

**AUTOMATIC MESSAGE ACCOUNTING
GENERAL DESCRIPTIVE INFORMATION
NO. 1 CROSSBAR OFFICES**

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1. INTRODUCTION

1.01 The automatic message accounting (AMA) system provides means for recording automatically in central offices all the data necessary to charge for subscriber-dialed telephone messages and the means for processing the recorded data in accounting centers to give billing information. The two functions of recording and processing the charge data are independent of each other. Recording of the charge data is accomplished at the central office, while the processing is done at an accounting center.

1.02 This section describes the method of recording charge data in a No. 1 crossbar central office and the equipment used to perform this recording. Information regarding the facilities at the accounting center, used for processing the charge data, may be found in Section 968-110-100.

1.03 This section is reissued to include the method of recording charge data for 10-digit calls in a No. 1 crossbar central office.

2. PRINCIPLES OF OPERATION

2.01 Among the necessary items of charge information used by the accounting center in preparing a customer's bill are the directory numbers of the called and calling customers and the duration of the conversation. These items of information, together with other information necessary for control or accounting purposes, are recorded on a tape in the form of coded, punched holes as shown in Fig. 1. Combinations of these coded, punched holes represent numbers, and a horizontal row of these numbers forms a line on the tape. One or more lines, referred to as an "entry," are used to record a specific event in the progress of a call. More than one entry is needed to record all the data for a completed call. These entries, three in number, are known as the "initial entry," the "answer entry," and the "disconnect entry."

2.02 After the calling customer completes dialing, an initial entry is recorded on the tape. This entry may consist of two, four, or five lines of information, depending upon the type of call originated, as explained below.

2.03 Local telephone service may be rendered either on a flat-rate basis whereby a customer is charged a fixed monthly rate for an unlimited number of calls within a specified area, or on a message-rate basis whereby completed calls are measured in terms of message units for purposes of charging. AMA recording is applied only to the latter of these two types of calls. However, calls from flat-rate lines to an extended area outside the regular flat-rate area may also be charged on a message-rate basis, thereby requiring AMA recordings. In the AMA system, the calls which are made on a message-rate basis are referred to as "message unit" calls and require the recording of a 2-line initial entry. When the data for these calls are processed at the accounting center, the customer's bill shows only the aggregate charges for all such calls in a billing month. This type of billing is known as "bulk billing."

2.04 Customer calls completed to points outside the local area are referred to as "toll calls" (for purposes of this section) and require either a 4-line initial entry or, in the case of 10-digit calls, a 5-line initial entry. When the

data for the toll calls are processed at the accounting center, a toll service statement is prepared which accompanies the customer's bill. This statement lists each individual toll call in chronological order and contains pertinent information, such as the date of the call, its destination, and its price. This type of billing is known as "detail billing."

2.05 Provision is made in the system whereby additional details may be obtained on calls ordinarily handled on a message unit bulk-billed basis. With this arrangement, the data for message unit calls are recorded in 4-line detail initial entries in the central office. When the data for these calls are processed at the accounting center, a "message unit detail" card is prepared which contains a detailed record of each completed call. The customer, however, is billed on a bulk-billed basis.

2.06 Subsequent to the recording of the initial entry an "answer entry" is recorded when the called station answers. This is a one-line entry and shows the time that answer supervision begins. Similarly, the "disconnect entry," also a one-line entry, is recorded on the tape when the calling customer disconnects.

2.07 One recorder handles all the AMA entries for one district junctor frame. At any one time, there may be several calls in progress which require AMA entries. Therefore, the three entries pertaining to a particular call may be interspersed with similar entries of other calls. To enable the accounting center equipment to identify the individual entries for a particular call, each entry is marked with a distinguishing number. This number is known as the "call identity index" and is recorded as a part of every call entry. The process of identifying each call is accomplished by assigning arbitrary numbers to a central office equipment element called a district junctor which is used for the duration of each call. The call-identity index for the three entries of any one call is the same.

2.08 Aside from the directory number of the calling customer and the duration of the call, rate information is needed by the accounting center in order to prepare the customer's bill. In the AMA system, this item of information is coded in the form of a one-digit number

known as the "message-billing index." The message-billing index is recorded as part of every initial entry and determines the charging rate for message unit calls.

2.09 Although both the calling and called customer directory numbers are recorded on toll calls, the charging rate for these calls is not determined by the message-billing index. For these calls, the charging rate is determined at the accounting center either on a manual or an automatic basis.

2.10 Aside from the data individual to each call, certain items of information common to large groups of calls must be recorded. In this category, are such items of information as the month and date of the calls, the identity of the recording central office, and the hour time of calls.

2.11 Once a day, the central office tape may be removed and sent to the accounting center for processing. Before the tapes are removed from the recorders, each tape in the central office must be perforated with a special tape pattern. This pattern called the "3:00 a.m. end-of-tape" pattern consists of a number of entries used by the accounting center equipment to identify the individual tapes from the various central office recorders. Detailed information regarding this end-of-tape pattern and a number of other central-office entries may be found in Part 5, AMA 6-DIGIT NUMBER LANGUAGE.

3. METHOD OF OPERATION

A. Two- or Four-line Initial Entries

3.01 In the No. 1 crossbar system, subscriber lines terminate on verticals of crossbar switches on line-link frames. Each line-link frame has an associated "line-link controller" which is arranged to control the switching and selecting operation on the frame when a subscriber line requests service. Associated circuit-wise with these line-link frames are other equipment units called "subscriber-sender-link frames." These frames, in conjunction with their individual "subscriber-sender-link controllers," provide the calling subscriber lines with access to "subscriber senders." Subscriber senders are the equipment units used to register the dialed

digits of the called directory number and to direct the call to the proper destination with the assistance of other equipment, both within the office and at the terminating office.

