

FEATURE DOCUMENT
AUTOMATIC MESSAGE ACCOUNTING
2-WIRE NO. 1 ELECTRONIC SWITCHING SYSTEM

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NOTICE
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INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This document provides information for the Automatic Message Accounting (AMA) feature for the No. 1 Electronic Switching System (ESS). The automatic message accounting operation described is for 9-track AMA units and is not generic program dependent. The AMA information provided in this document is applicable to centralized automatic message accounting (CAMA) and local automatic message accounting (LAMA). For a detailed description of CAMA, refer to item A(1) in Part 18.

REASON FOR REISSUE

1.02 This document is reissued to provide AMA information for the following features and services:

- Busy/Idle Status Indicator (BISI) feature
- Centrex Station Rearrangements (CSR) feature
- Originating Screening Office (OSO) feature
- Message Detail AMA Records (MDR-RAO) service.

Revision arrows are used to emphasize the significant changes.

FEATURE AVAILABILITY

1.03 The AMA feature is available in all active No. 1 ESS base generic programs.

2. DEFINITION/BACKGROUND

DEFINITION

2.01 The AMA feature provides the facility for automatically recording billing information on magnetic tape for later processing by the accounting center.

BACKGROUND

2.02 The AMA feature is required in all No. 1 ESS offices. The purpose of the AMA feature is to

provide the office with a facility which automatically collects and stores billing information on magnetic tapes. The magnetic tapes are furnished to the accounting center on a periodic basis. The AMA equipment accomplishes this objective in conjunction with the central processor which consists of central control, program store, and call stores in a No. 1 ESS office. In larger ESS offices, the central processor also includes the signal processor and its associated call stores. The AMA function is controlled by software programs which gather the billing information on a periodic basis.

DESCRIPTION

3. USER OPERATION

CUSTOMER

3.01 Not applicable.

TELEPHONE COMPANY

A. General

3.02 The AMA equipment consists of two tape recorders and associated circuitry, and is collocated with the maintenance teletypewriter in a double-bay frame in the master control center (Fig. 1). There are two AMA units (AMA 0 and AMA 1) with separate controls for each. These units operate on an active or standby basis to ensure reliability and to augment maintenance operations. With this arrangement the system has access to either AMA 0 or AMA 1 at all times, thus ensuring service continuity.

3.03 During an in-process call, billing information is stored in an AMA register in call store (Fig. 2). When a call is completed, the billing information is formatted into a single billing entry and transferred to a call store area designated as the AMA output buffer. When a predetermined amount of data has accumulated in the output buffer, the central processor transfers the data to the active AMA unit (via the peripheral unit address bus and the AMA circuit).

3.04 When recording on a reel of tape has been completed, the reel must be manually removed and replaced with another reel. For tape handling procedures, refer to item A(2) in Part 18. The removed reel is transported to the accounting center for computation and billing purposes.

3.05 The AMA feature uses the No. 1 ESS system clock to derive the billing times entered on the

AMA tape. If the system clock is incorrect, erroneous billing can be made. The system clock should be checked periodically as specified in the equipment test list (ETL).

B. AMA Equipment Controls and Indicators

3.06 The No. 1 ESS AMA frame control panel contains pushbuttons for providing manual control of particular AMA equipment conditions (Fig. 3). The AMA controls are as follows:

- (a) The *OFF-0* and *OFF-1* pushbuttons are used to turn off AMA unit 0 or unit 1.
- (b) The *MAN C-0* and *MAN C-1* pushbuttons are used to remove AMA unit 0 or unit 1 from service.
- (c) The *NOR* (normal) pushbutton provides for the AMA units (0 and 1) to operate automatically under system control.

Two out-of-service indicators (*OS-0* and *OS-1*) are provided to indicate when either or both AMA units are out of service. The AMA bus control pushbuttons (*OFF-0*, *NOR*, *OFF-1*) are provided to allow either communication bus (0 or 1) for AMA to be turned off or to operate automatically under system control.

3.07 Each KS-19125 L3 recorder contains a *SLOW FORWARD*, *FAST FORWARD*, and *STOP* switch (Fig. 4). Each recorder has two illuminating indicators to indicate the operational state (*ACTIVE* or *STANDBY*) of the particular recorder. The recorder controls are used when changing tapes and when performing recorder maintenance. For AMA tape handling procedures, refer to item A(2) in Part 18. For KS-19125 L3 recorder adjustment procedures, refer to item A(3) in Part 18.

C. AMA Equipment Conditions

3.08 The AMA function is automatically controlled by the AMA programs and the central processor; however, actual operation of the AMA equipment occurs under three conditions which are controlled by manually operated pushbuttons. Two pushbuttons (one for each AMA recorder) are provided for each of the following conditions.

- (a) The *normal* condition is used when the system has automatic control of the recorder.

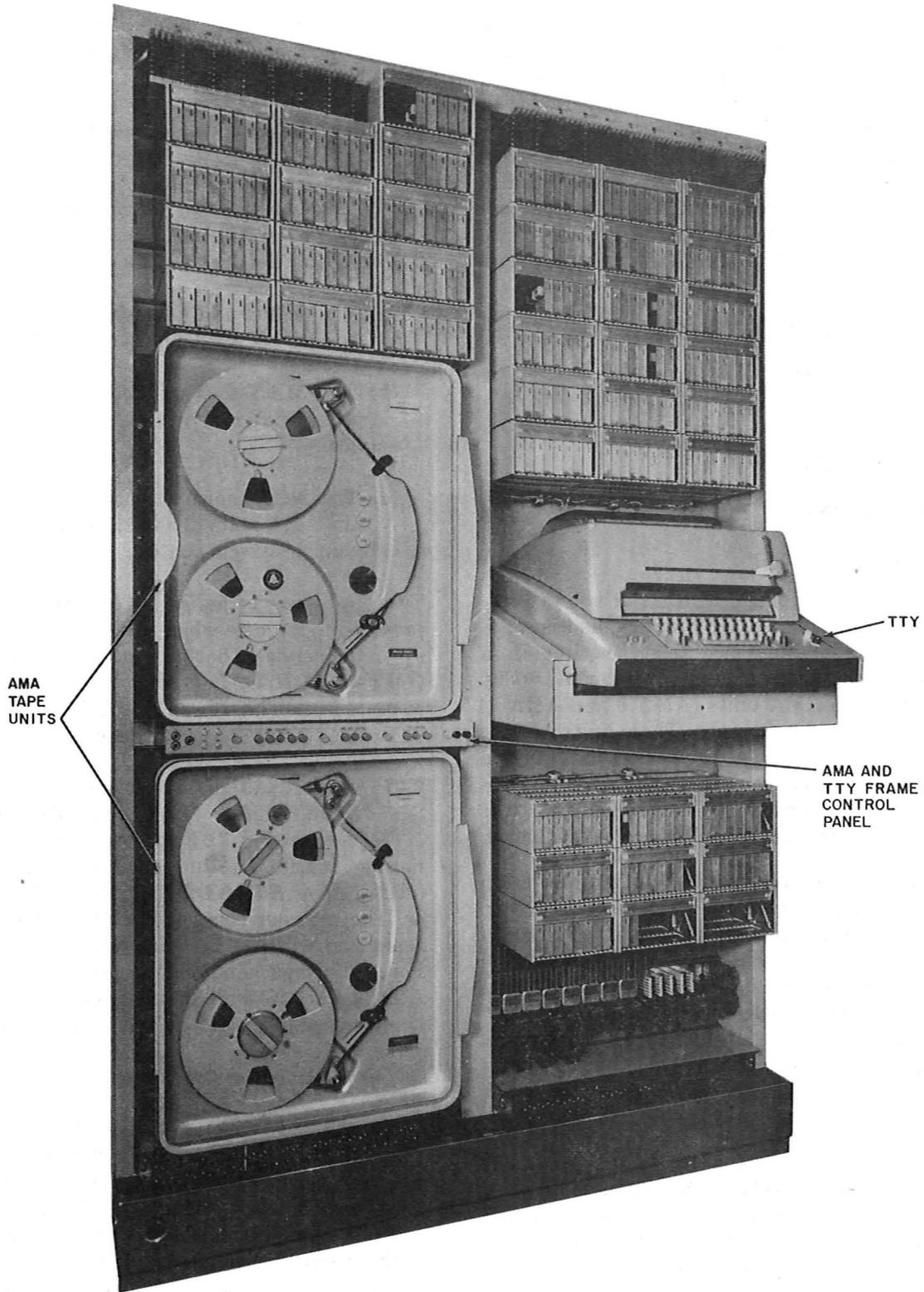
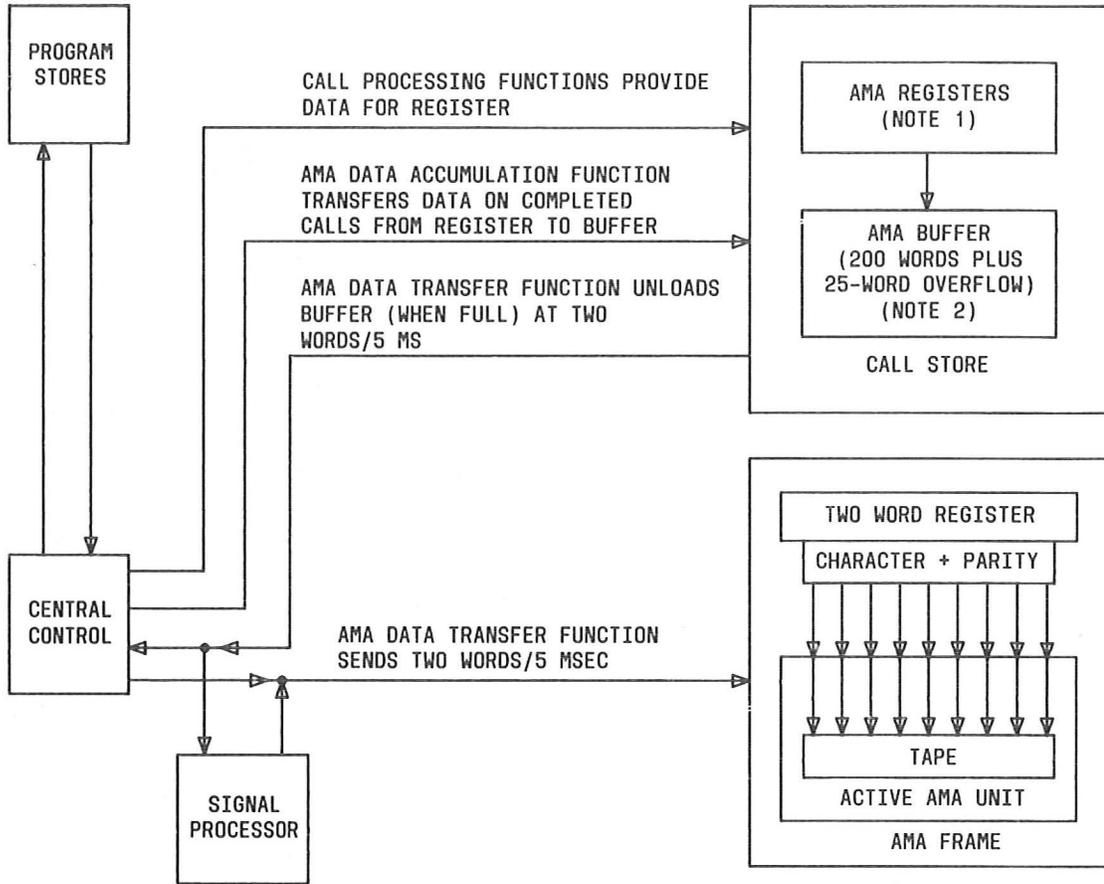


Fig. 1—AMA and TTY Frame



- NOTES:
1. AMA REGISTERS INCLUDE 9-, 13-, AND 18-WORD REGISTERS IN CALL STORE.
 2. THE AMA BUFFER IS IN CENTRAL CONTROL CALL STORE IN A CENTRAL CONTROL OFFICE AND IN SIGNAL PROCESSOR CALL STORE IN A SIGNAL PROCESSOR OFFICE.

Fig. 2—Functions for Recording AMA Data

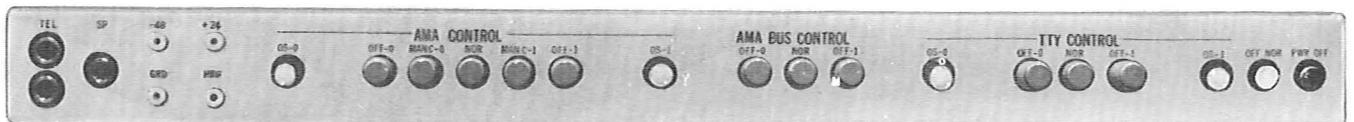


Fig. 3—Typical No. 1 ESS AMA Frame Control Panel

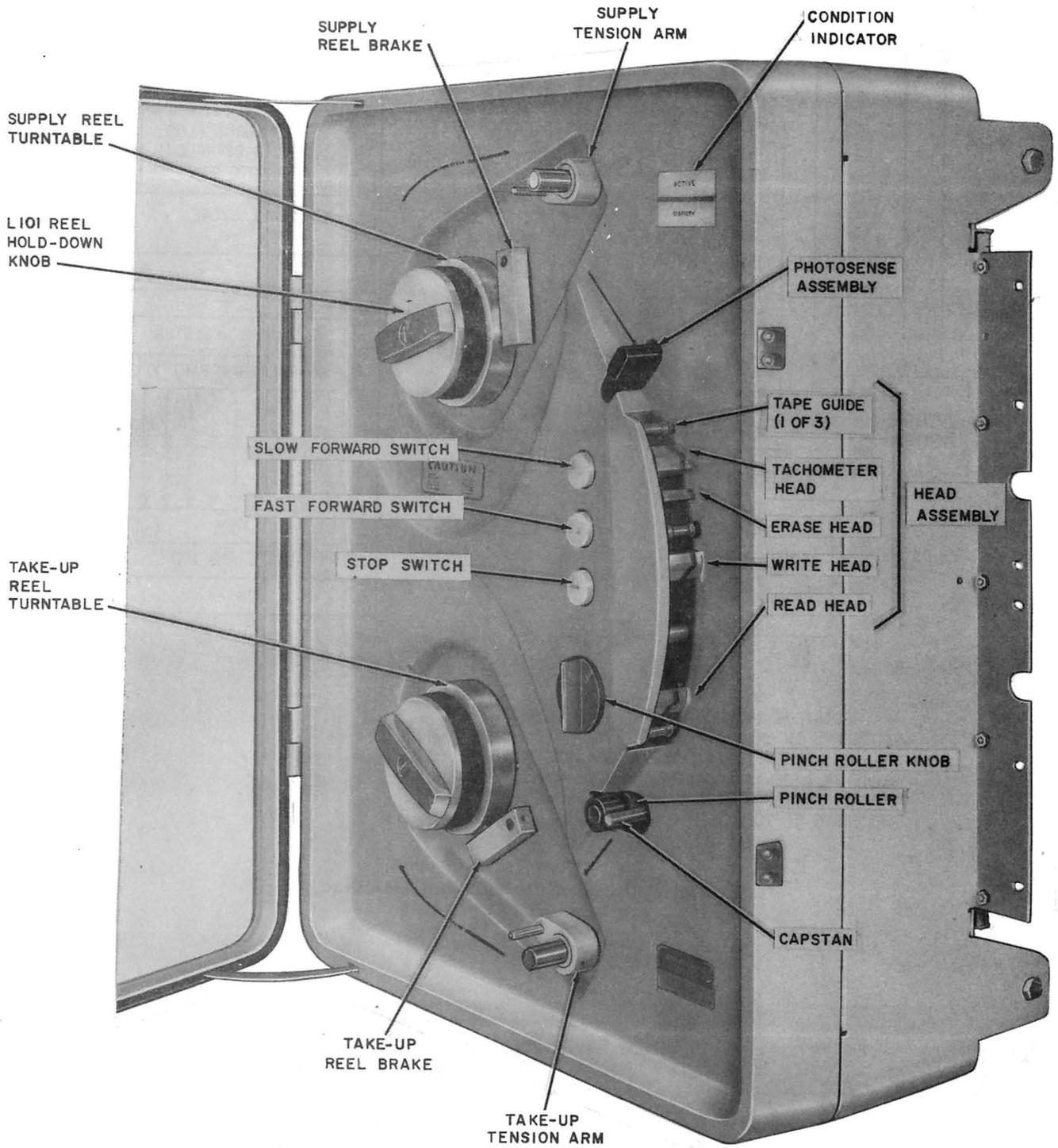


Fig. 4—KS-19125 L3 Recorder (Without Tape Reels)

During this condition, data is recorded and system diagnosis of troubles may be performed.

