording limit of 170,000 character pairs or 340 blocks per hour which effectively limits the number of calls that may be AMA recorded. Refer to Traffic Facilities Practices, Division D, Section 12(l) for capacity calculations.

6.03 The LO-1 generic program is limited to 11 networks due to the algorithm for determining the CII which is effectively the junctor number and the limitation of 3000 CIIs. The EF-1 generic program eliminates the 11-network limit by using an improved algorithm based on a number derived from the calling party TEN as described previously.

6.04 For LO-1 offices, call forwarding is not allowed if AMA recording is required on the call forwarded leg.

6.05 A maximum of 64 screening tables and 64 screening indexes may be provided. (Refer to OFFICE DATA for the description of office data and translations.)

6.06 In LO-1 offices, the maximum number of simultaneously charged AMA calls is 2816 (11 networks with 256 billable junctors). In EF-1 offices, the call store limits the maximum number of simultaneously charged AMA calls to 1152. Of these 1152 calls, 128 of them could involve up to three charged legs for call forwarding.

7. RESTRICTION CAPABILITY

7.01 Translations provide for flexible charging arrangements. This is based on the number that is dialed and the calling station. (Refer to OFFICE DATA for description of translations.)

8. COST DATA

8.01 The AMA buffer in call store is 128 words. The AMA control area program uses a 12-word block in the call store. The control area contains maintenance and status information on the AMA frame and the tape transports.

8.02 Costs attributable to charging translations are the charge index tables of 64 words. The generic program costs include the AMA program (base and interrupt levels) and the AMA maintenance program.

AMA Program LO-1 generic:1100 words

AMA Program EF-1 generic:1350 words

AMA Maintenance Program
LO-1 generic:1700 words
EF-1 generic:1750 words

8.03 Refer to Traffic Facilities Practices, Division D, Section 12(l) for real time calculations.

8.04 Other costs include a standard No. 2 ESS single-bay frame (J2H021) and its associated equipment. A spare parts kit (KS-20017, L101 Kit of Spare Parts and Special Tools) is required with each AMA unit. Each transport requires two rows of ferrod sensors for the status of the transports. Also, an ample supply of 7 or 10-1/2 inch magnetic tapes and associated tape carrying cases.

8.05 Tapes must be changed periodically per local requirements. Approximately five to ten minutes are required to perform this task.

8.06 Maintenance costs should be minimal since the AMA system has two redundant control units and recorders which can be operated alternately for maintenance service and programmed diagnostic programs for testing and diagnosing recording problems. See Section 232-112-101 for further information on maintenance of the AMA recorders.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 Incorporation of AMA in a new local No. 2 ESS office requires no special precautions.

9.02 When adding AMA equipment to an existing local No. 2 ESS office, refer to Section 232-112-303—Integrating Local Automatic Message Accounting into Service No. 2 Electronic Switching System. This section provides procedures for integrating an AMA frame into an existing No. 2 ESS office. The procedures consist of utilizing recent change messages to insert new routing and charging patterns in the stored programs.

9.03 For new offices, the AMA frame and the tape transports are schedule for shipment at the same time. However, the two (KS-20017, L3) tape recorders required for the AMA frame and the 1/2-inch wide magnetic tape are ordered separately by Western Electric Company.

9.04 Standard coordination procedures between the telephone companies and Western Electric Company apply during the planning stages for the AMA equipment.

9.05 Floor space required for the AMA frame is 17.5 square feet. The frame must be located in an aisle that is at least four feet wide. (Normally, the frame is located in the control complex aisle.)

10. HARDWARE ENGINEERING

10.01 The AMA equipment consists of J2H021A, (SD-2H066-01) frame and the associated control and peripheral equipment. Each tape transport requires two rows of ferrod sensors (SD-2H2167). One row uses all 16 (15-0) and one uses only four (3-0) sensors. There are two transports in an AMA system and these are ordered and shipped separately per the above equipment drawing. Each tape transport requires two Central Pulse Distributor Points (CPD) per control unit (CU).

11. SOFTWARE ENGINEERING

11.01 Engineering of the memory requirements, in terms of busy-hour AMA capacity, is discussed in the Traffic Facilities Practices, Division D, Section 12-g (3). Refer to this section for the details.