3.02 When a subscriber originates a call, as shown in Fig. 2, line-link and sender-link controllers associate the calling line with a subscriber sender and a "district junctor." The district junctor is a control and supervisory circuit used in the talking path for the call duration. Simultaneously with these operations, the line-link controller determines and passes the identity of the calling line to a storage device known as the "calling line register" associated with the subscriber sender. This information, in the form of an equipment number, identifies the calling line by specifying the vertical column, horizontal group, and vertical file in which the calling line is located. After these operations have been completed, the controller is released to serve other calls. The subscriber sender supplies the calling subscriber with dial tone.

3.03 As the called-line directory digits are dialed, the sender records them. When the office code has been recorded in the sender, an "originating marker" is seized through an originating-marker connector. The marker is an equipment unit used to route the call to the proper destination and to set up the switching operations in completing the talking path to an intraoffice or interoffice trunk. After connecting to the sender, the marker receives such information as the called office code, calling line class of service, and the equipment location of the district junctor used for the call.

3.04 Using the called office code and calling line class of service, the marker determines whether or not this is an AMA call, and if so, transmits the message-billing index to the sender. The message-billing index controls the application of the proper charging rate to message unit calls. The marker also performs a decoding of the called office code and passes information to the sender which is needed for completing selections beyond the originating office. The information pertaining to the location of the district junctor is used by the marker in completing the connections for a talking path within the office. At this time the marker and marker connector are released.

3.05 After the marker and marker connector have disconnected, the sender is in a position to seize the AMA equipment. The time of seizure of this equipment varies for calls requiring 2- or 4-line initial entries. When a 4-line initial entry is to be recorded, a record of the called-line directory numericals is required. Consequently, on these calls, the sender waits until all digits of the called-line directory number have been dialed before it seizes the AMA equipment. On 2-line initial entry calls, however, a record of the called-line directory numericals is not required and the sender seizes the AMA equipment before dialing is completed. In both cases, the sender eventually attaches itself to a transverter through a transverter connector. The transverter is an AMA equipment unit which serves as a medium for transferring and converting the information from the senders to the AMA equipment units used for the recording process. When the transverter is connected to the sender, the following information is registered in the transverter.

- Calling subscriber-line equipment number.
- Calling subscriber-party designation (tip or ring).
- Message-billing index.
- Initial-entry designation of two or four lines.
- Three digits comprising the called office code.
 - Equipment location of the district junctor (passed through transverter but not registered).
 - Area location for the called subscriber (local or extended).
 - "Over ten thousand" indication if the called subscriber number is 10,000 or over.

3.06 Before the transverter can start the recording of the initial entry, the calling-line equipment number has to be converted to the calling-customer directory number. This is necessary since the bills are made out in accordance with customer directory numbers. To accomplish the conversion, the transverter seizes another AMA equipment unit known as the

"translator." There are a number of translators to accommodate all the numbers in the office and the transverter selects the proper translator by means of the calling line equipment number and party designation. The translator converts the equipment number supplied by the transverter to the corresponding directory number and transmits it back to the transverter.

3.07 The transverter now has the necessary information to proceed with the recording process. Accordingly, the transverter selects an AMA equipment element called the "recorder." This connection is completed through a recorder connector. The recorder functions to control the operations of its associated "perforator," which is the equipment unit that perforates the tape. The recording of the initial entry on the tape is started by the recorder and perforator under control of the transverter. When the recording of the initial entry progresses to the last line, the call-identity index has to be obtained. To accomplish this, the transverter signals the district junctor through the subscriber sender to identify itself. Another AMA equipment unit known as the "call-identity indexer" operates in conjunction with the district junctor and supplies the recorder with the call-identity index. When this last item of information is received, the recorder completes the perforation of the initial entry. At the conclusion of this process, the recorder and transverter are released.

3.08 The initial entry contains only the information concerning a call attempt. Charges for a call will not be made unless the initial entry is followed by an answer entry indicating that the call was answered. If the call encountered a "line-busy" or "don't answer" condition, no answer entry would follow the initial entry. When the absence of these answer entries is detected at the accounting center, the call is discarded. If the call is answered, the district junctor signals its associated recorder through the call-identity indexer. The recorder then makes an answer entry using the call-identity index supplied by the call-identity indexer. The recorder obtains the time of day from its timing switches which are controlled by an AMA equipment unit called the "master timer."

3.09 A transverter attempting to proceed with the recording of an initial entry may en-

counter a recorder in process of handling another call. When this occurs, the transverter waits to allow the recorder to become available; whereupon, it seizes the recorder and proceeds with the initial entry.

3.10 If a transverter encounters a condition where a recorder is unavailable, the initial entry cannot be recorded. At the end of a waiting period, those calls requiring 2-line initial entries are completed on a no-charge basis, while calls requiring a 4- or 5-line initial entry are routed to overflow.

3.11 If a call-identity indexer finds its associated recorder engaged on another call when it attempts to seize it for an answer entry, it waits to allow the recorder to complete its functions. When the recorder becomes available, the call-identity indexer proceeds with the recording of the answer entry.

3.12 Transverters awaiting a recorder for initial entries have preference over the call-identity indexer waiting to record answer or disconnect entries.