- (b) The **manual control** condition is used when tapes are changed. (This provides control of the transports by pushbutton.)

Caution: During this condition, care should be taken to avoid mutilation or erasing of recorded data. The user should not allow the area of the tape containing recorded data to pass over the recording head again, and under no circumstances should a tape be remounted until it has been processed by the accounting center.

- (c) The **off** condition removes all power from the recorder. Mechanical interlocks are provided for this condition to ensure against inadvertent removal of power from both AMA recorders at the same time.

D. AMA Unit States

3.09 When the AMA unit is operating in the **normal** condition, the central processor can place either recorder in any one of four operational states.

- (a) The **active** state is used when the AMA unit is ready to record data or is in the recording process. This state is also used for system diagnosis of trouble. Normally, during one 24-hour period, only one recorder is active and it records all of the data.
- (b) The **special active** state is used to disable the **alarm time-out (ATO)**, developed for the data retrieval and insertion procedures. For AMA data retrieval and insertion procedures, refer to item A(4) in Part 18. The special active state consists of two parts: a read mode and a write mode. The read mode reads data from tape with even parity and disables the write and erase heads to prevent erasing of the tape. The write mode writes data on tape with even parity.

Note: The **special active** state is also used for the automatic positioning of the beginning-of-tape option. For this option, the **special active** state allows a continuous search for the beginning-of-tape mark. The **ATO** is disabled.

- (c) The **standby state** is used when an AMA unit is prepared to record data but is not

needed because the other AMA recorder is in service. In this state, the cable drivers and enable verifiers are operational but the tape drive is disabled and writing is prevented.

- (d) The **quarantine state** is used automatically when the central processor detects trouble. In this state, the AMA unit is isolated from the system and the cable drivers and enable verifiers are inhibited.

E. AMA Unit Modes

3.10 The central processor can place either AMA unit into any one of four operational modes.

- (a) The **normal** mode is used for data recording whenever the AMA unit is in the active state.
- (b) The **maintenance 1** mode is used by the central processor to automatically examine the writing and the verifying sections of the AMA circuitry for the presence of faults.
- (c) The **maintenance 2** mode is used by the central processor to request reports from the AMA sequence control with respect to various internal circuit conditions.
- (d) The **maintenance 3** mode is used by the central processor for the same function as the maintenance 1 mode, except that in this case, incorrect even parity is intentionally generated for the first character of each word. The resultant parity inversion assists in verifying the operation of the check register parity circuit.

Note: The maintenance modes are normally included as part of the operational program. However, when an AMA unit is switched from off or manual control to the normal condition at the frame control panel, the system automatically makes a diagnostic test by stepping through the three maintenance modes in succession.

F. AMA Feature Options

3.11 The AMA feature is flexible in that other features may interact with AMA. Interactions with other features are discussed in Part 7. The options available for AMA are described below.

(a) **The AMA Detailed Billing on Timed and Untimed Message Unit Calls (DUMB):**

This option, available in all active generic programs, replaces AMA type-of-entry codes 16 and 17 with type-of-entry codes 22 and 23, respectively. Type-of-entry codes 22 and 23 cause the called numbering plan area (NPA) and called central office code (NXX) to be entered on the AMA tape on 10-digit calls. The NXX is entered on the AMA tape on 7-digit calls. The DUMB option is controlled by the AMA-BILL input message at the maintenance teletypewriter.

(b) **Automatic Positioning of AMA Beginning-of-Tape Mark (APBOT):** This option, available in all active generic programs, automatically positions the beginning-of-tape mark after a new reel of tape is mounted on the AMA tape transport. The APBOT option requires hardware and translation changes.

(c) **Initial AMA Entry on All AMA Call Attempts (IAAC):** This option, available in all active generic programs, provides AMA entries for all incomplete calls that otherwise would have been chargeable. If a call is incomplete, the IAAC option will change type-of-entry codes 17 and 23 to 16 and 22, respectively, and will include the trunk network number if there is an outgoing trunk on the call. The call abandon time is entered in the answer time space, and noncheck dummy characters are recorded in the disconnect time space. The IAAC option is controlled by the AMA-BILL input message entered at the maintenance teletypewriter.

G. AMA Input/Output Messages

3.12 Input messages may be input via the maintenance TTY to effect certain actions for the AMA feature. The input messages and responses are discussed below. For detailed input message descriptions, refer to item B(1) in Part 18.

(a) The AMA-ACT message causes the trunk network number (TNN) of the trunk used for an outgoing call to be entered on the AMA tape whenever there is an AMA register associated with the call. System response is **OK**.

Note: An AMA record is made for all incomplete outgoing trunk calls.

(b) The AMA-BILL message controls the DUMB and IAAC options for AMA billing. System response is **OK**.

Note: The AMA-BILL message is not desirable to use for trunk studies because it causes recording of intraoffice incomplete call records that are not required for trunk studies.

(c) The AMA-DGN message is used to request a diagnosis of the specified AMA unit. System response is a printout of the requested diagnosis, or **NG** if the diagnosis cannot be performed. System response **OK** is followed by a DR01, DR02, or DR04 output message.

(d) The AMA-EOT message, used in tape changing procedures, requests that an end-of-file mark be recorded on the standby AMA unit. The standby unit is placed in the quarantine state after the end-of-file mark is written. System response is **OK** followed by an AM07 or AM08 output message, or **NG** if both AMA units are out of service. Also, the appropriate **OS** (out-of-service) lamp on the frame control panel (Fig. 3) is lighted upon completion of the request.

Note: If the standby AMA unit is being diagnosed, the diagnosis is aborted and the end-of-file mark is recorded when AMA-EOT is requested.

(e) The AMA-OFF message cancels the message AMA-ACT. System response is **OK**.

(f) The AMA-QUAR message places the standby AMA unit in the quarantine state. If the standby unit is being diagnosed, the diagnosis is aborted and the standby AMA unit is removed from service. System response is **OK** followed by an AM02 output message, or **NG** if both AMA units are out of service. The **OS** lamp for the standby unit is lighted upon completion of the request.

(g) The AMA-RESTORE message requests that the specified AMA unit be restored to service without a diagnosis. The specified AMA unit is placed in the standby in-service state if previously both AMA units were **not** out of service; or it is restored to the active in-service state if previously both AMA units were out of service. System response is **OK** if both AMA units previously were not out of service. If previously both AMA units were out of service, the AM02 output message, containing diagnostic information about the AMA unit **not specified**, will be printed. A DR01 or

DR02 diagnostic printout will follow the AM02 output message.

Caution: *When both AMA units are out of service, caution should be exercised in the use of the AMA-RESTORE input message since AMA data may not be able to be properly recorded.*

System response is **NG** if the end-of-file mark has been recorded previously on the specified AMA unit; if the diagnostic or bootstrap tape block writing test is in progress; or if the request is for the active AMA unit.

(h) The AMA-SWAMA message is used to request a switch in AMA units. Before the switch, if there is any information in the AMA output buffer, the remainder of the buffer is filled with noncheck dummy characters. Then the output buffer data will be transferred to the active AMA unit before the switch is made. System response is **OK** followed by the switch of AMA units; or it is **NG** if the standby AMA unit has a trouble record, or has an end-of-file mark previously recorded, or if both AMA units are busy (eg, a data transfer is in progress).

(i) The TC-WORK message is a multipurpose message used to set and reset flags and activity bits associated with work timetables. This message is used for AMA to cause the AMA units to be switched at midnight of the day indicated by parameters or the day selected using the TC-WORK message. The AMA units are automatically switched according to the information in the fixed timetable as specified by the values of set cards SUN, MON, TUE, WED, THU, FRI, and SAT or as manually requested using the TC-WORK message. System response is **OK** if the request was accepted or **NG** if an invalid request.

Note: The TC-WORK message is used to request midnight switches according to parameters or to request manually selected midnight switches. Manually selected midnight switch requests override the midnight switch parameters specified by the set cards SUN through SAT.

3.13 The AMA related output messages are discussed below. For detailed output message descriptions, refer to item B in Part 18.

(a) The AM01 message is printed when an AMA call passes the second midnight and each sub-

sequent midnight through the ninth. This message indicates that an AMA call has been in progress for at least 24 hours, but for not more than 9 days. This message is printed as part of the normal AMA routine at midnight, if such a call exists.

(b) The AM02 message indicates that an AMA unit has been removed from service and the other AMA unit is active. This action was taken in response to one of the following conditions:

- (1) The indicated AMA unit was deemed incapable of accurate recording by the AMA fault recognition program.
- (2) The control panel keys of the indicated AMA unit have been activated from the normal to the off condition.
- (3) The physical end-of-tape marker was sensed on the indicated AMA unit; the AM05 message should precede this message in this case.
- (4) If both AMA units were previously out-of-service, the AMA unit *not* indicated was restored to service.
- (5) TTY input message AMA-QUAR has been answered.

Note: When an AM02 message is printed, a major alarm is sounded except when the standby AMA unit is removed from service.

(c) The AM03 message indicates that the active AMA unit has been removed from service while the other AMA unit is also out of service. This condition is the result of one of the following:

- (1) The AMA fault recognition program found the active AMA unit incapable of accurate recording.
- (2) The control panel keys of the active AMA unit have been activated from the normal to the off condition.
- (3) The end-of-file mark has been written, or requested to be written, on the active AMA unit.

Note: When an AM03 message is printed, a **critical** alarm is sounded.

(d) The AM04 message indicates that the tape on the indicated AMA unit has lost its tension, and the indicated AMA unit has been removed from service. In this case, the other AMA unit is placed in service and a major alarm is sounded.

(e) The AM05 message indicates that the physical end-of-tape mark has been sensed, or the photo lamp which senses the end-of-tape mark (designating end of reel of tape) is defective. The indicated AMA unit is removed from service, and an attempt is made to automatically record the end-of-file mark on the same indicated AMA unit. This action is accompanied by either the AM07 or the AM08 output message, and a major alarm is sounded.

(f) The AM06 message contains the status of pertinent AMA control memory and is printed either once or twice due to a detected AMA trouble or error.

(1) If the message is printed only once, it indicates that the AMA data transfer program encountered trouble and has requested the AMA fault recognition program. The message contains information about the cause of the trouble.

(2) If the message is printed twice, it indicates that the AMA audit program detected and corrected an error in the AMA control memory. The first printout contains the information in memory at the time the error was detected; the second printout contains the information in memory after the error has been corrected.

(g) The AM07 message indicates that the end-of-file mark has been successfully recorded on the indicated AMA unit, and that unit has been placed in the quarantine out-of-service state for tape replacement.

(h) The AM08 message indicates that an attempt to record the end-of-file mark on the standby AMA unit has been unsuccessful. The end-of-file mark has not been recorded; however, the standby AMA unit has been placed in the quarantine out-of-service state.

(i) The AM09 message indicates that the AMA bootstrap program has successfully restored to service the indicated AMA unit. Previously, both

AMA units were out of service. This message should have been preceded by the AM03 message.

(j) The AM10 message indicates a failure occurred while attempting to automatically position the beginning-of-tape (BOT) mark.

(k) The AM11 message indicates that an error occurred when formatting the hourly AMA output records. Certain errors will cause the output for that particular hour to be terminated because the AMA data integrity cannot be maintained. In such cases, the hourly AMA data output may not be complete.

4. SYSTEM OPERATION

HARDWARE

4.01 The AMA hardware is collocated with the maintenance TTY in a double-bay frame in the master control center (MCC). The AMA-TTY frame J1A041B contains two KS-19125 L3 or L4 tape recorders, a control unit J1A041AK, and associated AMA circuitry J1A041AM. AMA hardware is discussed in Part 3. For detailed AMA hardware information, refer to item C(1) in Part 18.

OFFICE DATA STRUCTURES

A. Translations

4.02 The unit type number 9 (UTYN 9) auxiliary block is used for the AMA recorders. The layout of the UTYN 9 auxiliary block is shown in Fig. 5. For detailed translation layout information, refer to item C(4) in Part 18.

B. Parameters/Call Store

Set Cards

4.03 Set cards applicable to AMA are discussed below. Set card values are determined in accordance with items C(2) and C(3) in Part 18.

(a) Set card AMAT is used to provide the 6-digit office identification included on the AMA tape. The 6-digit identification number (usually the 3-digit area code plus the 3-digit office code) is determined by the telephone company.

(b) Set card NAM is required to allocate 13-word AMA registers required for detailed billed

	22	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WORD 0	WRDN	QUANT		GROUP		ROW		COLUMN		PAIR		*	†							
WORD 1	QUANT	0	0	FRAME				ROW				COLUMN								
WORD 2	QUANT	0	0	FRAME				ROW				COLUMN								
WORD 3	QUANT	‡	§	0	0	GROUP		ROW		COLUMN		PAIR		*	†					

*-CPDN, †-HALF, ‡-SAM, §-BOT

WORD/ITEM	DESCRIPTION
WORD 0 WRDN	NUMBER OF WORDS IN THE AUXILIARY BLOCK EQUALS FOUR (00100).
QUANT	QUANTITY OF UNIPOLAR CENTRAL PULSE DISTRIBUTOR (CPD) POINTS EQUALS TEN (1010) FOR THE 9-TRACK AMA RECORDER.
GROUP, ROW, COLUMN, PAIR, HALF	CPD GROUP NUMBER, ROW, COLUMN, PAIR, AND HALF FOR LEADS OENO AND 1ENO.
CPDN	CPD NUMBER EQUALS ZERO FOR AN AMA RECORDER.
WORD 1 QUANT	QUANTITY OF SUPERVISORY MASTER SCANNER POINTS EQUALS SEVEN (00111).
FRAME, ROW, COLUMN	MASTER SCANNER FRAME NUMBER, ROW, AND COLUMN FOR LEAD SCO.
WORD 2 QUANT	QUANTITY OF SUPERVISORY MASTER SCANNER POINTS EQUALS ONE (00001). THIS POINT IS SHARED BY MEMBER NUMBERS ZERO AND ONE.
FRAME, ROW, COLUMN	MASTER SCANNER FRAME NUMBER, ROW, AND COLUMN FOR LEAD SC7.
WORD 3 QUANT	QUANTITY OF BIPOLAR CPD POINTS EQUALS SEVEN (00111).
SAM	SPECIAL ACTIVE MODE EQUALS ONE WHEN THE AMA IS EQUIPPED PER J1A041B, LIST L, AND ASSIGNED AS UNIT TYPE NTAMAL OR NTAMAB; OTHERWISE SAM EQUALS ZERO.
BOT	BEGINNING-OF-TAPE MARK EQUALS ONE WHEN THE AMA IS EQUIPPED PER J1A041B, LIST 4, AND ASSIGNED AS UNIT TYPE NTAMAB.
GROUP, ROW, COLUMN, PAIR, HALF	CPD GROUP NUMBER, ROW, COLUMN, PAIR, AND HALF FOR LEADS OMO AND 1MO.
CPDN	CPD NUMBER EQUALS ZERO FOR AN AMA RECORDER.

Fig. 5—Unit Type Number 9 Auxiliary Block

calls, including international direct distance dialing (IDDD) calls.

(c) Set card NAM9 is required to allocate 9-word AMA registers used for bulk billed calls (where the called number is not recorded), untimed message rate calls, untimed directory assistance calls, and 800 Service calls.

(d) Set card NAMSS is required to allocate 18-

word AMA registers. Eighteen word AMA registers are used in the 1E4 generic program only for detailed billing of tie lines (9STAMA). In the 1E5 and later generic programs, 18-word AMA registers are also used for OUTWATS calls (which previously used 13-word AMA registers) and for message detailed recording for the Enhanced Private Switched Communication Service (EPSCS) feature. In the 1E6 and later generic programs, 18-word AMA registers are used for station message

detail recording for the Electronic Tandem Switching (ETS) feature. In the 1E7 and later generic programs, 18-word AMA registers are used for the BISI, CSR, OSO, and MDR-RAO features.

(e) Set cards SUN, MON, TUE, WED, THU, FRI, and SAT are used to provide the schedule for switching the AMA recorders at the beginning of the first hour of the day(s) indicated. If a set card value = 1, the standby recorder is switched into service for that particular day. If the value = 0, the switch does not occur.

Note: Generic dependent set card 9PAR is also required to build the AMA recorder switching schedule.

(f) Set card 9TRACK indicates whether or not 9-track AMA recorders are equipped in the office. The value = 1 if equipped with 9-track recorders; the value = 0 if not.