12. COMPATIBILITY

12.02 Local AMA is compatible with any No. 2 ESS office. For hardware interface refer to HARDWARE ENGINEERING.

13. OFFICE DATA

A. Translations

13.01 The layout of the 12 words of AMA overhead area (dedicated call store) (PD-2H132) is shown in Figure 5.

13.02 The AMA buffer word layout is shown in Figure 2.

13.03 The CII call store layout is shown in Figure 6.

13.04 The office option word "OFFOP0" must indicate that the office is equipped with AMA.

13.05 Figure 7 shows the translation structure for obtaining the charge index on a particular call. The dialed code essentially defines a screening table. The screening code of the calling party identifies the entry in the screening table for obtaining the charge index. The charge index enters the charge index table for the charging information.

B. Recent Change (RC) Messages

13.06 The A RC:L/ message and the keyword COB is used to insert, change, or delete complaint observing for a customer line.

13.07 The A RC:DAY/ message is used to change the type of day assignments for the different days of the week for charging purposes.

13.08 The A VY:DAY/ message is used to verify what type of day each day of the week is for coin and message register charging purposes.

13.09 The following TTY maintenance messages are used to perform various AMA routine functions. Refer to the Input Message Manual (IM-2H200) for detailed description of these messages.

- M AM:ABT—Abort AMA functions in progress
- Ma AM:DGN—Diagnose off-line (standby or out of service) AMA
- M AM:EOF—An end-of-file mark is to be written on the designated AMA

AMA OVERHEAD AREA
(DEDICATED CALL STORE)