3.13 When disconnection by the calling subscriber takes place, the district junctor again signals the recorder to perforate a timing entry. The entry recorded is the disconnect entry and is identical to the answer entry except that the time recorded is different.

(a) Conditions may arise where the associated recorder is busy when the district junctor signals for the perforation of a disconnect entry. In these cases, the district junctor waits a short interval of time for the recorder to become available. If the recorder is still busy at the end of this period of time, no disconnect entry is recorded. The accounting center equipment recognizes such conditions and computes only the initial charges for the call even though the call may have incurred charges in excess of the initial charge.

(b) Other cases may be encountered where the calling subscriber remains connected after the called subscriber disconnects. When this occurs, the district junctor waits for a preset interval of time to allow the calling party to disconnect. If at the end of this period of time

the calling subscriber is still connected, the district junctor signals the recorder to perforate a special disconnect entry. This entry is called a timed-release disconnect entry. The accounting center equipment, when processing entries of this type, computes the time of conversation and subtracts the preset interval used in waiting for the calling party to hang up. This feature insures that the calling subscriber is not billed in excess of the charges incurred for the conversation period.

B. Five-line Initial Entry

3.14 A customer originating a 10-digit call is connected to the subscriber sender in the manner previously described and dials the X O/1 X foreign area code followed by the 7-digit directory number. From the "zero" or "1" in the second digit, the subscriber sender recognizes this as a 10-digit call requiring an auxiliary sender for completion. The auxiliary sender is an equipment unit which supplements the digit capacity of the subscriber sender and enables the customer to dial ten digits.

3.15 After the third digit is dialed, an originating marker is connected to the subscriber sender in the usual manner. The marker decodes the foreign area code, establishes a path to the outgoing trunk, and transmits the usual directing information back to the sender. At this time, the marker and marker connector are released.

3.16 Meanwhile, the subscriber sender continues to receive digits and when the seventh dialed digit is registered, the subscriber sender makes a bid for an auxiliary sender. During the dialing of the eighth digit, a connection is established to an auxiliary sender through an auxiliary sender link frame for the registration of the ninth and tenth digits as dialed (shown in Fig. 3). If this connection is not made in time to accept the ninth digit, the subscriber sender recalls the marker to route the call to overflow.

3.17 The auxiliary sender indicates the completion of dialing to the subscriber sender which immediately calls for a transverter. When

When the transverter is connected, the following information is passed to it through the transverter connector.

- Calling customer line equipment number.
- Calling customer party designation (tip or ring).
- Message-billing index 9 (detail-billed call).
- The first eight digits of the called number, including the X O/1 X foreign area code.
- Equipment location of the district junctor.

3.18 The transverter recognizes that an auxiliary sender is involved on the call through the "zero" or "1" in the second digit. It signals the auxiliary-transverter link that a connection is required between the transverter and the particular auxiliary sender involved on the call. This link is capable of connecting any one of the auxiliary senders associated with the subscriber senders in a particular transverter group when so requested by the transverter. The transverter uses a lead through the transverter connector and the auxiliary-sender link to control the auxiliary-transverter link in completing the required connection. Through this linkage, the transverter receives the last two digits of the called number.

3.19 The transverter now has access to all the necessary information with which to proceed with the recording. The directory number of the calling line together with the call-identity index are obtained in the usual manner. The transverter summons a recorder-perforator and causes a 5-line initial entry to be perforated on the tape. The transverter indicates the completion of perforation to the subscriber sender and the transverter and recorder release.

3.20 The answer and disconnect entries are made under the control of the district junctor and the call-identity indexer.

C. Observing Entries

3.21 When an AMA line is arranged for service observing or complaint observing, it is patched at a service-observing patching panel to

—an observing-line circuit or an observing-entry control circuit. This circuit causes the AMA entries for the calls originated on the line to be prefixed by a special-entry index. If a 10-digit call is originated by an observed line, the service observing mark is included in the 5-line initial entry. All other observing initial entries will consist of four lines regardless of whether 2- or 4-line initial entries are required for charging purposes. At the accounting center, the special-entry index causes a duplicate record to be made on an observing tape for the observer's use. Observing entries are perforated only for AMA calls. There are no provisions for an AMA record —on observed non-AMA calls.

D. Emergency Recorder Operation

3.22 An emergency recorder and perforator, which may be substituted for any regular recorder and perforator under certain trouble conditions, or for maintenance purposes, are provided. Before the transfer is completed, the master timer causes an end-of-tape pattern to be placed on the tapes of both the regular and emergency recorders. A special transfer entry is included as part of this pattern to distinguish it from the 3:00 a.m. end-of-tape pattern and to inform the accounting-center equipment that the information for calls in process at the time the transfer is made will be found on the tape of the emergency recorder. The emergency recorder is automatically arranged to enter on the tape the number of the regular recorder for which it is substituted.

4. EQUIPMENT ELEMENTS

A. General

4.01 This part describes the additional central office equipment elements which are required when a No. 1 crossbar office is arranged for AMA operation. Except for line verification test trunks, AMA operation involves only the originating portion of an office, as shown in Fig. 4.