Parameters

4.04 The parameters associated with AMA are discussed below. For detailed parameter information, refer to items C(2) and C(3) in Part 18.

(a) A8NPA (built with set cards AMAT and 9TRACK) is the office AMA tape identification number parameter. If 9TRACK = 0, this parameter is not built.

(b) A8SCHED (built with set cards SUN, MON, TUE, WED, THU, FRI, SAT, and 9PAR) is the AMA switching schedule parameter. If 9PAR = 0, the parameter is not built.

(c) I4AMSS (built with set card NAMSS) is the 18-word AMA register's parameter. When set card NAMSS is greater than zero, I4AMSS contains the quantity and starting address of the 18-word AMA registers in call store table AMSS.

(d) I4AM (built with set card NAM) is the 13-word AMA register's parameter. When set card NAM is greater than zero, I4AM contains the quantity and starting address of the 13-word AMA registers in call store table AM.

(e) I4AM9 (built with set card NAM9) is the 9-word AMA register's parameter. When set

card NAM9 is greater than zero, I4AM9 contains the quantity and starting address of the 9-word AMA registers in call store table AMA9.

(f) I4QMAX (built with set cards NAM, NAM9, NAMSS, and other set cards unrelated to AMA) is the parameter for the maximum number of linked registers. The values of set cards NAM, NAM9, and NAMSS are among the values summed to produce the maximum number of linked registers.

(g) I4REGS (built with set cards NAM, NAM9, NAMSS, and other set cards unrelated to AMA) is a table of pointers to variable call store giving the start address and number of registers for each type register. Call store table AM is for 13-word AMA registers; table AMA9 is for 9-word AMA registers; table AMSS is for 18-word AMA registers.

(h) X2LMN (built with set card 9TRACK and other set cards unrelated to AMA) is the highest member number table for unit type number (UTYN). X2LMN is 64 words long and is used for testing and for the validation of TTY input messages. X2LMN is always built and is indexed by UTYN; thus, the AMA entry is located at X2LMN + 9 since UTYN 9 is assigned for the AMA recorders.

Call Store

4.05 Call store contains 13-, 9-, and 18-word AMA registers as indicated in call store tables AM, AMA9, and AMSS, respectively. The particular type of AMA register required depends on the type of call. Generally, 13-word AMA registers are used for detailed billed calls; 9-word AMA registers are used for summary and bulk billed calls; 18-word AMA registers are used for detailed billing; and other AMA data for various features discussed in paragraph 4.03. The data layouts for the 13-, 9-, and 18-word AMA registers are shown in Fig. 6. The format for the 9- and 13-word AMA registers is the same format as the first 9 and 13 words of the 18-word AMA register format.

4.06 A 225-word AMA buffer in call store is defined by COMPOOL. AMA data from the AMA registers is retained in the AMA buffer until the data is recorded on the AMA tape. Twenty-five words of the 225-word AMA buffer are used for overflow; thus, the buffer is generally referred to as a 200-word buffer.

	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WORD 0	Y4P MAD	Y4RI						Y4 TOA	Y4 LI	Y4PMFI				Y4 TO	Y4PT					Y4 QI			
WORD 1	A8DTME																						
WORD 2	Y4 MR	Y4 RW	Y4 CI	Y4LINK																			
WORD 3	A8ANS																						
WORD 4	Y4PMA0																						
WORD 5	Y4PMA1																						
WORD 6	Y4PMA2																						
ALT WORD 6	A8 TS	A8VPTN						A8IPTN															
ALT WORD 6	A8AC1					A8AC2				A8AC3				A8AC4				A8AC5					
WORD 7		A8 LST	A8S AMP	A8 TSO	A8 NO CHG	A8SRV			A8 UNC	A8CTYP				A8BILL			A8 MSR	A8 ATC	A8C AMA	A8S TDY	A8I DDD		
ALT WORD 7																	A8ITYP		A8LEG				
ALT WORD 7																							A8M RTN
WORD 8	A8MNT					A8CDNO																	
ALT WORD 8	A8 BAT	A8M OBL	A8MNT			A8O PID	A8CNPA3			A8CD1			A8CD2			A8CD3							
ALT WORD 8						A8AC6																	
WORD 9	A8DNO																						
ALT WORD 9		A8 TD	A8D9			A8D10			A8D1			A8D2			A8D3								
ALT WORD 9	A8K ROC	A8 TR																					
WORD 10	A8DN1																						
ALT WORD 10		A8 TSC	A8C DAR	A8D8			A8D4			A8D5			A8D6			A8D7							
WORD 11				A8ADS1			A8ADS2			A8ADS3			A8D11			A8D12							
ALT WORD 11	A8CNPA1			A8CNPA2			A8CD4			A8CD5			A8CD6			A8CD7							
ALT WORD 11	A8 EP SCS	A8ID																					
WORD 12				A8ADS4			A8ADS5			A8ADS6			A8ADS7			A8ADS8							
ALT WORD 12	A8EODT																						
WORD 13	A8PSANS																						
WORD 14				A8D13			A8D14			A8D15			A8D16			A8D17							
WORD 15				A8D18			A8D19			A8D20			A8D21			A8D22							
WORD 16	A8 FBD -MT	A8PTN					A8DCOUNT					A8D23			A8D24								
WORD 17	A8FUTURE-DVL																						

9-WORD AMA REGISTER

NOTE:
THE FORMAT FOR THE 9-WORD AND 13-WORD AMA REGISTERS IS THE SAME FORMAT AS THE FIRST NINE AND THIRTEEN WORDS OF THE 18-WORD AMA REGISTER FORMAT.

13-WORD AMA REGISTER

Fig. 6-9-, 13-, and 18-Word AMA Register Formats (Sheet 1 of 4)

<u>WORD/ITEM</u>	<u>ITEM DEFINITIONS</u>
WORD 0	
Y4PMAD	- PATH MEMORY ANNEX DISPLACED (IF = 1 PATH MEMORY IS DISPLACED).
Y4RI	- REGISTER IDENTIFIER (INDEX FOR TABLE CONTAINING PT TABLE ADDRESSES). Y4RI = 23 FOR 18-WORD AMA REGISTERS; Y4RI = 2 FOR 13-WORD AMA REGISTERS; Y4RI = 42 FOR 9-WORD AMA REGISTERS
Y4TOA	- TIMEOUT ANNEX.
Y4LI	- LINK INDICATOR (IF = 1 LINK WORD IS BEING USED TO LINK THE AMA WITH ANOTHER REGISTER).
Y4PMFI	- PATH MEMORY FORMAT INDICATOR (REFLECTS PATH MEMORY IN REGISTER).
Y4TO	- TIMEOUT INDICATOR.
Y4PT	- PROGRAM TAG (= INDEX TO PT TABLE).
Y4QI	- QUEUE INDICATOR (IF = 1 REGISTER IS ON A QUEUE OR IS IN GENERAL PURPOSE TIMING FOR Y4PT).
WORD 1	
A8DTME	- (NORMALLY THE QUEUE WORD) IS USED TO STORE THE DISCONNECT TIME.
WORD 2	
Y4MR	- MASTER REGISTER (IF = 1 THE AMA IS THE MASTER REGISTER).
Y4RW	- REQUEST WAITING (IF = 1 SOMEONE WANTS TO CONTROL THE CALL) (UNUSED FOR NOW).
Y4CI	- CALL WAS INVESTIGATED FOR ELECTRONIC TOLL FRAUD IF = 1.
Y4LINK	- LINK WORD (CONTAINS ADDRESS OF REGISTER LINKED TO RIGHT OF OR IF Y4LI = 1).
WORD 3	
A8ANS	- (NORMALLY THE SCAN WORD) IS USED TO STORE THE ANSWER TIME.
WORD 4	
Y4PMA0	- USED TO STORE THE DISCONNECT TIME WHEN THE AMA REGISTER IS ON THE "COMPLETED AMA REGISTER QUEUE".
WORD 5	
Y4PMA1	- USED TO STORE THE OGT TNN WHEN THE AMA REGISTER IS NOT THE MASTER.
WORD 6	
Y4PMA2	- PATH MEMORY ANNEX TWO.
A8TS	- TRUNK STATE, IF = 1 ICT OFF HOOK.
A8VPTN	- USED AS A CHECK FOR LINE-TO-LINE CALLS TO ASSURE A VALID PTN.
A8IPTN	- INWATS PSEUDO-TRUNK OR TERMINAL NUMBER.
A8AC1	- EPSCS AUTHORIZATION CODE ONE.
A8AC2	- EPSCS AUTHORIZATION CODE TWO.
A8AC3	- EPSCS AUTHORIZATION CODE THREE.
A8AC4	- EPSCS AUTHORIZATION CODE FOUR.
A8AC5	- EPSCS AUTHORIZATION CODE FIVE.
WORD 7	
A8LST	- IF = 1 THE AMA REGISTER IS THE LAST REGISTER OF THE DAY ON THE COMPLETED AMA REGISTER QUEUE.
A8SAMP	- IF = 1 THE CALL IS SAMPLED.
A8TSO	- IF = 1 THE CALL IS BEING TRAFFIC SERVICE OBSERVED OR DDD OBSERVED.
A8NOCHG	- IF = 1 THIS CALL IS NOT A CHARGEABLE RECORD.
A8SRV	- SERVICE FEATURE CODE. SRV IS IN AN INDEX TO THE CORRECT SERVICE FEATURE CODE TO BE RECORDED ON THE AMA TAPE.
A8UNC	- IF = 1 IS FOR ANY CALL WHICH REQUIRES AN AMA RECORD EVEN IF UNCOMPLETED.
A8CTYP	- CHARGE TYPE. CTYP IS THE BINARY VALUE OF THE TWO DIGIT CODE WHICH IDENTIFIES THE TYPE OF ENTRY ON THE AMA TAPE.
A8BILL	- MESSAGE BILLING INDEX. BILL IS THE BINARY VALUE OF A TWO DIGIT CODE WHICH SPECIFIES THE NUMBER OF UNITS TO BE CHARGED ON A MESSAGE UNIT CALL.
A8MSR	- IF = 1 THE AMA REGISTER IS NOT FOR A DDD CALL (NORMALLY, MSR = 1 FOR MESSAGE RATE TRAFFIC).
A8ATC	- IF = 1 A TIME CHANGE HAS OCCURRED BETWEEN ANSWER AND DISCONNECT.
A8CAMA	- IF = 1 FOR CAMA CALLS, NECESSITATING USE OF THE ALTERNATE LAYOUTS FOR WORDS 8 AND 11.
A8IDDD	- IF = 1 FOR IDDD CALLS.
A8STDY	- CALLING DN ON ON SPECIAL STUDY.
A8ITYP	- DATA GROUP I8 INDICATOR.
A8LEG	- NUMBER OF LEGS ON A CONFERENCE CALL.
A8MRTN	- INITIALIZE FOR MOBILE REGISTER USE INDICATOR.

Fig. 6—9-, 13-, and 18-Word AMA Register Formats (Sheet 2 of 4)

<u>WORD/ITEM</u>	<u>ITEM DEFINITIONS</u>
WORD 8	
A8BAT	- IF=1 BAT HAS OCCURRED DURING THIS CALL.
A8MOBL	- INDICATES MOBILE TELEPHONE.
A8MNT	- THE NUMBER OF MIDDNIGHTS PASSED WHILE THE AMA REGISTER IS ON THE CALL.
A8CDNO	- CALLING DIRECTORY NUMBER, IN 17-BIT BINARY FORM.
A8OPID	- OPERATOR IDENTIFIED. OPID = 1 ON AN ONI CALL.
A8CNPA3	- CALLING NPA DIGIT THREE.
A8CD1	- CALLING DIGIT ONE.
A8CD2	- CALLING DIGIT TWO.
A8CD3	- CALLING DIGIT THREE.
A8AC6	- EPSCS AUTHORIZATION CODE SIX.
WORD 9	
A8DNO	- DIRECTORY NUMBER ZERO.
A8KROX	- KEP RECORD ON CALL INDICATOR.
A8TR	- TERMINATING RECORD INDICATOR.
A8TD	- TEN DIGITS. TD = 0 IF 3 FILL CHARACTERS ARE TO BE RECORDED ON THE AMA BEFORE THE DIALED DIGITS. TD = 1 IF NO FILL CHARACTERS ARE TO BE RECORDED PRIOR TO THE DIALED DIGITS (PRIMARYLY ON 10-DIGIT CALLS).
A8D10	- DIGIT TEN OF THE CALLED NUMBER.
A8D9	- DIGIT NINE OF THE CALLED NUMBER.
A8D1	- DIGIT ONE OF THE CALLED NUMBER.
A8D2	- DIGIT TWO OF THE CALLED NUMBER.
A8D3	- DIGIT THREE OF THE CALLED NUMBER.
WORD 10	
A8DN1	- DIRECTORY NUMBER ONE.
A8TSC	- TRAFFICE-SAMPLED CHARGE. (RESERVED FOR FUTURE USE).
A8CDAR	- CUSTOMER DIALED ACCOUNT RECORDING.
A8D8	- DIGIT EIGHT OF THE CALLED NUMBER.
A8D4	- DIGIT FOUR OF THE CALLED NUMBER.
A8D5	- DIGIT FIVE OF THE CALLED NUMBER.
A8D6	- DIGIT SIX OF THE CALLED NUMBER.
A8D7	- DIGIT SEVEN OF THE CALLED NUMBER.
WORD 11	
A8ADS1	- ACCOUNT NUMBER DIGIT SLOT ONE.
A8ADS2	- ACCOUNT NUMBER DIGIT SLOT TWO.
A8ADS3	- ACCOUNT NUMBER DIGIT SLOT THREE.
A8D11	- DIGIT ELEVEN. (ONLY AVAILABLE WITH IDOD).
A8D12	- DIGIT TWELVE. (ONLY AVAILABLE WITH IDOD).
A8EPSCS	- EPSCS INDICATOR.
A8ID	- EPSCS CUSTOMER IDENTIFICATION.
A8CNPA1	- CALLING NPA DIGIT ONE (VALUE REDUCED BY TWO).
A8CNPA2	- CALLING NPA DIGIT TWO.
A8CD4	- CALLING DIGIT FOUR.
A8CD5	- CALLING DIGIT FIVE.
A8CD6	- CALLING DIGIT SIX.
A8CD7	- CALLING DIGIT SEVEN.
WORD 12	
A8ADS4	- ACCOUNT NUMBER DIGIT FOUR.
A8ADS5	- ACCOUNT NUMBER DIGIT FIVE.
A8ADS6	- ACCOUNT NUMBER DIGIT SIX.
A8ADS7	- ACCOUNT NUMBER DIGIT SEVEN.
A8ADS8	- ACCOUNT NUMBER DIGIT EIGHT.
A8EODT	- END OF DIALING TIME.
WORD 13	
A8SPANS	- USED TO STORE THE PSEUDO-ANSWER TIME IF NEEDED.

Fig. 6—9-, 13-, and 18-Word AMA Register Formats (Sheet 3 of 4)

<u>WORD/ITEM</u>	<u>ITEM DEFINITIONS</u>
WORD 14	
A8D13	- CALLED DIGIT SLOT THIRTEEN.
A8D14	- CALLED DIGIT SLOT FOURTEEN.
A8D15	- CALLED DIGIT SLOT FIFTEEN.
A8D16	- CALLED DIGIT SLOT SIXTEEN.
A8D17	- CALLED DIGIT SLOT SEVENTEEN.
WORD 15	
A8D18	- CALLED DIGIT SLOT EIGHTEEN.
A8D19	- CALLED DIGIT SLOT NINETEEN.
A8D20	- CALLED DIGIT SLOT TWENTY.
A8D21	- CALLED DIGIT SLOT TWENTY ONE.
A8D22	- CALLED DIGIT SLOT TWENTY TWO.
WORD 16	
A8DCOUNT	- VALUE OF CALLED DIGITS PRESENTLY STORED IN THIS REGISTER.
A8D23	- CALLED DIGIT SLOT TWENTY THREE.
A8D24	- CALLED DIGIT SLOT TWENTY FOUR.
A8FBD-MT	- WATS FULL BUSINESS DAY - MEASURED TIME INDICATOR.
A8PTN	- WATS PSEUDO TRUNK NUMBER.
WORD 17	
A8FUTURE-OVL	- RESERVED FOR FUTURE DEVELOPMENTS.

Fig. 6—9-, 13-, and 18-Word AMA Register Formats (Sheet 4 of 4)

FEATURE OPERATION

A. AMA Software

4.07 The AMA software consists of six programs; each program is described below.

(a) The AMA data accumulation program accumulates AMA data, loads it into the AMA buffer, and sets the buffer full flag when 200 words have been loaded into the buffer.