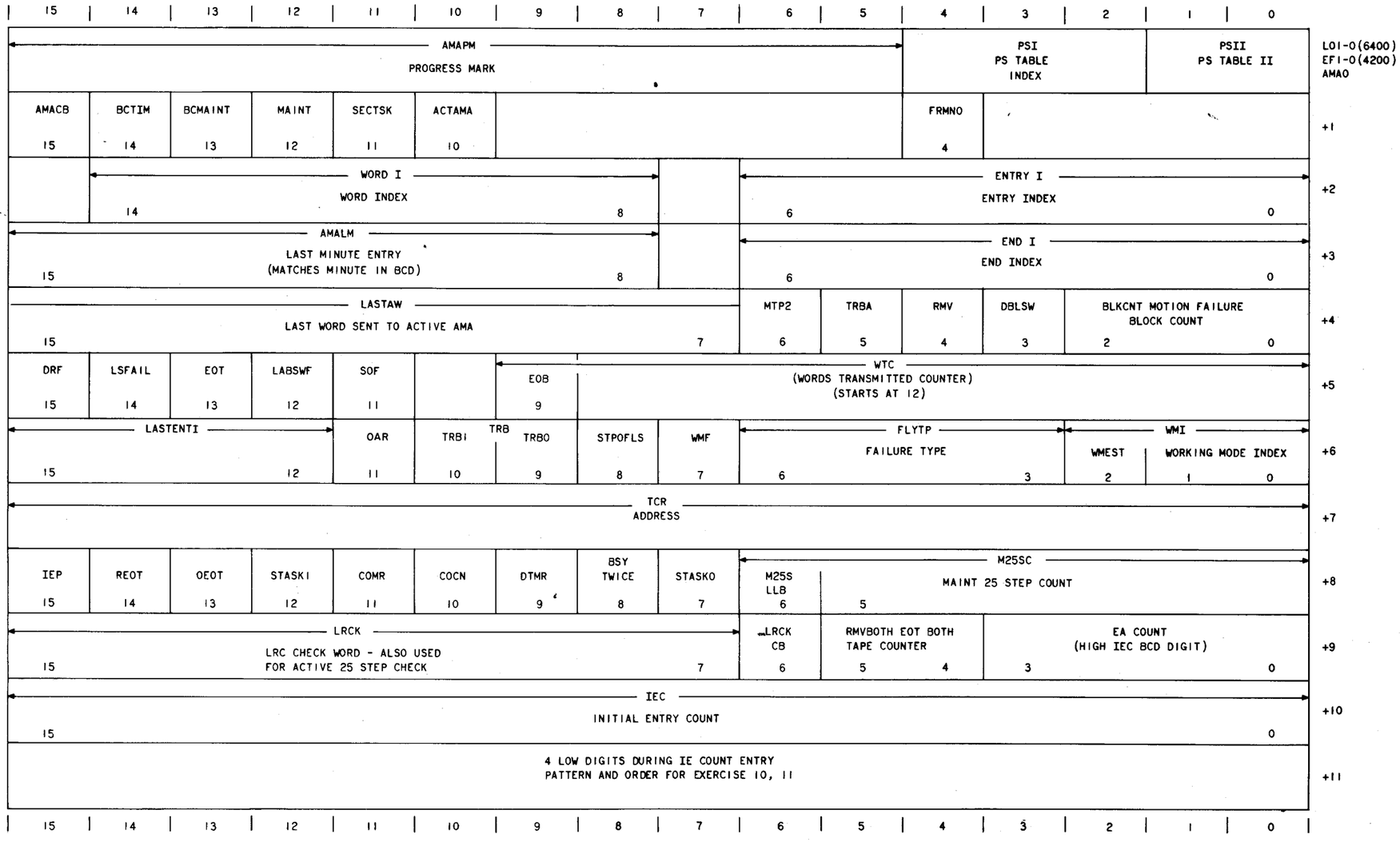


Fig. 5—AMA Overhead Area Call Store Layout

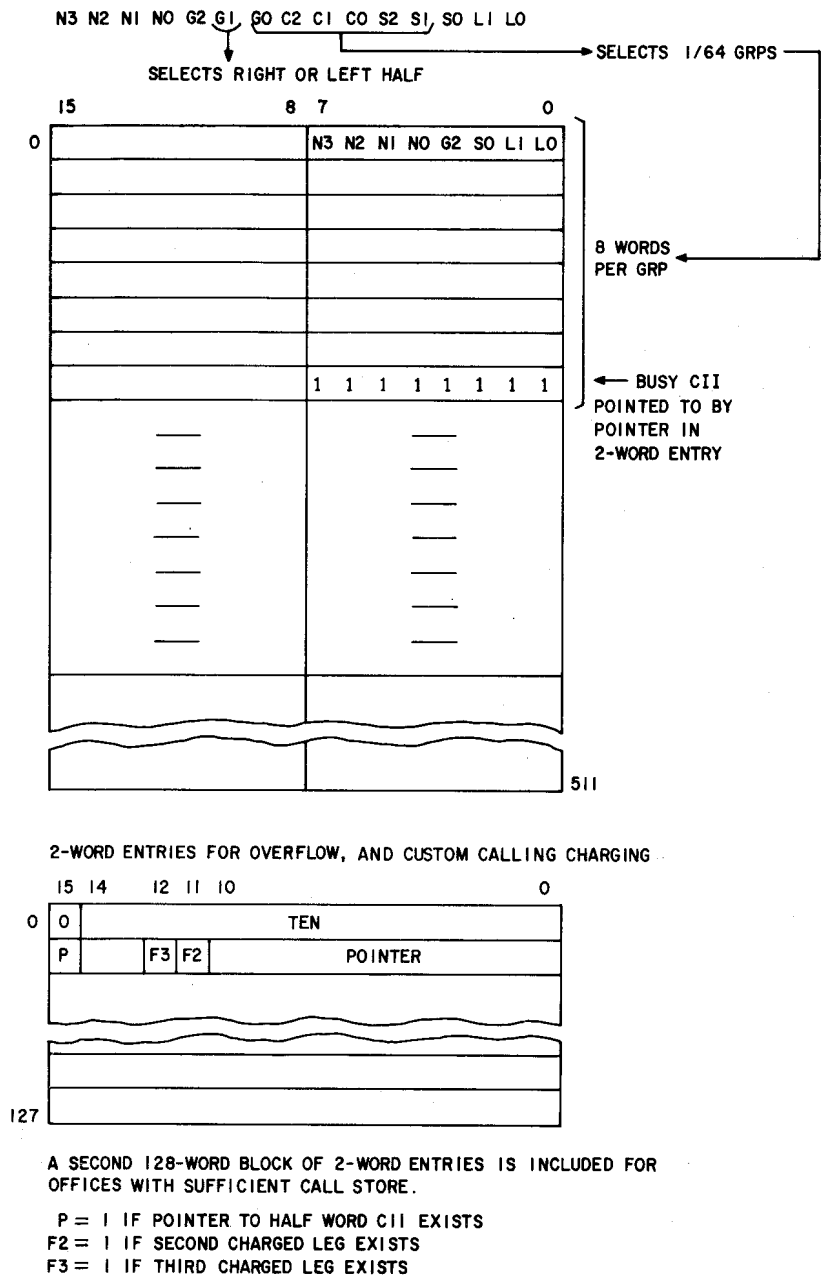


Fig. 6—CII Call Store Layout

- M AM:EX—An exercise is to be run on the off-line AMA
- M AM:OBS—AMA observing and/or detail billing is to be done
- M AM:RMV—Remove AMA transport from service
- Ma AM:RST—Restore AMA transport to service
- My AM:SWO—The on-line AMA is to be switched off-line
- T WT:AML—Change time in the Traffic Work Table for the AMA end-of-day label.

C. ODA Information

13.10 The following ESS input forms must be properly completed by the dial administrator of the operating company and submitted to the ODA system (WECo Regional Center) to define LAMA for the No. 2 ESS office. Normal scheduling procedures should be observed for completing these forms.

- ***ESS 2100—Directory Number Table***—This table is used to list the DN and its related information for use as part of the TEN and 4-digit translators. This table also defines charging by the LAMA system for lines having the call forwarding feature. Lines in offices equipped with the LO-1 generic are only allowed to forward calls to other numbers within that line's free calling area. Lines in offices equipped with the EF-1 generic are allowed to forward calls to numbers outside the free calling area and recording by the LAMA system is performed for charging purposes.

- ***ESS 2101—Centrex Directory Number Table***—This table is used to define DNs associated with centrex groups. It relates a TEN, equipment, features, and restrictions to a particular DN. Different classes of service are defined on this form for billing purposes.