B. Perforator

4.02 The unit that punches the holes in the AMA tape is known as the perforator. It is an electromechanical equipment element con-

sisting of perforator magnets and associated perforating pin arrangement together with a cylindrical drum and a stepping mechanism. When a perforator magnet is energized, its associated perforating pin is forced through the paper tape which is located on the periphery of the drum. The hole produced has embossed edges which engages with a corresponding hole in the drum. The embossed edges insure proper alignment of the tape with reference to the perforating pins, and also provide the traction needed to move the tape through the perforator. After the hole has been punched, the perforating pin is withdrawn by means of the perforating magnet. The stepping mechanism advances the tape and drum to the next position. In practice, a combination of these holes is punched simultaneously with the resultant pattern of holes forming a line. The perforator is under direct control of its associated recorder. Two views of the perforator are shown in Fig. 4. Fig. 5 shows the arrangement of the perforator and tape reels in a perforator cabinet.

C. AMA Recorder

4.03 The recorder operates in response to a transverter in making initial entries for subscriber and test calls, and in response to the call-identity indexer in making answer and disconnect entries. Other entries are made under the control of the master-timing frame. Each recorder is associated with one district-junctor frame by means of a call-identity indexer. In conjunction with its associated perforator, the recorder directs the perforating operations with the information supplied by the circuit in control.

4.04 When a recorder is engaged by a transverter, call-identity indexer, or the master-timing frame, it operates the perforator magnets as directed by the circuit in control, operates the perforator stepping magnet to advance the paper tape as each line is perforated, and performs checking functions on the perforator. Each recorder registers time in minutes and tenths of minutes past the hour under control of the master-timing circuit and causes a record of the time in minutes and tenths of minutes to be placed on the tape at the beginning and end of the conversation period as directed by the district junctor in use. At the start of each hour,

the recorder places on the tape an hour entry, and at 3:00 a.m., an end-of-tape pattern. Both of these entries are recorded under control of the master-timing frame.

4.05 An emergency recorder and perforator are provided, which may be substituted for any of the regular recorders.

D. Call-identity Indexer Frame

4.06 The call-identity indexer frame mounts the equipment for two call identity-indexer units and two sender group connector units. This frame serves four district-junctor and associated sender-link frames.

4.07 The call-identity indexer unit performs connecting functions between district junctors and their associated recorders and supplies information in the form of a 2-digit number for identifying the district junctor used on a call. This information forms a part of each call entry on the tape and serves to associate the entries for a particular call so that later they can be assembled in consecutive order at the accounting center.

4.08 The sender-group connector unit is discussed in 4.16.

E. Master-timing Frame

4.09 The master-timing frame accommodates two master-timing circuits, designated the "odd" and "even" master timers, and a recorder test circuit. Functions of the recorder test circuit are discussed in Part 6, MAINTENANCE FACILITIES. One of the master timers supplies pulses every 6 seconds to all the recorders being served by the master-timing frame. Transfer arrangements are provided to permit this function to be assumed by either master timer. The master-timing frame supplies the recorders with the timing information used to record timing entries and the end-of-tape pattern. The end-of-tape pattern is recorded on the tapes of all recorders under control of the master-timing frame every day at 3:00 a.m. For this function, the odd- and even-numbered recorders are under control of the odd and even master timers, respectively.

Transfer facilities to permit either master timer to perform this function exclusively are provided. At intervals of 1 minute, the timer in control checks the other timer and the timing switches of all the recorders for synchronization and brings in an alarm in the event of trouble. A key is provided to permit synchronization of those recorder units and/or the master timer which may be out of synchronism with the timer in control.

F. Transverter

4.10 The transverter is used to impart information to the recorders concerning initial entries on service and test calls. By way of a transverter connector, it receives information registered in the sender and transmits part of the information in its original form and converts the remainder to a form suitable for accounting center use. The information is transmitted forward to the recorders in line-by-line formation, being supplemented by entry identification as required. On a 10-digit call, the transverter controls the auxiliary-transverter link in establishing a connection to the auxiliary sender to obtain the information registered in this sender. It then causes the required 5-line initial entry to be perforated on the tape.

4.11 Aside from controlling the transfer and the recording of the information on the tape, the transverter engages a translator frame to obtain the directory number corresponding to a calling subscriber line location and party assignment. Other functions performed by the transverter are checking and trouble detecting operations and control of the transfer of the number of the district junctor used on the call from the call-identity indexer to the recorder.

G. Translator

4.12 The translator frame, shown in Fig. 7, supplies directory-number information corresponding to the calling-subscriber equipment number. The transverter, upon receiving from the subscriber sender the identity of the calling line in terms of an equipment number and party, summons the proper translator frame to ascertain the directory number of the calling customer. The three digits of the calling office

code are reduced by translation to a single digit known as the "office index." The transverter selects the proper translator frame by means of cross connections in the transverter.

H. Calling-line Register Frame

4.13 A calling-line register frame mounts three calling-line register units, each of which contains the auxiliary equipment for a sender subgroup. This equipment, furnished on a per sender basis, provides means for registering the calling-line equipment number and may be considered as a subscriber-sender applique unit.

4.14 The line-link controller, during its normal operating functions, obtains the identity of the calling line in terms of an equipment number. This information is transmitted via the district group and sender group connectors to the calling-line register unit associated with the particular subscriber sender serving the call, and is registered on register relays. The transverter, in conjunction with a translator, makes use of this information in controlling the recording of the corresponding calling-line directory number on the AMA tape.

I. Auxiliary-transverter Link

4.15 The auxiliary-transverter link is required when an office is arranged for 10-digit AMA operation. The link enables the transverter to read directly from the auxiliary sender the last two digits of the 10-digit numbers.