(b) The AMA data transfer program unloads the AMA buffer and writes the data on the AMA tape.

(c) The data fault recognition program is used to determine if the AMA data transfer program detects a fault. This program also contains a bootstrap routine, which is attempted every 10 seconds if both AMA units are out of service. The bootstrap routine attempts to find a reliable recorder and restore it to service.

(d) The AMA 9-track miscellaneous program performs miscellaneous tasks associated with AMA. The tasks include the following:

- Write labels and the end-of-file mark
- Switch AMA units

- Update AMA enables (tables of central pulse distributor and master scanner points used with AMA)

- Execute the automatic positioning of the beginning-of-tape mark (APBOT) option

- Audit AMA operation (every 10 seconds)

- Process certain AMA-related teletypewriter input messages

- Supervise maintenance routines performed when AMA units are switched.

(e) The AMA 9-track K-level interrupt program provides an interface between central control (CC) and the signal processor (SP) in an SP office.

(f) The diagnostic program performs diagnostic tests on a specified AMA unit. The unit may be requested by the system, by key action on the AMA control panel, or by teletypewriter input message.

4.08 The data retrieval and insertion program, which is an auxiliary test program, may be used with AMA. This program allows the data in any area of program store or call store to be recorded on the standby AMA unit. Refer to item A(4) in Part 18 for AMA data retrieval and insertion procedures.

B. AMA Operation**Data Accumulation and Buffer Loading**

4.09 The AMA data accumulation program collects the AMA data for all calls requiring AMA. Charging and other related AMA data are initially collected in an originating register by the call processing programs. Those calls requiring AMA data accumulation must be assigned to an AMA register in call store prior to seizing a terminating facility (line or trunk). The AMA data accumulation program attempts to seize and initialize an AMA register. If all AMA registers are busy, the class of the originating line determines whether or not the call will be allowed to complete. Generally, single unit message rate and coin calls are allowed to go free if an AMA register is not available. All other calls are given reorder tone. If there is an AMA hardware failure (resulting in a lack of buffer space and AMA registers), then all calls are allowed to complete (free of charging).

4.10 The AMA data accumulation program is entered on outgoing calls just before the outgoing call control program is given control. On intraoffice calls (eg, message rate), the AMA data accumulation program is entered just before the ringing program gets control. At the time of initial seizure of an AMA register, the AMA data accumulation program is called as a subroutine of the call processing client program currently in control of the call. AMA register initialization requires that an originating register (OR) be on the call, although any standard call register (eg, coin charge) may be the master register.

4.11 After an AMA register is assigned to the call, the AMA data available in the OR is transferred to the AMA register. The initial billing information includes such data as the calling DN, billing index or chart class (depending on the service marks in the OR), and the called DN. Upon entry, the AMA data accumulation program checks if service observing is in effect on the line originating the call, does message rate tests, and gets the originating major class information associated with the line. Based on the type of billing required for the call, either a 9-, 13-, or 18-word AMA register is associated with the call. The type of billing required is specified to the AMA data accumulation program by the charge type (CTYP) item in the OR. ♦Table A lists the charge type (type entry code) and indicates the type of AMA register used for various type entry codes.♦

4.12 Once an AMA register is associated with a call, returns to the AMA data accumulation program from the controlling call processing program(s) (to report events such as answer, disconnect, abandon, etc) are via the program tag (PT) item in word 0 of the AMA register (Fig. 6). The PT is actually a pointer, set by the AMA data accumulation program, to define the proper return entry to the AMA data accumulation program from the controlling call processing program. During the call process the call origination, answer, and disconnect times (or abandon time) are stored in the AMA register. The time is supplied by the system time-of-day clock in units of hours, minutes, seconds, and tenths of seconds.

4.13 When the call is completed (all AMA data has been collected in an AMA register), the AMA data accumulation program is reentered via the program tag item. Following checks for available space in the AMA buffer, the AMA data accumulation program encodes the AMA register data into the required data formats and stores the formatted data in the AMA buffer. AMA data encoding and formatting are discussed in paragraphs 4.15 and 4.16. Specific AMA data, according to type-of-entry codes, is discussed in subsequent paragraphs. The AMA register is released after the AMA data has been collected, formatted, and loaded into the AMA buffer.

4.14 After the formatting and buffer loading is complete, the buffer input pointer (which points to the next available buffer entry slot) is updated and a check is made for a buffer full condition. If full, a queueing condition is set to queue AMA registers waiting to be unloaded and the AMA data transfer program is called to unload the AMA buffer and write the data on the active AMA tape.

Note: If AMA register queueing occurs and an AMA register does not clear the call register queue within 5 minutes, an audit will dump the AMA register. Since approximately 0.5 second is required to copy a full AMA buffer on tape, if an AMA register is on queue for longer than a couple of seconds, then a major AMA hardware failure has occurred and some AMA data will be lost.

AMA Data Encoding and Tape Format

4.15 The AMA information is organized in a binary coded decimal (BCD) format. The BCD infor-

♦TABLE A♦

AMA REGISTER SELECTION (NOTE)

TYPE ENTRY CODE (CTYP)	AMA REGISTER LENGTH	DESCRIPTION
01	13	Standard LAMA and CAMA toll billing, 7 or 10 digits. Used (with options) for IDDD. (Station paid.)
04	13	Same as CTYP 01 but with access digits.
08	13	Dial TWX, station paid. Same as station paid except for CTYP number.
09	13	CCSA sample. This is a traffic sampled no charge CTYP, provided for statistical analysis of a customer's use of his CCSA network.
11	13	Regular wide area telephone service (WATS), timed or untimed basis. Untimed is provided as traffic sampled no charge. Except for CTYP number, data output is same as for CTYP 01.
15	13	Detailed message rate, no message billing index (MBI).
16	9	Timed message rate with MBI.
17	9	Untimed message rate with MBI.
18	13	Detailed message rate with MBI.
19	9	Conference usage.
22	9	Semi-detailed timed message rate. Equivalent to CTYP 16 except that the called NNX is provided on output as well as the OGT. This data is provided for statistical functions; usage is controlled by TTY message.
23	9	Semi-detailed untimed message rate. See CTYP 22.
25	13	WATS service with WATS band indication. WATS band number will be tacked onto final message as a billing index.
26	13	Call forwarding usage — POTS.
27	18	Tandem tie line calls.
29	9	800 service calls.
30	9	Directory assistance charging.

Note: In 1E5 and later generic programs, all OUTWATS calls use 18-word AMA registers. Message detail recording for EPSCS uses 18-word AMA registers in 1E5 and later generic programs. In 1E6 and later generic programs, 18-word AMA registers are used for station message detailed recording for ETS calls. In 1E7 and later generic programs, 18-word AMA registers are used for the BISI, CSR, OSO, and MDR-RAO features.

mation for each call must be a multiple of five 9-bit AMA tape characters. When required, the information is extended (padded) to a multiple of five AMA tape characters. Padding is done with noncheck dummy (NCD) characters. The AMA tape characters (excluding the parity bits) are contained in two words in the AMA buffer. (Refer to Fig. 7.) Each AMA tape character is made up of two BCD characters (A and B), plus one parity bit. Each BCD character (A or B) is comprised of four bits, with each of these bits having a value of 0 or 1. With this encoding method, there are 16 unique values for each BCD character. The values assigned for AMA are listed in Table B.

4.16 The 9-track AMA magnetic tape format contains five AMA tape characters (Fig. 8). Each AMA tape character contains eight data bits (BCD characters A and B) plus one parity bit. Each bit is assigned a track number on the AMA recorder. The AMA tape characters in Fig. 7 may be correlated to the AMA tape format in Fig. 8, which illustrates how the data appears on the AMA tape.

AMA Data Transfer and Tape Writing

4.17 The AMA data transfer program and the AMA 9-track miscellaneous program accomplish the AMA data transfer and tape writing operations via the central control. Central control has the capability to send data to either AMA recorder over one of the two available peripheral unit address buses. (Refer to Fig. 9.) Central control interrogates a bit (buffer full flag) every 100 ms to determine if the AMA data block is full (and thus ready for transfer). The data block refers to a group of 200 call store words in the AMA buffer. The AMA buffer area contains a 200-word data block plus space for overflow of 25 words. Each word is 23 bits in length, 21 of which are used; bits 19 through 0 are data bits; bit 22 is the parity bit. A typical billing message requires 9 call store words, but some messages may require as many as 15 call store words or as few as 5 call store words. When a data block is ready, the data transfer cycle is started by the system.

4.18 The AMA transfer cycle begins when a 100-ms entry finds the buffer full flag set. At this time, the central control turns on the recorder motor and a 250-ms delay is provided to allow the recorder to reach its operating (recording) speed of 5.25 inches of tape per second.

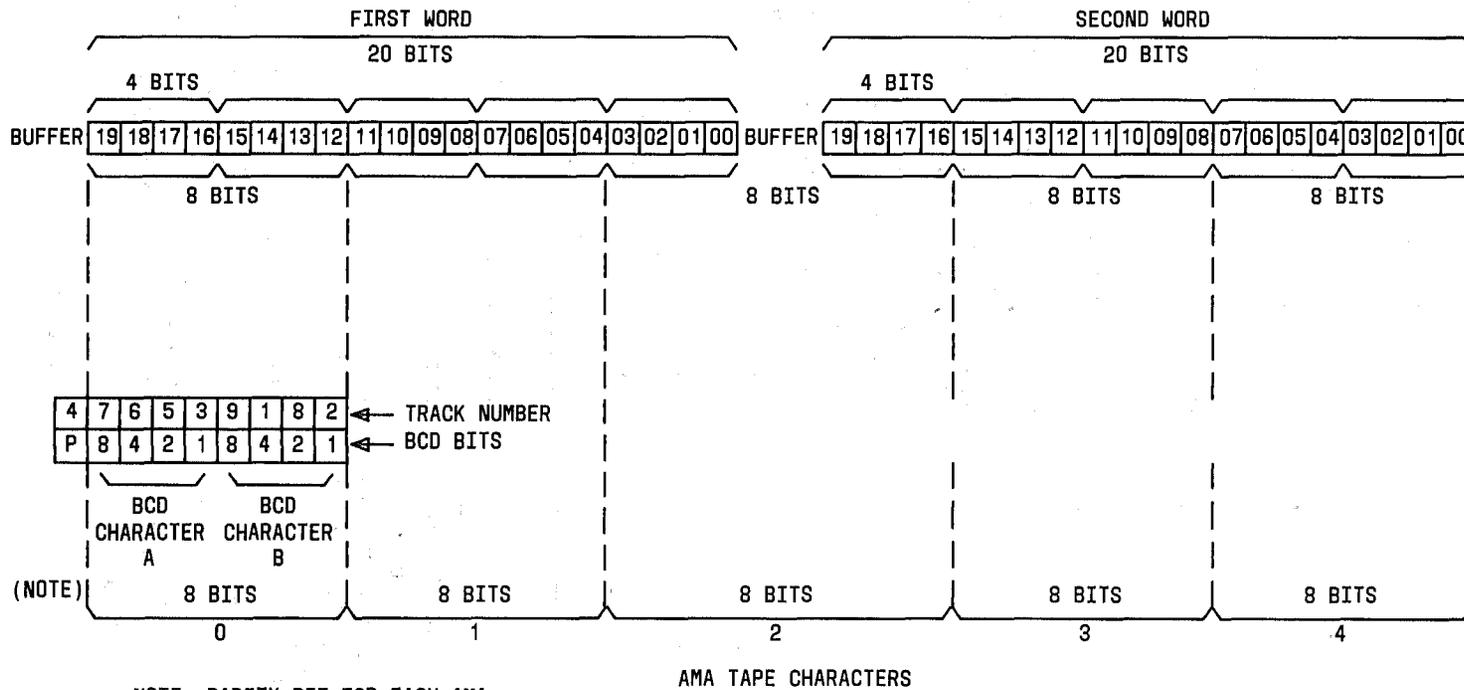
4.19 Data is transmitted to the AMA cable receivers over the peripheral unit address bus (0 or

1) as two 21-bit words. Since the bus (Fig. 9) carries information for other system functions, the AMA units are enabled only during the time interval when AMA information is being transmitted on the bus. The enable pulses are sent from central control via the central pulse distributor on separate leads to the designated (active) AMA recorder.

4.20 The extent to which duplication is used for the cable receivers and the gates is shown in Fig. 9. This duplication provides that central control may use either bus with two sets of cable receivers. Therefore, if either of the duplicated cable receivers or gates becomes inoperative, central control may continue operation by selecting the remaining operational units.

4.21 When the central control sends an enable pulse, the 20 bits of information comprising the first data word are gated from the cable receiver to the first half of the input register. After the first word is stored in the input register, the central control sends a second enable pulse which gates the second word into the remaining half of the input register. The input register serves as a storage area for the 40 information bits from the cable receivers. This storage area is necessary since the AMA recorder writes only one tape character at a time. Within the input register, the 40 bits are stored as five 8-bit characters. Simultaneously with the storage of these bits in the input register, the parity check circuit checks for overall odd parity and generates a parity bit for each of the five 8-bit characters. These five characters are next transferred to the assembler, and the parity bit from the parity check circuit is added to each 8-bit character to form one 9-bit tape character.

4.22 The write timing and sequence control circuit in the central processor generates five data character clock pulses (DAT 0, DAT 1, DAT 2, DAT 3, and DAT 4), which serve as enables for the assembler characters. These pulses are derived from two central control clock pulse trains (TCLK 0 and TCLK 1), which occur every 5.0 and 0.5 ms, respectively. Each of these data character clock pulses enables one of the 9-bit tape characters to be transferred from the assembler to the character write amplifiers and causes the 9-bit tape character to be recorded on the AMA tape. Each of the clock pulses occurs in succession, 1 ms apart; thus, the time interval required to record two call store words (five tape characters) is 5 ms. The data is recorded on the tape at a density of 200 bits per inch (BPI).



NOTE: PARITY BIT FOR EACH AMA TAPE CHARACTER IS ON TRACK 4

Fig. 7—AMA Tape Character Format

TABLE B

MEANING ASSIGNED TO BCD CHARACTERS

BCD CHARACTER A OR B				ASSIGNED MEANING
8	4	2	1	
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

4.23 Each of the 200 words in the call store AMA buffer area is transmitted to the AMA tape in succession. These 200 words comprise 500 tape characters on the AMA tape. After the 500 characters have been written, a longitudinal parity character is written on the tape and the tape is stopped until the 200-word call store buffer is refilled by the AMA data accumulation program. The time required to stop the tape is 250 ms. Interblock spacing between each group of 500 tape characters is provided by stopping and starting the tape. Character and track positioning, as well as tape motion and interblock spacing, is shown in Fig. 8.

4.24 The format of the recorded data previously discussed is shown in Fig. 7. The AMA tape characters in Fig. 7 may be correlated with the AMA

tape characters in Fig. 8 to illustrate how the data appears on the AMA tape.

AMA Midnight Routine

4.25 At midnight, the AMA data accumulation program is entered from the executive control main program (ECMP). All AMA registers in the office are checked for traffic for today's tape. Busy AMA registers are found by checking their PT values. For any in-process AMA call, other checks are made to determine the number of midnights passed since the call originated.

4.26 If an AMA register is busy on a call at midnight, the midnight count is scored in the AMA register (item MNT in word 8, Fig. 6). This counter has a maximum count of nine. Midnight counts of two to nine generate an AM01 output message on the maintenance TTY. Refer to paragraph 3.12. The AM01 message includes the billing DN, number of midnights passed since the call originated, the address of the AMA register serving the call and other pertinent call information. If the MNT count reaches ten, the AMA register is taken off the call with a dummy code entered for disconnect time. The call is left up.

4.27 The AMA buffer is readied for a new day's activity by unloading the buffer and writing the AMA tape. This end-of-day processing results in a clearing of the AMA buffer with the buffer input pointer reset to the first AMA buffer slot.

C. AMA Labels and Statistical Data

4.28 Certain entries on the AMA tape are represented by specific character pairs. The character pairs used and the entries they represent are listed in Table C.

4.29 Labels relate certain nonbilling data essential to processing the AMA tape. The four labels are header, trailer, transfer, and time change labels. (See Fig. 10.) Statistical data provides nonbilling information useful to the operating telephone company and/or certain customers.

Header Label

4.30 A header label marks the beginning of a new business day and is written on the active AMA tape immediately after each midnight. Diagnostic

(c) If the switch in AMA units is due to a sensed end-of-tape (physical) mark, recording on the active AMA unit continues until the data block in progress is written. The units are then switched, and a transfer label is written on both tapes. Additionally, an end-of-file mark is written on the originally active AMA tape. With this condition, a switch back to the originally active AMA unit is not possible until the AMA tape has been replaced.