- ***ESS 2105—Multiline Hunt Group Table***—This form should be completed whenever the ESS 2100, 2101, 2107, or 2109 forms are prepared. Refer to Translation Guide, TG-2H for the details in preparing this form where local AMA recording is required.

- ***ESS 2107—Supplementary Information Table***—This table is used to provide additional information for DNs supplementing that entered on ESS 2100 and 2101 forms.

- ***ESS 2109—Centrex Group Table***—This table is used to provide information needed for building portions of the centrex number translator. Table 2109-3 provides information needed to access the charge table (Table 2302) to access the charge index.

- ***ESS 2301—Rate and Route Table***—This table provides translations for both originating and terminating of calls in a No. 2 ESS office. Rate area and line or trunk class codes are defined by this table.

- ***ESS 2302—Charge Table***—This table is used to define all required local charging instructions.

- ***ESS 2500 Form Codes 5C, 5G, 5K—General Information Table***—This table is used to specify local AMA for an office.

13.11 Refer to Translation Guide, TG-2H, Division 4 for instructions for filling out the above forms. Copies of the reproducible input forms are in Division 11, Section 1, of the Translation Guide, TG-2H.

14. GROWTH/RETROFIT PROCEDURES

14.01 Refer to PLANNING for the description of procedures for adding AMA equipment in a No. 2 ESS office. Section 232-124-301 provides the office update procedures by using the regional ODA system programs.

15. TESTING

15.01 When AMA equipment is engineered for a new office, testing procedures are provided in the Installation Handbook 266. Refer to Installation Handbook 266A for testing procedures applicable to AMA equipment added to an existing office.