J. Connectors

4.16 The following connectors are required when an office is arranged for AMA.

- (a) The *district group connectors* are used to transmit the identity of the calling line from the line-link frames to the senders via the sender-group connectors.
- (b) The *sender-group connectors* are used to transmit calling-line identification from district-group connectors to senders.
- (c) The *transverter connectors provide* access for the subscriber senders to the transverters.

(d) *Connector relays* mounted on the recorder frame provide access to the recorders from transverters, master timers, and call-identity indexers.

(e) *Connector relays* mounted on the translator frame furnish access to the translator from the transverters.

5. AMA 6-DIGIT NUMBER LANGUAGE

5.01 As mentioned in Part 2, PRINCIPLES OF OPERATION, billing data and information common to large groups of calls are recorded on the tape in a series of lines of punched holes. Each line of coded, punched holes represents a 6-digit number with combinations of these digits used to represent various elements of information. For convenience, these six digits are arbitrarily designated as digits A to F, respectively.

5.02 In order to indicate to the accounting center machinery the type of entry being processed, each entry is identified by a distinguishing number. This number may consist of one or a combination of digits and is designated the entry index. The remaining digits recorded as part of each entry contain the information pertaining to individual calls or groups of calls. To illustrate this method, a number of examples are shown in Fig. 8 and 9.

6. MAINTENANCE FACILITIES

A. General

6.01 The AMA equipment elements are designed so that they are self-checking to a large extent. Equipment elements are provided in an AMA equipped No. 1 crossbar office to include means for checking and testing the various frames of the AMA equipment. Some of these equipment elements are provided in non-AMA No. 1 crossbar offices. With the introduction of AMA features, the above units were modified to perform the additional testing functions on an optional basis. These modified units are the district-junctor test frame, the originating and auxiliary sender test frame, the controller-trouble indicator frame, and the originating-trouble indicator.

B. District Junctor Test Frame

6.02 Provision is made for testing the performance of district junctors in bringing in the call-identity indexer and recorder on all entries.

C. Originating and Auxiliary Sender Test Frame

6.03 The sender test frame includes provision for testing the AMA features of subscribers and auxiliary senders, transverter connectors, and transverters. There are also facilities for making certain tests on the translators. In the course of these tests, the maintenance recorder is used, a printed record being made of the test calls.

D. Master-timing Circuit — Recorder Test

6.04 In addition to the functions explained in 4.09, the master timer is provided with a recorder test unit. This is used to check the various operating features of the recorders in making initial, answer, and disconnect entries. In using this test circuit, the recorder under test is made busy and its functions transferred to the emergency recorder.

E. Trouble Indicating Equipment

6.05 *Controller Trouble Indicator:* The purpose of the subscriber-sender link and controller trouble indicator is to record information which will facilitate the location of troubles that interfere with the completion of a connection between a subscriber line and an originating sender. In AMA arranged offices, line-vertical number checking equipment is provided which can be associated with any subscriber sender link and controller to check the line-vertical number of each call handled by the controller for the purpose of locating trouble. When this line-vertical number checking equipment is not associated with a particular subscriber-sender link controller, it functions as part of the trouble-indicator equipment to indicate the line vertical involved when the trouble-indicator frame is seized under a trouble condition.

6.06 *Originating-trouble Indicator:* The originating-trouble indicator includes equipment for checking the message billing index relays in the marker.

6.07 *Transverter-trouble Indicator:* The transverter-trouble indicator frame is accessible to the transverters, recorders, and master timers and is arranged to indicate, at the time of connection to these equipment units, the progress of the units in completing their functions. The transverters, recorders, and master timers connect to the transverter-trouble indicator frame when they fail to complete their function in an allowed time and the record made facilitates the location of the trouble. The auxiliary-transverter links have access to this circuit through the transverters. Lamp indications are provided for the auxiliary-transverter link circuit operations. Busy indicating lamps for the transverters, recorders, master timers, transverter connectors, and the translators are located on this frame. Transverter connector sender position lamps are also located on this frame. The lamps identify the connector and the position of the sender in that connector, and thus the sender. There are also lamps to indicate the auxiliary sender associated with the transverter on a 10-digit call. In addition, make-busy jacks are provided

- (a) For making transverters busy to all transverter connectors.
- (b) For making transverters busy to particular transverter connectors.
- (c) For making the transverter trouble-indicator frame busy to transverters and recorders.
- (d) For taking out of service subscriber senders associated with the same transverter connector.

F. Maintenance-recorder Frame

6.08 The maintenance-recorder frame is used in conjunction with a perforator, reader, and teletypewriter to provide a printed record of permanent signals, sender test calls, and line verification test calls. It accommodates one maintenance-recorder circuit, one maintenance reader and printer circuit, and the transverter-trouble indicator connector relays. The main-

tenance-recorder circuit serves to perforate the tape with the aid of its associated perforator. The maintenance reader and printer circuit, in association with a reader and teletypewriter, reads the entries made on the tape and prints them in proper order on a page printer.

6.09 *Permanent Signal Calls:* When subscriber dialing does not start in the time allowed, the sender calls in the marker and directs it to route the call to a permanent signal-holding trunk. The sender obtains connection to a transverter and transmits the type of call and the calling line number. The transverter, thereupon, seizes the maintenance recorder. The maintenance recorder, recognizing this type of call, connects itself to the permanent signal-holding trunk to which the sender is attached. The identity of the permanent signal-holding trunk is transmitted to the maintenance recorder. This information is recorded on the tape under the direction of the transverter. Recording of this information on the tape is done in two lines, the first of which has entry and permanent signal-holding trunk identification, the second of which has calling-line equipment identification. With the aid of a reader and teletypewriter associated with the maintenance recorder, the perforated record is translated into printed form for immediate inspection by the plant force.