Time Change Label

4.33 A time change label is used whenever it is necessary to make corrections in the system clock. A time correction is made via the maintenance teletypewriter and causes the time change label to be written on the active AMA tape. The format of the time change label is shown in Table G. If there is a call in progress at the time of the time correction, a time change indication is marked in the AMA entry for that call.

Statistical Data

4.34 Statistical data entries can be made for 800 Service (formerly known as INWATS) overflow counts for WATS customers and for intercom facilities, 3-port facilities, and total overflow counts for Centrex/ESSX-1 customers. Common Channel Interoffice Signaling (CCIS) INWATS statistical data is available for the BISI feature in 1E7 and later generic programs. Any statistical entry is preceded by the statistical heading identifier (VZ).

4.35 The 800 Service overflow counts are made on nonhunting simulated facilities groups and are recorded on AMA tape at 11 pm daily as a statistical record. An 800 Service statistical record contains overflow counts for up to five 800 Service customer groups. The 800 Service statistical data format is recorded as listed in Table H.

4.36 The VZ12 entry is used to provide intercom and 3-port statistical data on an hourly basis for Centrex/ESSX-1 customers as follows.

(a) Statistical data for intercom facilities is as follows:

- Number of attempts
- Usage
- Number of overflows
- Number of assigned facilities.

(b) Statistical data for 3-port facilities is as follows:

- Number of attempts
- Usage
- Number of overflows
- Number of assigned facilities.

(c) Total overflow counts are the number of service requests that are not completed and that are routed to regular overflow tone.

The VZ12 statistical data format is recorded as listed in Table I. The VZ12 statistical data is available in 1E5 and later generic programs.

Note: In the event that a particular customer does not utilize intercom and/or 3-port facilities, noncheck dummy characters will appear in those data entries. There will always be data in the total overflow data entry.

4.37 The optional BISI feature provides 800 Service customers with an indication of the effectiveness of the 800 Service. The BISI feature utilizes the common channel interoffice signaling (CCIS) data base, which maintains the busy/idle status of Simulated Facilities Groups (SFGs). The data base allows calls to be completed, rerouted, or blocked more efficiently (before reaching the terminating end office). The VZ18 CCIS INWATS statistical data for BISI includes end office busy counts and data base busy counts as listed in Table J.

Error Designation Code

4.38 The error designation code (ZY) is reserved for accounting center use and is not used for recording call data. This code is inserted when data known to be irregular or erroneous is detected.

Start of Entry

4.39 The start-of-entry character (V) identifies the beginning of a call entry and is discussed in paragraph 4.41.

Entry Extender

4.40 The entry extender (Y) indicates that certain optional data is appended to the call entry. The entry extender is discussed in paragraph 4.43.

TABLE C
BCD CHARACTER PAIRS

CHARACTER PAIR	DEFINITION
VV	Header Label
VW	Trailer Label
VX	Transfer Label
VY	Time Change Label
VZ	Statistics Identifier
V*	Start of Entry
†V	Start of Entry
YY	Headcheck Code
Y‡	Entry Extender
†Y	Entry Extender
ZY	Error Designation Code
ZZ	Check Dummy Code
12	End-of-File Mark

* First digit of type-of-entry code

† Last digit (0-9) of preceding data

‡ First digit of data group M

D. AMA Call Record Formats

4.41 Every AMA call entry starts with the single character V (Table C) immediately followed by a 2-digit type-of-entry code. Since the start of a call entry is dependent upon the completion of the preceding call entry, the single character V may be either the first (character A) or second (character B) binary coded decimal (BCD) digit in the AMA tape character (Fig. 7 and 8), depending on where the preceding call entry ended.

4.42 The AMA record format is divided into a number of data groups as shown in Table K. The data groups required for a call entry depend on the type of call involved. Each type of call is assigned a unique 2-digit type-of-entry code. Data groups A through I, inclusive, are fixed by the type-of-call entry. Inclusion of the calling NPA (data group J) is

fixed by the office. That is, if data group J is used in an office, it is included in every AMA entry for that office.

4.43 Data groups L, M, N, P, Q, and U are included as required by the type of call. Their inclusion in a call record is indicated by recording the entry extender character Y in data group L, immediately after the last fixed data group for the call. Data group M, which is recorded immediately after the entry extender, indicates which of the optional data groups (N, P, and/or Q) are included in the call entry.

4.44 If more than one call record is required for billing, the records may be interspersed with other call records on the tape. A single record is normally sufficient but multiple records may also occur, as is the case with 3-way calling.

4.45 The characteristics of the AMA data groups are listed in Table L. Entries that are not self-explanatory are described in the subsequent paragraphs.

Note: The formats of entries made on AMA tapes are provided in detail in item C(5) in Part 18.

4.46 The first two digits in data group A2 are information digits which provide additional information about the call entry. The permissible digits and their definitions are given in Table L. If any call is traffic service observed (first information digit), the AMA entry for the call will include data group Q (trunk network number) whether the call completed or not. If the call is an incompleting call, the AMA entry will include a release time, which is recorded in the connect time space (data group A3), and noncheck dummy characters, which are recorded in the disconnect time space (data group C). Incompleting traffic service observed calls, which would normally be a type 17 or 23 entry, are recorded as a type 16 or 22 entry since types 17 and 23 do not use data group C.

4.47 Data group C contains a midnights passed digit, which indicates the number of midnights that have passed while the call is in progress. If the ESS detects a nonzero midnights passed digit prior to incrementing the digit at midnight (that is, the call has been in progress for at least 24 hours), a printout identifying this condition is made on the maintenance teletypewriter. If a call has been in

progress for nine midnights, an AMA record of the call is made using noncheck dummy characters in the disconnect time space (data group C). The call is allowed to continue.

4.48 Data group G contains the message billing index (MBI), used in message rate type-of-entry code (Table K). Type-of-entry code 15 (detailed message rate) entries do not have a data group G; the accounting center must compute the number of message units using the calling and called office codes and the length of the call. For type 25 entries, data group G contains the OUTWATS band number.

4.49 For a type entry code 27, data group I3 may contain up to 24 dialed digits, left adjusted, and if necessary, filled out to 24 with noncheck dummy characters.

4.50 For a type entry code 91 (for signaling irregularities), data group I3 has a different meaning. The received multifrequency digits 0 through 9, if any, are stored in character slots 1 through 14. Any unused slots are filled with noncheck dummy characters. Character slots 15 through 23 are always filled with noncheck dummy characters. The electronic toll fraud (ETF) investigation termination code is stored in character position 24. The code indicates one of the following four conditions:

- Called party answered
- Toll security MF receiver time-out
- Calling party abandoned
- Subsequent short supervisory transitions (STT) report.

4.51 Data group I4 provides wide area telecommunication service (WATS) facility usage data for WATS administration on those WATS lines which utilize simulated facilities. Facility usage information is not provided in the case where dedicated physical OUTWATS or 800 Service lines are used. Data group I4 is a 5-character field which will be appended to all OUTWATS (type 11 and 25) and 800 Service (type 29) AMA entries. The entry format (ABBBB) is described below.

- (a) For OUTWATS, item A indicates full business day (1) or measured time (2) OUTWATS service. Item B is noncheck dummy characters where

dedicated physical facilities are used; or, zeros if the facility usage information is unavailable; or, pseudo facility number involved in the OUTWATS call. The range of values is from 0001 to 0127.

- (b) For 800 Service, item A is always a noncheck dummy character. Item B is noncheck dummy characters if the call had a line-to-line path configuration. (The 800 Service calls should not be arranged to have line-to-line path configurations); or, zeros if the facility usage information is unavailable; or, pseudo facility or terminal number involved in the call. Range of values here are 0001 to 9999.

Note: The cases where data group I4 outputs zeros or noncheck dummy characters as facility usage data are few, but should they occur, the AMA record should **not** be considered unsalvageable.

4.52 Data group I5 provides a date field for type 26 entries (call forwarding usage).

4.53 ♦Data group I8 provides terminating data concerning 800 Service calls using the OSO feature.♦

4.54 Data group J (calling NPA) is required in CAMA offices which handle traffic from two or more NPAs. With CAMA, the calling NPA is obtained from a local office. In LAMA offices, data group J records a dummy NPA. Data group J is recorded on all or none of the type-of-entry codes; selective use is not permissible. Use of data group J is marked in the AMA tape labels by an entry of 1 for the format modifier.

4.55 ♦Data group L indicates that optional data groups may be appended for a particular type entry code.♦

4.56 For extended entries, data group M indicates the optional data group(s) included (Table L).

4.57 Data group N (overseas number expander) is recorded for all IDDD calls. The dialed digits are recorded in the data group D and data group N combination, beginning with the first digit of data group D. If the dialed number is less than 12 digits, the unused spaces are filled with noncheck dummy characters.

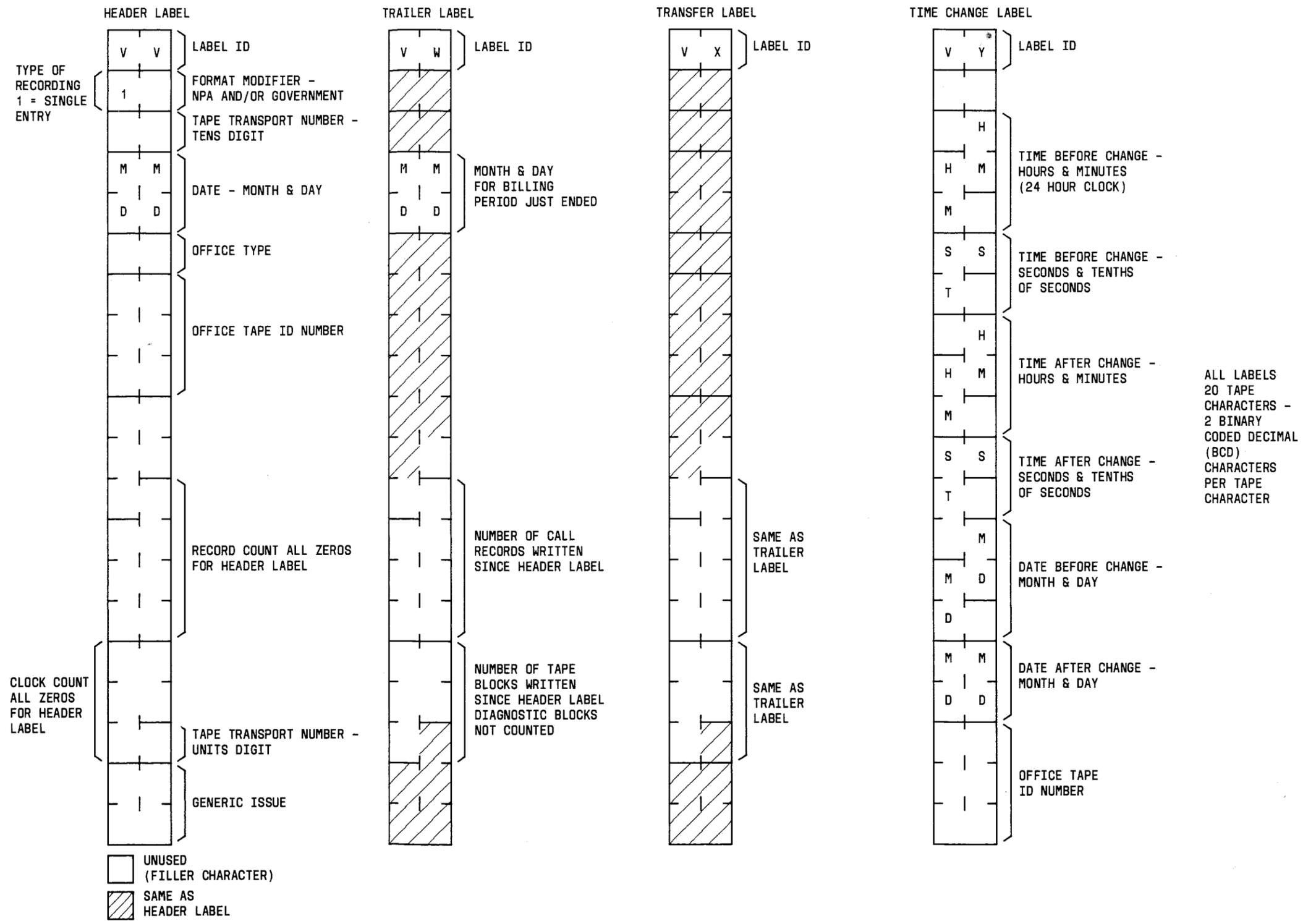


Fig. 10—AMA Tape Labels

TABLE D
HEADER LABEL FORMAT

NO. OF BCD CHARACTERS	USE	DEFINITION
2	Label Identifier	“VV” indicates header label
1	Type of Recording	“1” indicates single entry
1	Format Modifier	Indicates entry formatting to be expected (NPA and/or government)
1	Unused	“NCD”
1	Tape Transport Number	Tens digit
4	Date	“MMDD” M = Month D = Day
2	Office Type	“NN” N = BCD digit Indicates type of office
6	Office Tape Identification Number	“NNNNNN” N = BCD digit. Number of office in which the recorder is located
5	Unused	“NCD”
7	Record Count	“0000000”
5	Block Count	“00000”
1	Tape Transport Number	Units digit
4	Generic Issue	“NNNN” N = BCD digit

4.58 Data group P contains a 4-digit number which identifies the U data group(s) present in the message. The data group P data is as follows:

- P = 0002 for U2
- P = 0004 for U4
- P = 0010 for U10
- P = 0040 for U40
- P = 0100 for U100.

Note: The value of P is additive if more than one U data group is present. For example, if U2

and U40 are used, the value of P equals 42 (P = 0042).

4.59 Data group Q contains the TNN when an outgoing call, which uses a trunk, requires an AMA entry. The trunk group recording is made for all or none of the calls requiring an AMA record; trunk group selection is not permissible.

4.60 Data group U2 contains a customer accounting code and is used with the Customer-Dialed Account Recording (CDAR) feature. For detailed information on the CDAR feature, refer to item A(5) in Part 18.

4.61 Data group U4 is used with the SIGI feature and contains the on-hook time of the short

TABLE E
TRAILER LABEL FORMAT

NO. OF BCD CHARACTERS	USE	DEFINITION
2	Label Identifier	“VV” indicates header label
1	Type of Recording	“1” indicates single entry
1	Format Modifier	Indicates entry formatting to be expected (NPA and/or government)
1	Unused	“NCD”
1	Tape Transport Number	Tens digit
4	Date	“MMDD” M = Month D = Day
2	Office Type	“NN” N = BCD digit Indicates type of office
6	Office Tape Identification Number	“NNNNNN” N = BCD digit. Number of office in which the recorder is located
5	Unused	“NCD”
7	Record Count	Number of call records recorded since header label
5	Block Count	Number of 500-character groups written since header label. Diagnostic blocks are not counted.
1	Tape Transport Number	Units digit
4	Generic Issue	“NNNN” N = BCD digit

supervisory transition (SST) if the electronic toll fraud investigation is terminated due to calling party abandon, toll security MF receiver time-out, or subsequent SST report.

4.62 Data group U10 is appended to all type 91 entries (SIGI) and contains two digits. The digit 30 indicates that all facilities (toll security observing register, toll security MF register, and network access path) employed for electronic toll fraud investi-

gations were available for the call. A value of 40 means the SST was not investigated due to lack of either hardware or software facilities.

4.63 Data group U40 provides a 4-digit customer identification for entry types 01, 09, 25, and 27. Optional data group U40 will be appended only when the CCSA Customer Identification feature (9GCSAID) is turned on. For a customer that is in an assigned centrex, the identification number is the

TABLE F
TRANSFER LABEL FORMAT

NO. OF BCD CHARACTERS	USE	DEFINITION
2	Label Identifier	"VX" label
1	Type of Recording	"1" indicates single entry
1	Format Modifier	Indicates entry formatting to be expected (NPA and/or government)
1	Unused	"NCD"
1	Tape Transport Number	Tens digit
4	Date	"MMDD" M = Month D = Day
2	Office Type	"NN" N = BCD digit Indicates type of office
6	Office Tape Identification Number	"NNNNNN" N = BCD digit. Number of office in which the recorder is located
5	Unused	"NCD"
7	Record Count	Number of call records recorded since header label
5	Block Count	Number of 500-character groups written since header label. Diagnostic blocks are not counted
1	Tape Transport Number	Units digit
4	Generic Issue	"NNNN" N = BCD digit

centrex group number (0001 to 2047). For customers not in a centrex, the identification numbers are assigned in the range from 2048 to 4095. In all cases, the identification number contains four digits.