15.02 Magnetic tape loading and unloading procedures for the AMA frame are outlined in Section 232-112-301.

ADMINISTRATION

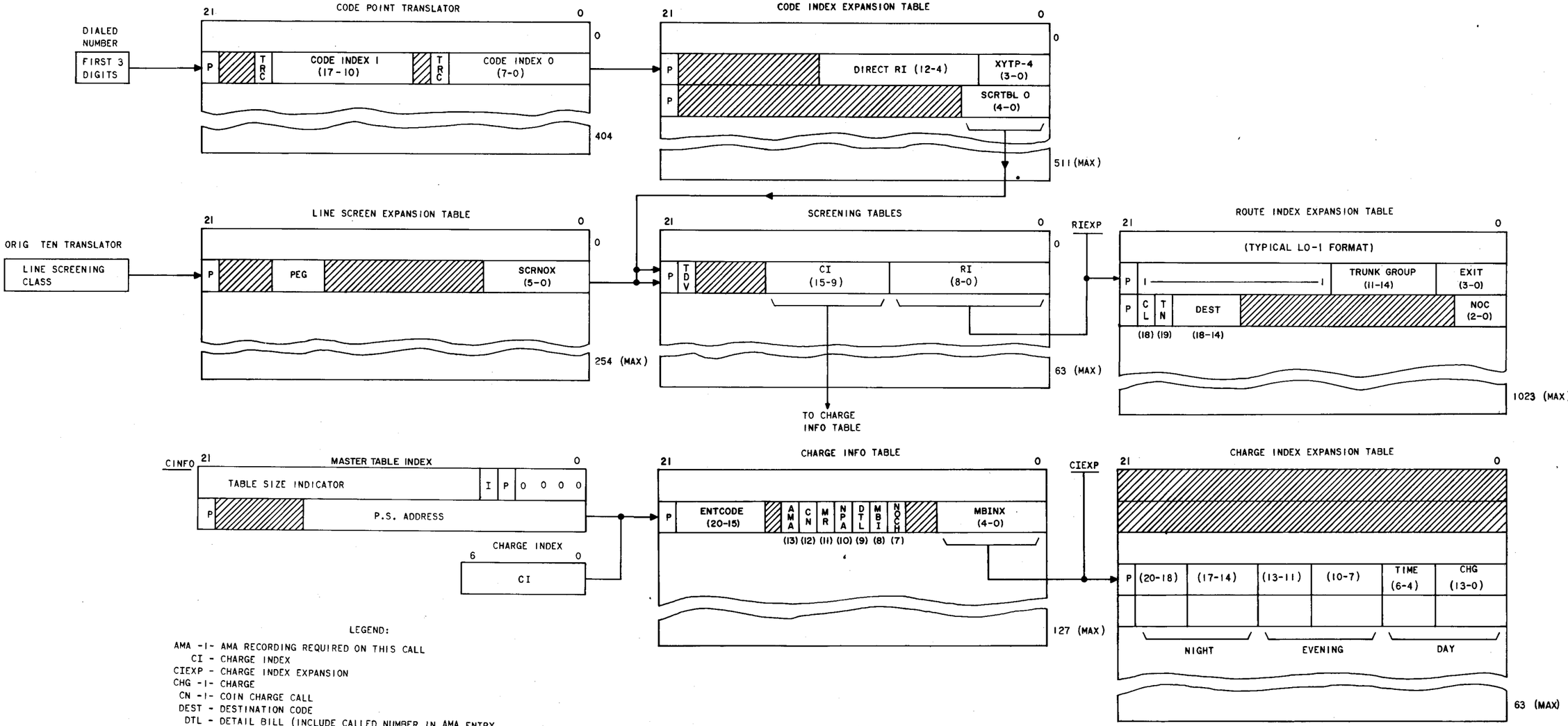
16. MEASUREMENTS

16.01 The Traffic Plant Schedule (Section 232-120-301—Traffic and Plant Measurements) prints out the following measurements.