6.10 *Line Verification Test Calls:* Line verification tests are made to insure that cross-connection work on distributing frames, on number-group frames, and on translator frames has been done properly so that switching and charging for a call is done correctly. Fig. 10 illustrates in block diagram the manner of setting up a line-verification call. To establish a connection to a subscriber line for verification, the associated line-link vertical is patched, by means of a cord, to a jack associated with the verification trunk serving the office of the line to be tested. Using a dial hand test set, a call is originated on the line from another jack on the verification trunk by dialing a special code assigned to the verification trunk together with the telephone number of the line being verified. The subscriber sender establishes a connection to an originating marker as in regular service. The marker, recognizing the special code dialed, completes a connection to the verification trunk on the office link frame to which the line under

test is patched. Connection is then established through the verification trunk to a terminating sender. The terminating sender, receiving the digits of the line number from the subscriber sender, calls for a special terminating marker which completes the call to the line under test on a no-test basis.

6.11 This special code dialed also signals for the seizure of AMA equipment to make a recording of the test information. This information, recorded by means of the maintenance recorder, is converted to printed form by means of an associated page printer. The information contained in a line verification entry is as follows:

Entry index

Dialed number (thousands, hundreds, tens, and units)

Number series (0 for the regular number series, 5 for the extra number series)

Class of service

Office code (A, B, and C digits when the maintenance reader and printer is arranged to print three digits; otherwise only the A digit is printed)

Office and directory number (OF—, TH—, H—, T—, and U—, of the translated number of an AMA line, zeros for a non-AMA line)

Calling line party (two for a tip party, one for all other line conditions)

Line equipment number (column, horizontal group, and vertical file)

G. Reader

6.12 The reader, shown in Fig. 11, is used in conjunction with the maintenance printer.

for converting coded information on the tape to a typed record for the use of the maintenance force. It is a power-driven equipment unit consisting of a series of sensing pins with associated contacts and a drum and stepping mechanism. The paper tape fed into the reader lies along the periphery of the drum and is properly aligned by the association of the perforated holes with corresponding holes in the drum. The sensing pins are arranged to close their contacts when registering with holes in the tape. By means of a stepping mechanism, the drum is rotated in synchronism with the in and out movement of the sensing pins. The drum and tape are stepped forward a line at a time with the pins being operated simultaneously to close contacts in accordance with the pattern of holes encountered.

H. Perforator Testing and Tape Servicing

6.13 A reader-perforator test table and cleaning cabinet are available for use in connection with periodic cleaning and lubrication of the perforators and readers and for checking their operating margins by the application of limiting conditions. Ordinarily, the number of perforators and readers in a single building is not sufficient to warrant the provision of these facilities. The servicing of the perforators and readers, therefore, may be centralized at some point within the area, possibly at the accounting center or at a regional maintenance center. Carrying cases are available for transporting the perforators and readers.