4.64 Data group U100 is appended for all calls (requiring an AMA record) that do not have a minimal recordable duration (MRD). The MRD record is nonchargeable and has the same entry type and data groups as the record which would have been

made if the call had been completed. An MRD record is identified by the following two items:

- (a) Information digit 1 (data group A2) will indicate no charge (a value of 4, 5, 6, or 7).
- (b) Optional data group U100 will be appended to the record, and will contain one digit with the value of 2. The value 2 marks the AMA record as an MRD call record.

TABLE G

TIME CHANGE LABEL FORMAT

NO. OF BCD CHARACTERS	USE	DEFINITION
2	Label Identifier	"VY" indicates time change label
1	Type of Recording	"1" indicates single entry
1	Format Modifier	Indicates entry formatting to be expected (NPA and/or government)
1	Unused	"NCD"
4	Time before change	"HHMM" H = Hours M = Minutes (24-hour clock)
1	Unused	
3	Time before change	"SST" S = Seconds T = Tenths of seconds
2	Unused	"NCD"
4	Time after change	"HHMM"
1	Unused	"NCD"
3	Time after change	"SST"
2	Unused	"NCD"
4	Date before change	"MMDD" M = Month D = Day
1	Unused	"NCD"
4	Date after change	"MMDD"
6	Office Tape Identification Number	"NNNNNN"

4.65 ♦The data format for each of the data groups, as stored in the AMA output buffer, is illustrated in Fig. 11. Only the bit positions used for AMA data (bits 0 through 19) are shown.♦

CHARACTERISTICS

5. FEATURE ASSIGNMENT

5.01 AMA is provided on a per-central-office basis.

♦TABLE H♦

VZ08 800 SERVICE STATISTICAL DATA (NOTE)

INFORMATION	NUMBER OF DIGITS
Statistics Identifier (VZ)	2
Type of Statistical Data (08)	2
Noncheck Dummy Character	1
Hours	2
Minutes	2
Noncheck Dummy Character	1
Directory Number	7
Usage Count	5
Directory Number	7
Usage Count	5
Directory Number	7
Usage Count	5
Directory Number	7
Usage Count	5
Directory Number	7
Usage Count	5

Note: Five directory number overflow count pairs may be included per entry. Additional entries (including another statistical header) are made when additional data is required. The final statistical entry may be less than 70 digits.

6. LIMITATIONS**OPERATIONAL**

6.01 The AMA feature has the capability to record 1000 AMA tape characters per second. Based on the minimum AMA tape characters required per call entry, AMA can record billing data for 144,000 calls per hour if all entries contain 25 AMA tape characters. The actual calls per hour handled are dependent upon the length and frequency of the entries.

6.02 The AMA records a data block (the contents of the 200-word AMA buffer) at the rate of one data block per second. The 200-word AMA buffer can contain 1000 AMA tape characters. This provides for up to 40 calls requiring only 5 AMA tape characters. The number of calls handled per data block depends on the number of AMA tape characters required per call.

ASSIGNMENT

6.03 Not applicable.

7. INTERACTIONS**STATIC**

7.01 Not applicable.

DYNAMIC

7.02 The system clock is an integral part of the AMA operation. If the system clock is incorrect, erroneous billing may occur. Therefore, the system clock should be checked regularly as specified in the equipment test list (ETL).

7.03 AMA interacts with numerous features which normally require new or changed parameters and/or translations to implement. The AMA-related features are listed in ♦Table M♦ and are discussed in the following paragraphs. Refer to items A(5)

TABLE I

VZ12 INTERCOM AND 3-PORT STATISTICAL DATA (NOTES)

INFORMATION	NUMBER OF DIGITS
Statistics Identifier (VZ)	2
Type of Statistical Data (12)	2
Noncheck Dummy Character	1
Hours	2
Minutes	2
Noncheck Dummy Character	1
Customer Listed Directory Number	10
Intercom Attempts	5
Intercom Usage	5
Intercom Overflows	5
Intercom Facilities	5
3-Port Attempts	5
3-Port Usage	5
3-Port Overflows	5
3-Port Facilities	5
Total Overflows	5

Notes:

1. Noncheck dummy characters are used in the NPA slot.
2. If intercom and/or 3-port facilities are not utilized, noncheck dummy characters appear in those entries.

through A(13) and A(21) through A(24) in Part 18 for detailed information on AMA-related features.

7.04 The optional **Busy/Idle Status Indicator (BISI)** feature provides 800 Service customers with an indication of the effectiveness of their 800 Service. BISI is part of the CCIS INWATS feature which utilizes a data base to maintain the busy/idle status of SFGs. The data base allows calls to be completed, rerouted, or blocked more efficiently (before reaching the terminating end office). The VZ18 CCIS INWATS statistical data for BISI includes end office busy counts and data base busy counts as listed in Table J. For a detailed description of BISI, refer to item A(21) in Part 18. For a detailed description of CCIS, refer to item A(22) in Part 18.

7.05 Call Forwarding Usage Sensitive (CFUP) provides the telephone company with the option of offering call forwarding service to individual-line customers; thus, all individual lines (other than Centrex/ESSX-1) without the call for-

warding option would have access to the call forwarding service. When these lines use the service, a usage AMA record will be generated. Refer to item A(6) in Part 18.

7.06 The **Centrex Station Rearrangements (CSR)** feature allows CSR customers to make certain changes for their extensions and features and to verify those changes. A record of each successful customer change and/or verification is recorded on AMA tape. Customer billing is on a usage sensitive basis. For a detailed description of CSR, refer to item A(23) in Part 18. There are four different AMA tape record formats for the CSR feature.

- (a) Extension number changes cause a V85-type AMA record to be made as listed in Table N.
- (b) Certain feature changes allowed for a particular extension cause a V86-type AMA record to be made as listed in Table O.

♦TABLE J♦

VZ18 CCIS INWATS STATISTICAL DATA FOR BISI

INFORMATION	NUMBER OF DIGITS
Statistics Identifier (VZ)	2
Type of Statistical Data (18)	2
Noncheck Dummy Character	1
Hours	2
Minutes	2
Noncheck Dummy Character	1
INWATS Billing Directory Number	7
End Office Busy Counts	5
Data Base Busy Counts	5
INWATS Billing Directory Number	7
End Office Busy Counts	5
Data Base Busy Counts	5
INWATS Billing Directory Number	7
End Office Busy Counts	5
Data Base Busy Counts	5
Noncheck Dummy Characters	4

(c) Station verification allows a CSR customer to verify which features are associated with any extension number. When an extension number(s) is searched, a V87-type AMA record is made as listed in Table P.

(d) Feature verification allows a CSR customer to verify which stations have a particular feature. Feature verification causes a V88-type AMA record to be made as listed in Table Q.

Note: CSR does not require the same data fields used for regular telephone service; therefore, the standard field names for data groups A2, C, and D are not used. Instead, the descriptive field information is as listed in Tables N, O, P, and Q. Table R lists the contents of the feature number field contained in the V86- and V88-type AMA records.♦

7.07 Charge Delay Timing Reduction (CHDR) reduces the charge delay timing on coin and certain other calls from 2 to 4 seconds to 600 to 800 ms. This feature also prevents call charging when either of the following conditions exist:

(a) A switching system transient appears (to the system) as the called party going off-hook.

(b) The calling party goes on-hook just as the called party goes off-hook.

Without this feature, either of these conditions could initiate call charging. Additionally, this feature provides charge delay timing on all outgoing calls.

7.08 Customer Dialed Account Recording (CDAR) permits a Centrex/ESSX-1 customer to add an account number to the AMA record for any call. The account number appears in the AMA record for its associated call and subsequently in the customer's telephone bill. The account number in no way affects the charging of the call, but rather, is used by the customer in cost allocations of the customer's AMA billed services. Refer to item A(5) in Part 18.

7.09 Customer Identification (CSAID) provides a means for customer identification to be included in AMA records for CCSA, WATS, and any CDAR calls. Data group U40 (Table K) is appended to the AMA record when CSAID is used. CSAID is discussed in item A(13) in Part 18.

7.10 Directory Assistance Charging (DAMA) provides bulk billing of calls to di-

rectory assistance using AMA type entry 30 (Table K). With DAMA, all charged calls to 411 are billed as entry type 30. Calls to 555-1212 may also be billed as type entry 30. The type entry 30 bulk bill includes the same information as an untimed message rate bill; basically, the calling number and answer time are included. AMA records are made only for completed directory assistance calls. No abandons are recorded. Refer to item A(7) in Part 18.

7.11 Enhanced Private Switched Communications Service (EPSCS), available in 1E5 and later generic programs, is a private switched network of dedicated facilities for Centrex/ESSX-1 customers. Network message detail recording, which uses 13- and 18-word AMA registers, is available with EPSCS. For a description of EPSCS and message detail recording, refer to items A(17) and A(18), respectfully, in Part 18.

7.12 Electronic Tandem Switching (ETS) provides a group of Centrex/ESSX-1 features for improved tandem tie-trunk services in 1E6 and later generic programs. Station message detail recording (SMDR), which uses 13- and 18-word AMA registers, is available with ETS. For a description of ETS and SMDR, refer to items A(19) and A(20), respectfully, in Part 18.

7.13 Flexible Route Selection (FRS) is optionally available for Centrex/ESSX-1 customers to automatically direct outgoing station calls to the customer's most preferred available route. FX, CCSA, WATS, and direct dial network (DDN) routes may be accessed by the FRS feature. Under certain conditions, tie lines used for off-network dialing may be included as a possible route. Refer to item A(8) in Part 18.

7.14 Full ESSX-1 Service provides customer facility groups (CFGs) which have the capability to limit network access calls, intercommunication calls, and 3-port facility usage for Centrex/ESSX-1 customers. Refer to item A(9) in Part 18.

7.15 Identified Outward Dialing provides the means for identifying the originating number on the AMA tape on calls involving timed or message unit charges. The number may be inserted in the AMA message manually by an operator or automatically by the switching system. This feature provides the telephone number from which each call was originated. Refer to item A(10) in Part 18.

7.16 The Message Detail AMA Records—Revenue Accounting Office (MDR-

RAO) feature has been enhanced to provide two modified AMA tape entries for calls routed by the ETS dialing plan to FX trunks, Centrex/ESSX-1 tie trunks, ETS intertandem trunks, and/or CCSA network access trunks.

(a) Station Message Detail Recording via the Revenue Accounting Office (SMDR-RAO) feature, as existed prior to the 1E6/1AE6 generic programs, provided station identified call detail for most calls placed by a Centrex/ESSX-1 customer. Intra Centrex/ESSX-1 calls were not included, but call detail (including station identification) could be provided by the AMA tape for calls routed via WATS, CCSA, FX, tie lines, and DDD facilities.

(b) The SMDR to the Customer Premises feature was introduced in the 1E6/1AE6 generic programs to provide for call detail to be sent directly to the customer premises via a peripheral unit controller (PUC) data link channel. This provided call detail (without RAO processing) for calls placed using the ETS dialing plan. However, details for calls placed through other access (9+, 1XX, etc) were not available. Also, use of SMDR-Premises resulted in the loss of station identified billing on the AMA tape for billable calls made using the ETS dialing plan.

(c) Both SMDR-Premises and SMDR-RAO were improved in the 1E7/1AE7 generic programs. The improvements in SMDR-Premises result in individual station identification on the AMA tape for calls placed via facilities for which a billing record is normally made (eg, DDD, WATS). The modification is essentially transparent to the RAO since the entry type remains unchanged. The bulk-billing number is simply replaced by the individual station number. The SMDR-RAO improvements also result in individual station identification. In addition, modifications of entry types V01 and V09 were made to provide call detail on the AMA tape for calls placed via the ETS dialing plan and routed over FX trunks, Centrex/ESSX-1 tie trunks, ETS access trunks, ETS intertandem trunks, and CCSA network access trunks. The modified V09 entry type is used for calls using CCSA network access trunks. The modified V01 entry type is used for all other call routing for which no other normal billing record would be made. These AMA records are for the use of the customer and are nonbillable. The difference between the standard V01 and V09 formats and the

♦TABLE K♦

AMA FORMAT CHART (NOTE 1)

DESCRIPTION	TYPE ENTRY CODE	STANDARD DATA GROUPS													OPTIONAL DATA GROUPS							MINIMUM BCD DIGITS PER CALL ENTRY (NOTE 2)		
		A2	A3	B2	C	D	G	H	I3	I4	I5	I8	J	L	M	N	P	Q	U2	U4	U10		U40	U100
Station Paid	01	✓	✓	✓	✓	✓	—	—	—	—	—	—	✓	✓	✓	✓	✓	✓	—	—	✓	✓	40	
DTWX Station Paid	08	✓	✓	✓	✓	✓	—	—	—	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	—	✓	40
CCSA	09	✓	✓	✓	✓	✓	—	—	—	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	✓	✓	40
OSO — CCIS INWATS Originating Entry	10	✓	✓	✓	✓	✓	—	—	—	—	—	—	✓	✓	✓	—	✓	✓	—	—	✓	—	✓	45
WATS — Measured and Unmeasured (No Band)	11	✓	✓	✓	✓	✓	—	—	—	✓	—	—	✓	✓	✓	—	✓	✓	✓	—	—	—	✓	45
Detail Message Rate — No MBI	15	✓	✓	✓	✓	✓	—	—	—	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	—	✓	40
Message Rate — Timed	16	✓	✓	✓	✓	—	✓	—	—	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	—	✓	35
Message Rate — Single Unit Untimed	17	✓	✓	✓	—	—	✓	—	—	—	—	—	✓	✓	✓	—	—	✓	—	—	—	—	✓	25
Detail Message Rate — MBI	18	✓	✓	✓	✓	✓	✓	—	—	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	—	✓	45
Conference Usage	19	✓	—	—	—	—	—	✓	—	—	—	—	✓	—	✓	—	—	✓	—	—	—	—	✓	35
Detail Message Rate — Timed	22	✓	✓	✓	✓	✓	✓	—	—	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	—	✓	45
Detail Message Rate — Untimed	23	✓	✓	✓	—	✓	✓	—	—	—	—	—	✓	✓	✓	—	—	✓	—	—	—	—	✓	35
WATS — Automatic Flexible Routing	25	✓	✓	✓	✓	✓	✓	—	—	✓	—	—	✓	✓	✓	—	✓	✓	✓	—	—	✓	✓	50
Call Forwarding Usage (Nonbusiness)	26	✓	✓	✓	✓	✓	—	—	—	—	✓	—	✓	—	—	—	—	—	—	—	—	—	—	45
Message Detail Recording on Tie Lines	27	✓	✓	✓	✓	—	—	—	✓	—	—	—	✓	✓	✓	—	✓	✓	✓	—	—	✓	✓	55
800 Service Call	29	✓	✓	✓	✓	—	—	—	—	✓	—	—	✓	✓	✓	—	✓	✓	—	—	—	✓	—	35
Directory Assistance Charging (Bulk-Billing)	30	✓	✓	✓	—	—	—	—	—	—	—	—	✓	✓	—	—	—	—	—	—	—	—	✓	25
Signaling Irregularities	91	✓	✓	✓	✓	—	—	—	✓	—	—	—	✓	✓	✓	—	✓	✓	—	✓	✓	—	✓	55

Note 1: ✓ Indicates Data Group may be used for Type Entry Code Listed.

— Indicates Data Group is not used for Type Entry Code Listed.

Note 2: The minimum number of BCD digits includes the start of entry character, type of Entry Code, and any noncheck dummy characters (NCDs) required to pad the entry to a multiple of 5 BCD digits. Data group J is optional on a per-office basis and is not included in the minimum digits per call entry.