A. Peripheral Unit Maintenance Measurements

- PUM01—Transient errors and bad address on AMA

- PUM06—Diagnostic faults on AMA



LEGEND:

AMA -I- AMA RECORDING REQUIRED ON THIS CALL
CI - CHARGE INDEX
CIEXP - CHARGE INDEX EXPANSION
CHG -I- CHARGE
CN -I- COIN CHARGE CALL
DEST - DESTINATION CODE
DTL - DETAIL BILL (INCLUDE CALLED NUMBER IN AMA ENTRY
ENTCODE - AMA TYPE OF ENTRY CODE
MBI -I- INCLUDE MBINX IN AMA ENTRY
MBINX - MESSAGE BILLING INDEX
MR -I- MESSAGE REGISTER CALL
NOCH -I- AMA ENTRY TO BE MARKED TRAFFIC SAMPLED
NOC - NORMALIZED OFFICE CODE
P - PARITY
PEG - PEG COUNTER NUMBER
RI - ROUTE INDEX

LEGEND
RIEXP - ROUTE INDEX EXPANSION (FROM MASTER TABLE INDEX)
SCRNDX - SCREENING INDEX
SCRTBL - SCREENING TABLE NUMBER
TDV - TOLL DIVERSION
TEN - TERMINAL EQUIPMENT NUMBER

Fig. 7—Rate and Route Translation of a Typical Interoffice Call

- PUM11—Diagnostic all tests pass (ATP) on AMA

B. Base and Service Maintenance Measurements

- BSM08—Total AMA recorded calls
- BSM09—AMA records lost (per call) due to AMA system trouble
- BSM30—AMA buffer overflow

C. Office Total (OFT) Measurements

- OFT 61—Number of data blocks recorded on AMA tape

17. RECORD KEEPING

17.01 There are no special office records to be kept except for the following ODA system generated output records (R forms):

- 2100-R—Directory Number Record
- 2101-R—Centrex Directory Number Record
- 2105-R—Multiline Hunt Group Record
- 2109-R—Centrex Group Record
- 2301-R—Rate and Route Record
- 2302-R—Charge Index Record
- 2302-3C-R—Daily Charge Rate Record
- 2500-5C-R—MTI Capacity and Office Options Record

18. CHARGING

18.01 For the information on the charging procedures by the AMA equipment, refer to DESCRIPTION.

AVAILABILITY

19. NEW INSTALLATIONS

19.01 The LAMA system is available in EF-1 (extended feature) and LO-1 (local office) generic programs. These generic programs contain the increased AMA capacity (170,000 character pairs per busy hour).

19.02 The EF-1 generic program uses a new CII which is not based on the talking junctor but rather on the calling party's TEN, thus eliminating the 11-network limitation.

20. GROWTH/RETROFIT

20.01 The LAMA system can be made available as an addition to any existing No. 2 ESS office.

SUPPLEMENTARY INFORMATION

21. GLOSSARY

21.01 The following list defines abbreviations and nonstandard terms used in this feature:

AMA	Automatic Message Accounting
BCD	Binary Coded Decimal
CII	Call Identity Index
CPD	Central Pulse Distributor
CS	Call Store
CU	Control Unit
EOT	End of Tape
IBG	Interblock Gap
IEC	Initial Entry Count
IO25	Input/Output 25-ms Interrupt
LAMA	Local Automatic Message Accounting
LRCC	Longitudinal Redundancy Check Character
LTN	Line Trunk Network
NCD	Noncheck Dummy Characters used as fill characters in the transfer label
NPA	Numbering Plan Area

ODA	Office Data Administration
PUAB	Peripheral Unit Address Bus
TEN	Terminal Equipment Number
UTJ	Universal Trunk and Junctor Frame
TTY	Teletypewriter

22. REASONS FOR REISSUE

22.01 This is the initial issue of this section.

23. REFERENCES

23.01 The following are major references used as the supporting documentation for this feature:

- Automatic Message Accounting Description No. 2 Electronic Switching System—Section 232-112-101
- Automatic Message Accounting Tape Loading and Unloading Procedures No. 2 Electronic Switching System—Section 232-112-301.
- Automatic Message Accounting Frame—Section 820-640-154 (J2H021)
- Circuit Schematic SD-2H066-01
- Program Specification PD-2H113
- Program Specification PD-2H232
- Office Data Tables Layout Specification PA-2H200
- No. 2 ESS Translation Guide, TG-2H
- Input Message Manual IM-2H200
- Output Message Manual OM-2H200
- Traffic and Plant Measurements No. 2 Electronic Switching System—Section 232-120-301
- Traffic Facilities Practices, Division D, Section 12
- 034 series BSPs.