7. REFERENCE

Section 968-145-100 — No. 1 Automatic Message Accounting Center Glossary

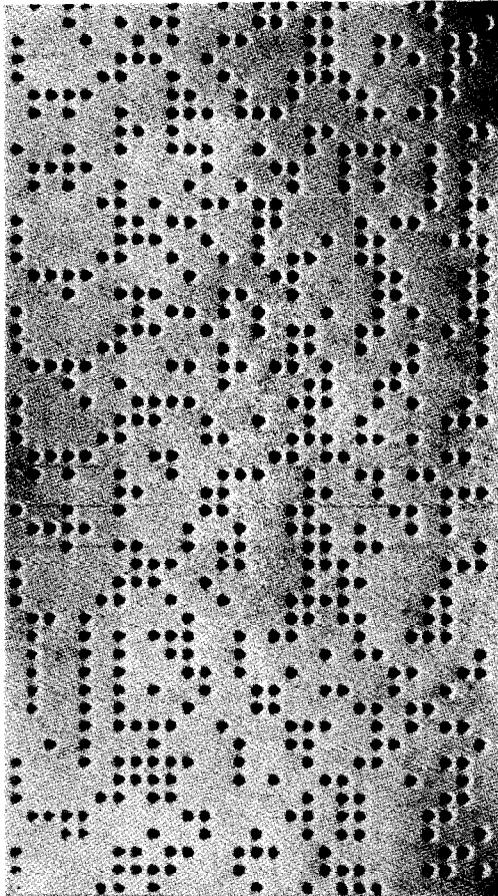


Fig. 1 — Section of Central Office Perforated Tape

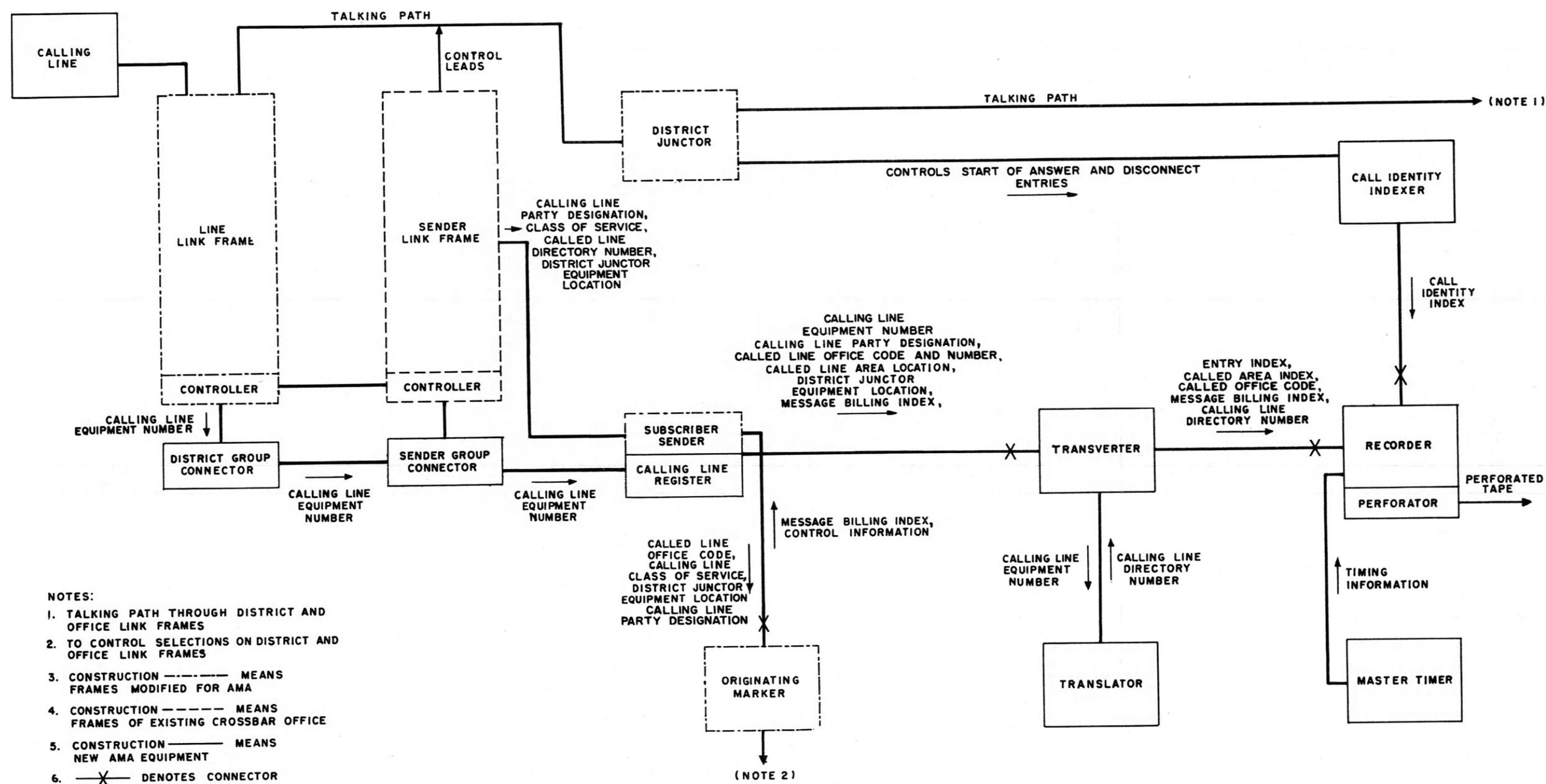