♦TABLE L♦
AMA DATA GROUPS

DATA GROUP	CONTENTS OF DATA GROUP	DIGITS PER ITEM	TOTAL BCD DIGITS PER GROUP																											
BEGINNING ENTRY	START CODE (V) CALL TYPE	1 2	3																											
A2	INFORMATION DIGITS <u>FIRST DIGIT</u> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">BINARY VALUE</th> <th style="text-align: center;">DECIMAL VALUE</th> <th style="text-align: left;">DEFINITION</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1010</td> <td style="text-align: center;">0</td> <td>Call is neither traffic service observed nor traffic sampled</td> </tr> <tr> <td style="text-align: center;">0001</td> <td style="text-align: center;">1</td> <td>Call is traffic service observed</td> </tr> <tr> <td style="text-align: center;">0010</td> <td style="text-align: center;">2</td> <td>Call is traffic sampled — charged</td> </tr> <tr> <td style="text-align: center;">0011</td> <td style="text-align: center;">3</td> <td>Call is traffic service observed and traffic sampled — charged</td> </tr> <tr> <td style="text-align: center;">0100</td> <td style="text-align: center;">4</td> <td>Call is traffic sampled — no charge</td> </tr> <tr> <td style="text-align: center;">0101</td> <td style="text-align: center;">5</td> <td>Call is traffic service observed and traffic sampled — no charge</td> </tr> <tr> <td style="text-align: center;">0110</td> <td style="text-align: center;">6</td> <td>Call is traffic service observed, but not traffic sampled — no charge</td> </tr> <tr> <td style="text-align: center;">0111</td> <td style="text-align: center;">7</td> <td>Call is neither traffic service observed nor traffic sampled — no charge</td> </tr> </tbody> </table>	BINARY VALUE	DECIMAL VALUE	DEFINITION	1010	0	Call is neither traffic service observed nor traffic sampled	0001	1	Call is traffic service observed	0010	2	Call is traffic sampled — charged	0011	3	Call is traffic service observed and traffic sampled — charged	0100	4	Call is traffic sampled — no charge	0101	5	Call is traffic service observed and traffic sampled — no charge	0110	6	Call is traffic service observed, but not traffic sampled — no charge	0111	7	Call is neither traffic service observed nor traffic sampled — no charge	1	
BINARY VALUE	DECIMAL VALUE	DEFINITION																												
1010	0	Call is neither traffic service observed nor traffic sampled																												
0001	1	Call is traffic service observed																												
0010	2	Call is traffic sampled — charged																												
0011	3	Call is traffic service observed and traffic sampled — charged																												
0100	4	Call is traffic sampled — no charge																												
0101	5	Call is traffic service observed and traffic sampled — no charge																												
0110	6	Call is traffic service observed, but not traffic sampled — no charge																												
0111	7	Call is neither traffic service observed nor traffic sampled — no charge																												

◆TABLE I (Contd)◆

AMA DATA GROUPS

DATA GROUP	CONTENTS OF DATA GROUP	DIGITS PER ITEM	TOTAL BCD DIGITS PER GROUP															
A2 (Contd)	<p><u>SECOND DIGIT</u></p> <table border="1"> <thead> <tr> <th data-bbox="370 512 472 573">BINARY VALUE</th> <th data-bbox="565 512 695 573">DECIMAL VALUE</th> <th data-bbox="732 512 899 541">DEFINITION</th> </tr> </thead> <tbody> <tr> <td data-bbox="391 594 451 623">1010</td> <td data-bbox="618 594 639 623">0</td> <td data-bbox="732 594 1040 751">Call is neither operator dialed, operator identified, nor is there a time change which affects the entry</td> </tr> <tr> <td data-bbox="391 768 451 798">0001</td> <td data-bbox="618 768 639 798">1</td> <td data-bbox="732 768 984 829">Time change affects this call entry</td> </tr> <tr> <td data-bbox="391 846 451 875">0100</td> <td data-bbox="618 846 639 875">4</td> <td data-bbox="732 846 971 875">Operator identified</td> </tr> <tr> <td data-bbox="391 892 451 921">0101</td> <td data-bbox="618 892 639 921">5</td> <td data-bbox="732 892 971 953">Operator identified and time change</td> </tr> </tbody> </table> <p>SERVICE FEATURES:</p> <ul style="list-style-type: none"> 00 — Other (None of the service features below) 01 — Coin 06 — Centrex Attendant 08 — 800 Service 10 — 3-Way Calling Service 12 — Call Forwarding 19 — MDR — RAO 20 — VSS (Call was switched and recorded by this ESS) 21 — VSS (Call was not switched by this ESS) 22 — VSS (Call was switched by this ESS, but recorded by another ESS) 	BINARY VALUE	DECIMAL VALUE	DEFINITION	1010	0	Call is neither operator dialed, operator identified, nor is there a time change which affects the entry	0001	1	Time change affects this call entry	0100	4	Operator identified	0101	5	Operator identified and time change	2	4
BINARY VALUE	DECIMAL VALUE	DEFINITION																
1010	0	Call is neither operator dialed, operator identified, nor is there a time change which affects the entry																
0001	1	Time change affects this call entry																
0100	4	Operator identified																
0101	5	Operator identified and time change																
A3	<p>Connect Time:</p> <ul style="list-style-type: none"> NCD or a "9" (1001) Which means Subscriber Line Usage Study Hours Minutes Seconds 1/10 Seconds 	1 2 2 2 1	8															

♦TABLE L (Contd)♦

AMA DATA GROUPS

DATA GROUP	CONTENTS OF DATA GROUP	DIGITS PER ITEM	TOTAL BCD DIGITS PER GROUP
B2	Calling Number	7	7
C	Disconnect Time: Midnights Passed Hours Minutes Seconds 1/10 Seconds	1 2 2 2 1	8
D	Called Number: NPA (if dialed) or noncheck characters Di- rectory Number	3 7	10
G	Message Billing Index or WATS Band	2	2
H	Conference Trunk (CT) Usage Noncheck dummy characters CT Seizure Time Hours Minutes Seconds 1/10 Seconds Calling Number Midnights Passed CT Release Time Hours Minutes Seconds 1/10 Seconds Maximum Number of Conference Trunk Legs Used	1 2 2 2 1 7 1 2 2 2 1 1	24
I3	Dialed Digits for Type Entry 27 or Detected MF Digits For Type Entry 91	24	24
I4	Pseudo Trunk Number For Type Entries 11, 25, and 29 First Digit = 1 For Full Business Day (FBD) = 2 For Measured Time (MT) = NCD For Type Entry 29 Second Through Fifth Digits = Trunk or Pseudo Trunk Number	1 4	5

◆TABLE I (Contd)◆

AMA DATA GROUPS

DATA GROUP	CONTENTS OF DATA GROUP	DIGITS PER ITEM	TOTAL BCD DIGITS PER GROUP
I5	Date for Type Entry 26 Digits 1 and 2 = Month Digits 3 and 4 = Day	2 2	4
I8	Terminating Company: 1100 — If the terminating company is Bell System and interstate. 1200 — If the terminating company is Bell System and intrastate. 2100 — If the terminating company is an independent system and interstate. 2200 — If the terminating company is an independent system and intrastate.	4	4
J	Calling NPA	3	3
L	Entry Extender Character (Y) (1111)	1	1
M	Optional Information: 00 Neither N, P, nor Q Data 10 Q Data Group Included 20 P Data Group Included 30 P and Q Data Groups Included 40 N Data Group Included 50 N and Q Data Groups Included 60 N and P Data Groups Included 70 N, P, and Q Data Groups Included	2	2
N	Overseas Number Expander	2	2
P	U — Data Groups Indicator 00002 — Data group U2 included in this entry 00004 — Data group U4 included in this entry 00010 — Data group U10 included in this entry 00040 — Data group U40 included in this entry 00100 — Data group U100 included in this entry		
Q	Trunk Network Number	6	6

♦TABLE L (Contd)♦

AMA DATA GROUPS

DATA GROUP	CONTENTS OF DATA GROUP	DIGITS PER ITEM	TOTAL BCD DIGITS PER GROUP
U2	Customer Accounting Code	8	8
U4	End of SST Time For Entry 91	8	8
U10	Equipment Status For Type Entry 91: 30 — All facilities for ETF investigation were available 40 — SST not investigated due to lack of either hardware or software facilities	2	2
U40	Customer Identification	4	4
U100	Minimum Recordable Duration (MRD) Indicator	1	1

modified V01 and V09 formats is in data group A2. In the modified V01 and V09 formats, the A2 information digits equal 40 (indicating sampled nonbillable calls) and the A2 service feature code equals 19 (indicating an MDR-RAO record.)♦

7.17 Message Detail Recording on Tie Trunks (TAMA) provides an AMA record of tie trunk or FX trunk call originations on a per access code basis. The AMA record contains the calling number, called number (1 to 24 digits), connect and disconnect times, and other information. Refer to item A(11) in Part 18.

7.18 Minimum Recordable Duration (MRD) provides the initial off-hook time as answer time in AMA entries for which 2-second minimum chargeable duration (MCD) timing is performed. A normal chargeable entry is made only when the off-hook signal persists for at least 2 seconds. If an off-hook signal occurs, but does not persist for longer than 2 seconds, the call is considered an MRD call and an MRD record is made. The MRD record is non-chargeable and has the same entry type and data groups as the record which would have been made if the call had been completed. The AMA record is identifiable as an MRD record by information digit 1 in data group A2 (digit 1 equals 4, 5, 6, or 7 for no charge) and optional data group U100 is appended with a value of 2.

7.19 ♦The Originating Screening Office (OSO) feature utilizes the CCIS data base for handling 800 Service (formerly called INWATS) calls. With the OSO feature, the CCIS data base determines if an 800 Service call can be completed to an idle terminating end office or if the call will be blocked due to a busy condition. The V10 type entry code is available in 1E7 and later generic programs for AMA records (for use in point-to-point studies) of 800 Service calls utilizing the OSO feature. The 800 Service calls not utilizing the OSO feature will continue to have the standard toll record (type entry code 01) made. These toll records are determined to be nonbillable by the revenue accounting office (RAO) by recognizing the digits 800 in data group D. For the AMA record format for the V10 type entry code, refer to Table K and Table L. Data group A3 contains either an NCD or "9" (indicating subscriber line usage study) and the connect time. Data group D contains the actual 800 Service number dialed. Data group I8 contains terminating data. For a description of the 800 Service—Originating and Screening feature, refer to item A(24) in Part 18.♦

7.20 Signaling Irregularities (SIGI) provides the capability to detect, identify the source of, and report illegal MF signaling on toll calls due to electronic toll fraud. SIGI uses a type entry 91 for AMA records. Refer to Table K and Table L for the data groups applicable to SIGI.

7.21 Source Billing of Attendant-Handled Calls (SBAC) causes the attendant billing directory number to be replaced in the AMA record by the source party billing directory number when a call is placed through the attendant position. For information on SBAC, refer to item A(10) in Part 18.

7.22 Interface With Voice Storage Systems (VSS) provides the capability to receive, store, administer, and deliver messages or voice announcements. VSS allows a customer to leave a message stipulating a number to which the message is to be delivered. The subsequent delivery of the message will cause an AMA entry to be made. The record is identical to existing tape formats except for the service feature code in data group A2. Refer to Table L. For detailed information on VSS, refer to item A(12) in Part 18.

7.23 Wide Area Telecommunications Service (WATS) provides a customer with service to a predetermined area or areas at a rate based on expected usage. WATS is divided into two distinct and separate service offerings, OUTWATS and 800 Service (formerly known as INWATS).

(a) OUTWATS provides direct distance dialing access to lines arranged for outward service between the customer's line and specified service areas. The service may be provided on a full business day basis or on a measured time basis. Details of direct dialed 7- or 10-digit OUTWATS calls are recorded on AMA tape in the OUTWATS serving office. Each transaction is characterized by one of two entry types: entry type 25 or entry type 11 (Table K). Entry type 25 identifies the OUTWATS band used and the calling station number; entry type 11 does not.

(b) The 800 Service allows customers to receive calls from the message network with the charges for the call being billed to the called party instead of the calling party. The service may be provided on a full business day basis or on a measured time basis. Full call details may be AMA recorded. An AMA record is made of all 800 Service calls (abandoned and completed). The record of an 800 Service transaction is entered on the AMA tape as an entry type 29. On incomplete (abandoned) calls, the abandon time is entered in the connect time space and the disconnect time space is filled with noncheck dummy (NCD) characters.

(c) The WATS Administration (WTAD) feature provides a unique identification number for

each individual WATS member of a simulated facilities group (SFG). For detailed information concerning WTAD, refer to item A(13) in Part 18.

8. RESTRICTION CAPABILITY

8.01 Not applicable.

INCORPORATION INTO SYSTEM

9. INSTALLATION/ADDITION/DELETION

9.01 The AMA hardware, discussed in Part 4, is installed by Western Electric Company. Refer to item C(5) in Part 18.

9.02 If the APBOT option is not incorporated in the office it can be added. Figure 12 depicts the incorporation procedure.

10. HARDWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

10.01 The AMA hardware is collocated with the maintenance TTY in a double-bay frame in the MCC. The AMA-TTY frame J1A041B contains two KS-19125 L3 or L4 tape recorders, a control unit J1A041AK, and associated AMA circuitry J1A041AM. The AMA system is installed by Western Electric Company in accordance with:

- CD- and SD-1A273-01—MCC AMA Circuit, 9-Track Recording
- CD- and SD-1A171-02—Magnetic Tape Transport
- CD- and SD-1A213-01—AC Power.

10.02 Each 9-track AMA tape recorder requires ten unipolar CPD points, seven bipolar CPD points, seven master scanner scan points, plus one master scanner scan point, which is shared by both AMA tape recorders. Refer to items C(7) through C(9) in Part 18.

BIT POSITION	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CHARACTER POSITION (CP)	CP1				CP2				CP3				CP4				CP5			
START ENTRY	START (V)				TYPE ENTRY CODE															
DATA GROUP A2									INFO. DIGIT 1				INFO. DIGIT 2							
	SERVICE FEATURES				NCD				NCD				NCD							
DATA GROUP A3 (CONNECT TIME)					NCD				HOURS											
	MINUTES				SECONDS				1/10 SECONDS											
	DIGIT 1		DIGIT 2		DIGIT 3		DIGIT 4		DIGIT 5											
DATA GROUP B2 (CALLING DN)	DIGIT 6		DIGIT 7																	
					MIDNIGHTS PASSED				HOURS											
DATA GROUP C (DISCONNECT TIME)	MINUTES				SECONDS				1/10 SECONDS											
	NPA OR 3 NCDs				DIGIT 1		DIGIT 2													
DATA GROUP D (CALLED DN)	DIGIT 3		DIGIT 4		DIGIT 5		DIGIT 6		DIGIT 7											
	MESSAGE BILLING INDEX																			
DATA GROUP G (NOTE 1)					MESSAGE BILLING INDEX															
					NCD				HOURS											
DATA GROUP H (SEIZURE TIME) (CALLING DN)	MINUTES				SECONDS				1/10 SECONDS											
	DIGIT 1		DIGIT 2		DIGIT 3		DIGIT 4		DIGIT 5											
	DIGIT 6		DIGIT 7		MIDNIGHTS PASSED		HOURS													
(RELEASE TIME)	MINUTES				SECONDS				1/10 SECONDS											
	MAX. NO. LEGS ON CONF. CALL																			
DATA GROUP I3 (NOTE 2)									EFT				NCD							

BIT POSITION	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DATA GROUP I4	FBD/MT				PSUEDO TRUNK OR TERMINAL NUMBER															
DATA GROUP I5	MONTH								DAY											
DATA GROUP I8	TERMINATING COMPANY CODE																			
DATA GROUP J	CALLING NPA																			
DATA GROUPS L AND M	ENTRY EXTENDER (Y)				OPTIONAL INFORMATION DIGITS															
DATA GROUP N									IDDD DIGIT 11				IDDD DIGIT 12							
DATA GROUP P	INDICATOR FOR DATA GROUP U																			
DATA GROUP Q (TNN)	TRUNK LINK NETWORK				TRUNK SW. FRAME				GRID				SWITCH							
	CUSTOMER ACCOUNTING CODE (8 DIGITS)																			
DATA GROUP U2	CUSTOMER ACCOUNTING CODE				NCD				NCD											
	END OF SST TIME (8 DIGITS)																			
DATA GROUP U4	END OF SST TIME																			
DATA GROUP U10	EQUIPMENT STATUS																			
DATA GROUP U40	CUSTOMER IDENTIFICATION																			
DATA GROUP U100													MRD							

NOTES:

- IF DATA GROUP G FOLLOWS DATA GROUP C OR D, THE MESSAGE BILLING INDEX IS CONTAINED IN CHARACTER POSITIONS ONE AND TWO. IF DATA GROUP G FOLLOWS DATA GROUP B2 THE MESSAGE BILLING INDEX IS CONTAINED IN CHARACTER POSITIONS THREE AND FOUR.
- DATA GROUP I3 REQUIRES FIVE WORDS IN THE OUTPUT BUFFER TO STORE 24 DIALED DIGITS FOR TYPE ENTRY CODE 27. EACH DIALED DIGIT REQUIRES ONE 4-BIT CHARACTER POSITION. FOR TYPE ENTRY CODE 91, TEN CHARACTER POSITIONS ARE USED TO STORE TEN MULTIFREQUENCY DIGITS (MF DIGITS 0 THROUGH 9) AND THE REMAINING CHARACTER POSITIONS ARE FILLED WITH NONCHECK DUMMY CHARACTERS (NCDS).

Fig. 11—Output Buffer Storage Formats for AMA Data Groups

TABLE M

AMA - RELATED FEATURES AND SERVICES

FEATURE OR SERVICE	GENERIC PROGRAM AVAILABILITY
Busy/Idle Status Indicator (BISI) Call Forwarding Usage Sensitive (CFUP) Centrex Station Rearrangements (CSR) Charge Delay Timing Reduction (CHDR) Customer Dialed Account Recording (CDAR) On AMA Customer Identification (CSAID) Directory Assistance Charging (DAMA) Electronic Tandem Switching (ETS) Enhanced Private Switched Communication Service (EPSCS) Flexible Route Selection (FRS) Full ESSX-1 Service Identified Outward Dialing (ANI and ONI) Message Detail AMA Records (MDR-RAO) Message Detail Recording On Tie Lines (TAMA) Minimum Recordable Duration (MRD) Originating Screening Office (OSO) Signaling Irregularities (SIGI) Source Billing of Attendant-Handled Calls (SBAC) Interface With Voice Storage System (VSS) WATS: Outward Wats (OUTWATS) 800 Service WATS Administration (WATD)	1E7 and Later Generic Programs All Active Generic Programs 1E7 and Later Generic Programs All Active Generic Programs All Active Generic Programs All Active Generic Programs All Active Generic Programs 1E6 and Later Generic Programs 1E5 and Later Generic Programs All Active Generic Programs 1E5 and Later Generic Programs All Active Generic Programs 1E7 and Later Generic Programs 1E4 and Later Generic Programs 1E4 and Later Generic Programs 1E7 and Later Generic Programs 1E6 and Later Generic Programs All Active Generic Programs 1E6 and Later Generic Programs All Active Generic Programs All Active Generic Programs 1E5 and Later Generic Programs

11. SOFTWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

MEMORY

A. Fixed

11.01 The following memory is always required.

- (a) **Base Generic Program (Program Store):** Approximately 3200 words are required for the six AMA programs.

- (b) **Parameters (Program Store):** Eight words are required.

- (c) **COMPOOL Defined Words (Call Store):** The word cost are as follows:

- Ten words for COMPOOL
- Two hundred and twenty-five words for the COMPOOL-defined AMA buffer
- One hundred words for AMA private memory (a work area).

B. Conditional

11.02 Each type of AMA register in call store requires call store memory as follows:

- Nine words per 9-word AMA register
- Thirteen words per 13-word AMA register
- Eighteen words per 18-word AMA register.

TABLE N

V85 CSR EXTENSION NUMBER CHANGE AMA FORMAT

INFORMATION	DESCRIPTION	NUMBER OF DIGITS
V	Start of Entry	1
85	Type Entry Code	2
NCD	Noncheck Dummy Character	1
NPA	Number Plan Area	3
NNX XXXX	Billing Number	3 4
Last Digit of Year	Date	1
Month		2
Day		2
Hours	Time	2
Minutes		2
Seconds		2
Tenths of Seconds		1
Extension Number	Extension Number Being Changed	5
To Extension Number	Extension Number Changed To	5

Note: AMA registers are engineered items. Set cards NAM9 (for 9-word AMA registers), NAM (for 13-word AMA registers), and NAMSS (for 18-word AMA registers) are discussed in paragraph 4.03. The quantity for each of these AMA registers is engineered based on the load factor per call type and the type of billing required. For detailed information, including engineering formulas concerning the AMA registers, refer to items C(2) and C(3) in Part 18.

REAL TIME IMPACT

11.04 Approximately 100 cycles are required to seize and initialize an AMA register.

11.05 Approximately 750 to 1000 cycles are required to accumulate and enter AMA data in the AMA buffer. The number of cycles required to accumulate and enter AMA data in the AMA buffer depends on the type of call. The approximate number of cycles for four typical type entry codes are given below.

TYPE ENTRY CODE	CYCLES
01	750
09	945
11	990
16	745

C. Variable

11.03 Translations (program store) requires ten words as follows:

- One word for the unit type number (UTYN) translator
- One word for the UTYN subtranslator
- Eight words for the two UTYN 9 auxiliary blocks (four words per AMA unit).

♦TABLE O4

V86 CSR FEATURE CHANGE AMA FORMAT

INFORMATION	DESCRIPTION	NUMBER OF DIGITS
V	Start of Entry	1
86	Type Entry Code	2
NCD	Noncheck Dummy Character	1
NPA	Number Plan Area	3
NNX XXXX	Billing Number	3 4
Last Digit of Year	Date	1
Month		2
Day		2
Hours	Time	2
Minutes		2
Seconds		2
Tenths of Seconds		1
Extension Number	Extension Number Being Changed	5
Feature Numbers Added	Features Being Changed *	9
Feature Numbers Deleted		9
NCD	Noncheck Dummy Character	1

* The data for the nine character fields representing features being changed is listed in Table R.

11.06 Approximately 3000 cycles are required to unload the AMA buffer and enter the AMA data on the AMA tape.

11.07 ♦Cycle times for the No. 1 ESS are as follows:
5.51 microseconds (0 percent speedup), 5.24 microseconds (5 percent speedup), or 5.0 microseconds (10 percent speedup). Clock speedup is available with 1E7 and base restarts of the 1E6 generic programs.♦

12. DATA ASSIGNMENTS AND RECORDS

TRANSLATION FORMS

12.01 The ESS translation forms, described in detail in item C(9) in Part 18, provide the master scanner and CPD data required for AMA and may be used to implement AMA entries for selected call types. The applicable forms and their uses are given below.

- (a) *ESS 1101—Directory Number Record:*
This form may be used to provide AMA sampling of CCSA access lines.

TABLE P4

V87 CSR STATION VERIFICATION AMA FORMAT

INFORMATION	DESCRIPTION	NUMBER OF DIGITS
V	Start of Entry	1
87	Type Entry Code	2
NCD	Noncheck Dummy Character	1
NPA	Number Plan Area	3
NNX XXXX	Billing Number	3 4
Last Digit of Year	Date	1
Month		2
Day		2
Hours	Time	2
Minutes		2
Seconds		2
Tenths of Seconds		1
Extension Number	Extension Number of First Station Verified	5
Number of Stations Verified		5

(b) **ESS 1302—Office Charge Record:** This form is used to specify charging for selected call types.

(c) **ESS 1304—Rate and Route Chart:** This form is used to specify certain classes of service (for example, WATS individual station billing).

(d) **ESS 1600—Master Scanner Record:** This form is used to provide the master scanner data required for the AMA recorder unit type translator.

(e) **ESS 1601—Central Pulse Distributor Record:** This form is used to provide the CPD data required for the AMA recorder unit type translator.

RECENT CHANGES

12.02 The RC:PSWD message is used to add, delete, or modify data in the UTYN9 auxiliary block. Refer to item A(14) in Part 18.

13. TESTING

13.01 The test procedure for AMA consists of making various types of chargeable telephone calls as described in item C(5) in Part 18. Refer to item A(2) in Part 18 to verify the operation of APBOT option.

14. OTHER PLANNING TOPICS

14.01 Not applicable.

♦TABLE Q♦

V88 CSR FEATURE VERIFICATION AMA FORMAT

INFORMATION	DESCRIPTION	NUMBER OF DIGITS
V	Start of Entry	1
88	Type Entry Code	2
NCD	Noncheck Dummy Character	1
NPA	Number Plan Area	3
NNX XXXX	Billing Number	3 4
Last Digit of Year Month Day	Date	1 2 2
Hours Minutes Seconds Tenths of Seconds	Time	2 2 2 1
Features Numbers	Features Searched *	9
NCD	Noncheck Dummy Character	1
Number of Stations Searched		5
NCD	Noncheck Dummy Character	1
Number of Stations Found		5
NCD	Noncheck Dummy Character	1

* The data for the nine character fields representing features being searched for is listed in Table R.

ADMINISTRATION**15. MEASUREMENTS**

15.01 Traffic measurements are available for AMA register peg, usage, and overflow counts. These are type measurement code 005 (TMC 005) and are available on the hourly H and C, DA-15 (selected quarter-hour), and S (special study) schedules. The TMC 005 measurements for AMA are listed in Table S. For a description of traffic measurements, refer to items A(15) and C(9) in Part 18.

15.02 Plant measurements are made for AMA as follows:

- (a) Item AMA ENTRIES (in base measurements) is a count of the number of billing entries put on AMA tape.
- (b) Out-of-service, trouble indication, and error counts are made for the AMA peripheral unit.

For detailed information on plant measurements, refer to items A(16) and C(9) in Part 18.

TABLE R4

NINE CHARACTER FIELD VALUES FOR CSR AMA FORMATS V86 AND V88

CHARACTER NUMBER	VALUE	FEATURES
1	1	Access Code Restriction Group (ACRG)
	2	Facility Restriction Level (FRL)
	3	ACRG + FRL
	4	Activate Inactive Station (ACT)
	5	ACT + ACRG
	6	ACT + FRL
	7	ACT + ACRG + FRL
	8	Not to be assigned
	9	Not to be assigned
2	1	Call Pickup (CPU)
	2	Make Station Inactive (INACT)
	3	CPU + INACT
	4	Call Forwarding Number (CFN)
	5	CFN + CPU
	6	CFN + INACT
	7	CFN + CPU + INACT
	8	Not to be assigned
	9	Not to be assigned
3	1	HUNT
	2	Directed Call Pickup (DCPU)
	3	HUNT + DCPU
	4	Call Forwarding Busy Line (CFBL)
	5	CFBL + HUNT
	6	CFBL + DCPU
	7	CFBL + HUNT + DCPU
	8	Not to be assigned
	9	Not to be assigned
4	1	Call Forwarding Don't Answer (CFDA)
	2	Ring Cycles before CFDA forwards (RCYC)
	3	CFDA + RCYC
	4	Call Forwarding Unrestricted Source (CFUS)
	5	CFUS + CFDA
	6	CFUS + RCYC
	7	CFUS + CFDA + RCYC
	8	Not to be assigned
	9	Not to be assigned

◆TABLE R (Contd)◆

NINE CHARACTER FIELD VALUES FOR CSR AMA FORMATS V86 AND V88

CHARACTER NUMBER	VALUE	FEATURES
5	1	Call Forwarding Variable (CFV)
	2	Speed Calling, 1 digit (SC)
	3	CFV + SC
	4	Call Hold (CHD)
	5	CHD + CFV
	6	CHD + SC
	7	CHD + CFV + SC
	8	Not to be assigned
	9	Not to be assigned
6	1	Call Waiting Terminating (CWT)
	2	Call Waiting Originating (CWO)
	3	CWT + CWO
	4	Inhibit ETS queueing (INEQ)
	5	INEQ + CWT
	6	INQ + CWO
	7	INEQ + CWT + CWO
	8	Not to be assigned
	9	Not to be assigned
7	1	Automatic Call Back (ACBC)
	2-7	Unassigned
	8	Not to be assigned
	9	Not to be assigned
8	1-7	Unassigned
	8	Not to be assigned
	9	Not to be assigned
9	1-7	Unassigned
	8	Not to be assigned
	9	Not to be assigned

16. CHARGING

AUTOMATIC MESSAGE ACCOUNTING

16.01 Not applicable.

UNIFORM SERVICE ORDER CODES

16.02 Not applicable.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

Common Control Switching Arrangement (CCSA)—CCSA is a switching arrangement which provides interconnections between customer locations by means of private lines which are switched at ESS or No. 5 crossbar switching centers.

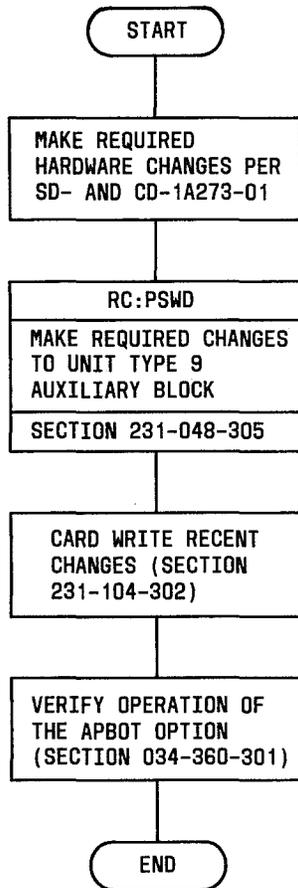


Fig. 12—Incorporation of APBOT Option

Master Register—When two or more software registers are required for a call, one of the registers is designated as the master (controlling) register.

18. REFERENCES

A. Bell System Practices

- (1) Section 231-090-278—Centralized Automatic Message Accounting Feature—2-Wire No. 1 Electronic Switching System
- (2) Section 034-360-301—Recorder KS-19125 L3 AMA Magnetic Tape Handling and Threading
- (3) Section 034-360-701—Recorder KS-19125 L3 Requirements and Adjusting Procedures
- (4) Section 231-150-301—AMA Data Retrieval and Insertion Procedures

- (5) Section 231-090-291—Customer Dialed Account Recording Feature—2-Wire No. 1 Electronic Switching System
- (6) Section 231-090-292—Call Forwarding Usage Sensitive Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (7) Section 231-090-344—Directory Assistance Charging Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (8) Section 231-090-142—Flexible Route Selection Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (9) Section 231-090-145—Full ESSX-1 Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (10) Section 231-090-147—Identified Outward Dialing Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (11) Section 231-090-417—Message Detail Recording on Tie Trunks Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (12) Section 231-090-151—Interface With Voice Storage System Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (13) Section 231-090-271—Wide Area Telecommunications Service Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (14) Section 231-048-305—RC Formats For GENT, PSWD, PSBLK, SUBTRAN, (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (15) Section 231-090-207—Traffic Measurements Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (16) Section 231-120-302—Plant Measurements—2-Wire No. 1 Electronic Switching System
- (17) Section 231-190-127—Enhanced Private Switched Communications Service Feature—2-Wire No. 1 Electronic Switching System
- (18) Section 231-190-130—Network Message Detail Recording Feature—Enhanced Private

TABLE S

TMC 005 TRAFFIC MEASUREMENTS FOR AMA

ITEM MEASURED	TYPE MEASUREMENT	OFFICE COUNT
9-Word AMA Register	Peg Count	196
	Usage	198
	Overflow	199
13-Word AMA Register	Peg Count	147
	Usage	053
	Overflow	195
18-Word AMA Register	Peg Count	318
	Usage	319
	Overflow	320
Originating Toll (AMA Register Total Usage From Non-Message Rate Interoffice Calls)	Usage	065
Originating Toll Attempts (AMA Register Total Peg Count For Seizures For Non-Message Rate Interoffice Calls)	Peg Count	076

Switched Communications Service—2-Wire No. 1 Electronic Switching System

(19) Section 231-090-154—Electronic Tandem Switching Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(20) Section 231-090-166—Station Message Detail Recording to Customer Premises—Electronic Tandem Switching—2-Wire No. 1 and No. 1A Electronic Switching Systems

(21) Section 231-090-274—Busy/Idle Status Indicator Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(22) Section 231-090-416—Common Channel Interoffice Signaling Local and Toll Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(23) Section 231-090-064—Centrex Station Rearrangements Feature—2-Wire No. 1 Electronic Switching System

(24) Section 231-090-274—800 Service-Originating Screening Office Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems.

B. TTY Input and Output Message Manuals

(1) Input Message Manual IM-1A001—No. 1 Electronic Switching System

(2) Output Message Manual OM-1A001—No. 1 Electronic Switching System.

C. Other Documentation

(1) Specification For Master Control Center AMA-TTY Frame J1A041B

SECTION 231-190-063

- (2) Office Parameter Specification PA-591001—
No. 1 Electronic Switching System
- (3) Parameter Guide PG-1—No. 1 Electronic
Switching System
- (4) Translation Output Configuration
PA-591003— No. 1 Electronic Switching Sys-
tem
- (5) Western Electric Installation Engineering—
Handbook, 275-Section 610
- (6) CD-/SD-1A273-01—MCC AMA Circuit—9-
Track Recording
- (7) CD-/SD-1A171-02—Magnetic Tape Transport
- (8) CD-/SD-1A213-01—AC Power
- (9) Translation Guide TG-1A
- (10) Comptrollers Letter M-284A
- (11) BISP 759-100-000—Subject Index—Central
Office Equipment Engineering System
(COEES)
- (12) BISP 759-100-100—General Description—
Central Office Equipment Engineering Sys-
tem (COEES).