Fig. 2 — Equipment Used on a 7- or 8- digit AMA Call

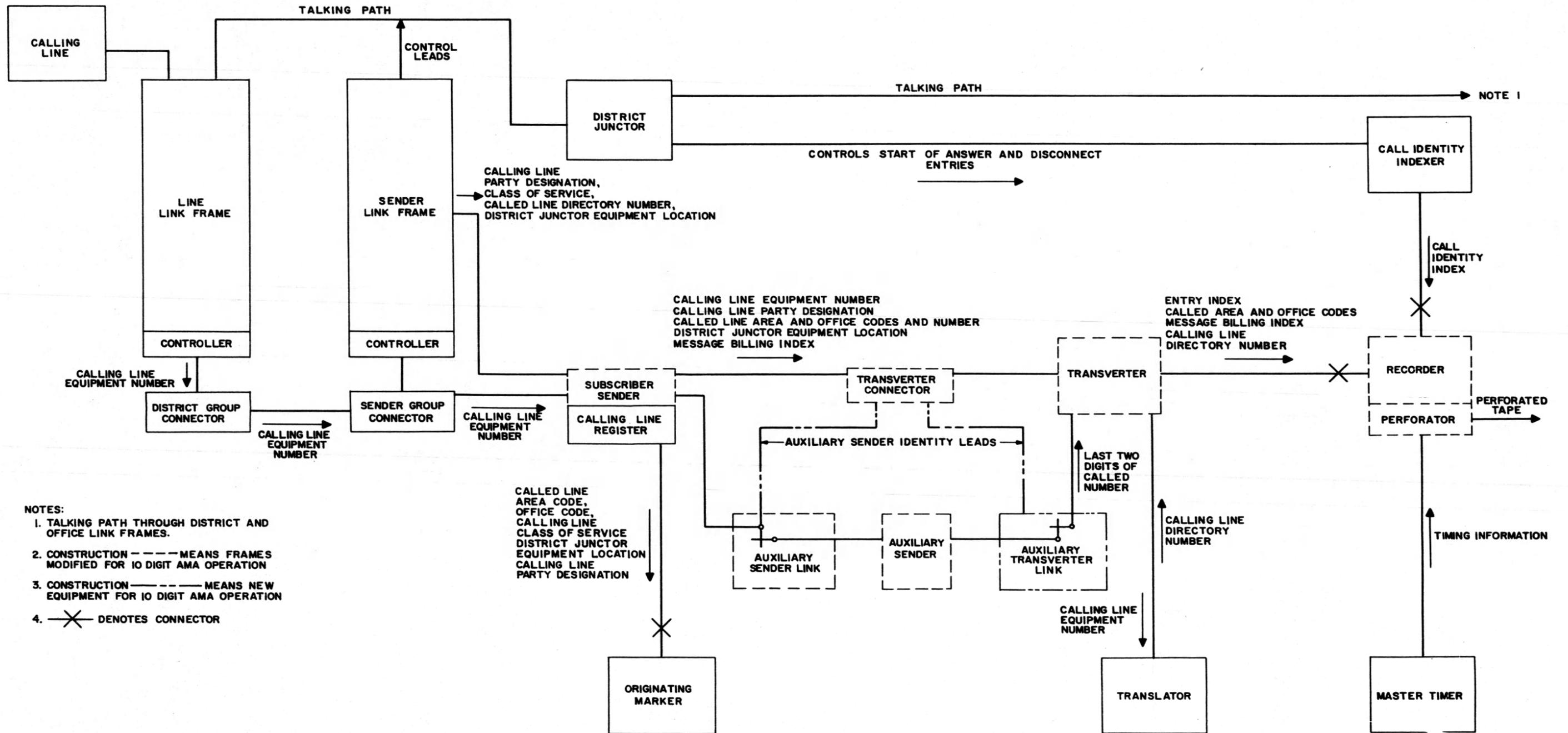


Fig. 3 - Equipment Used on a 10-digit AMA Call

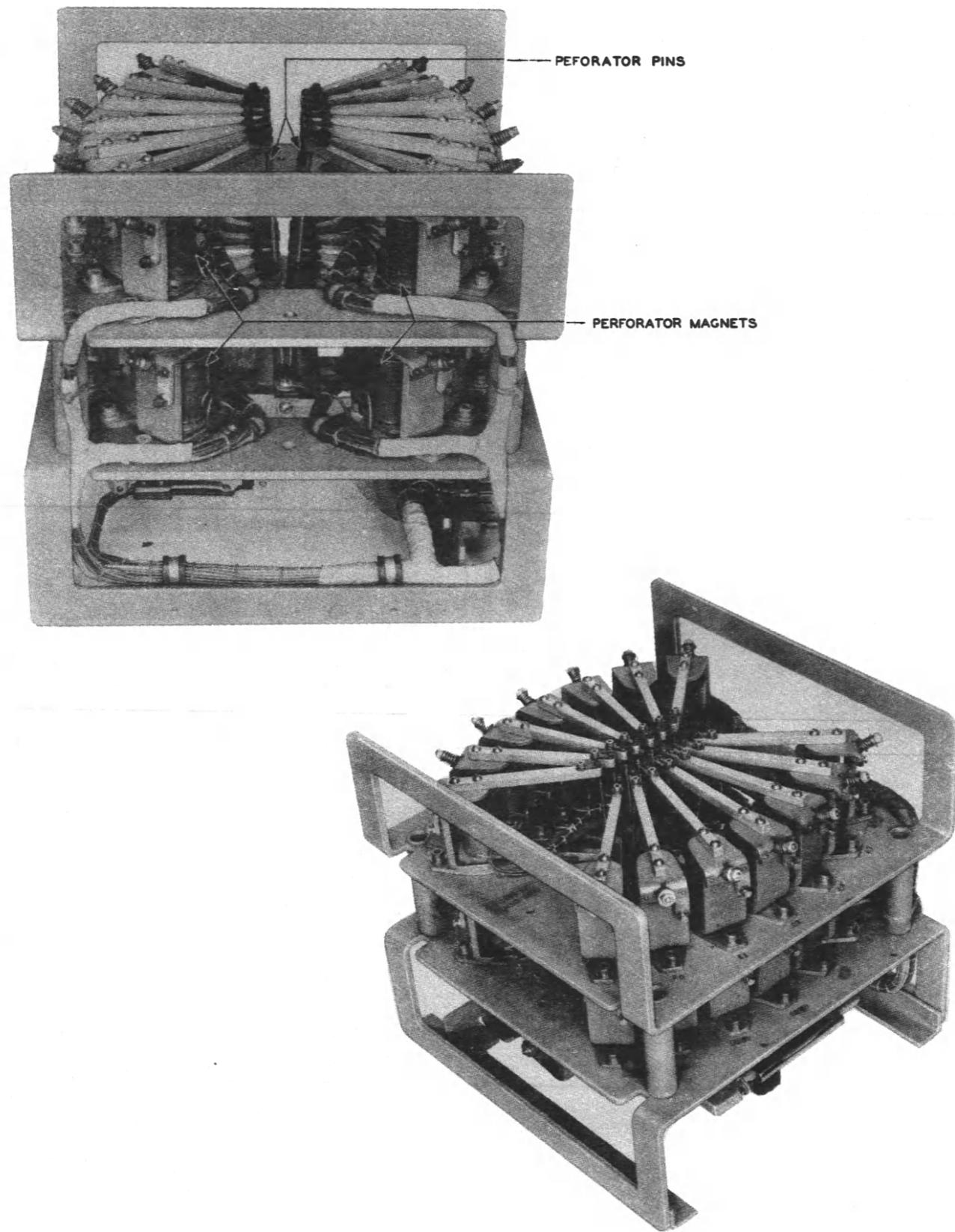


Fig. 5 - Two Views of AMA Perforator

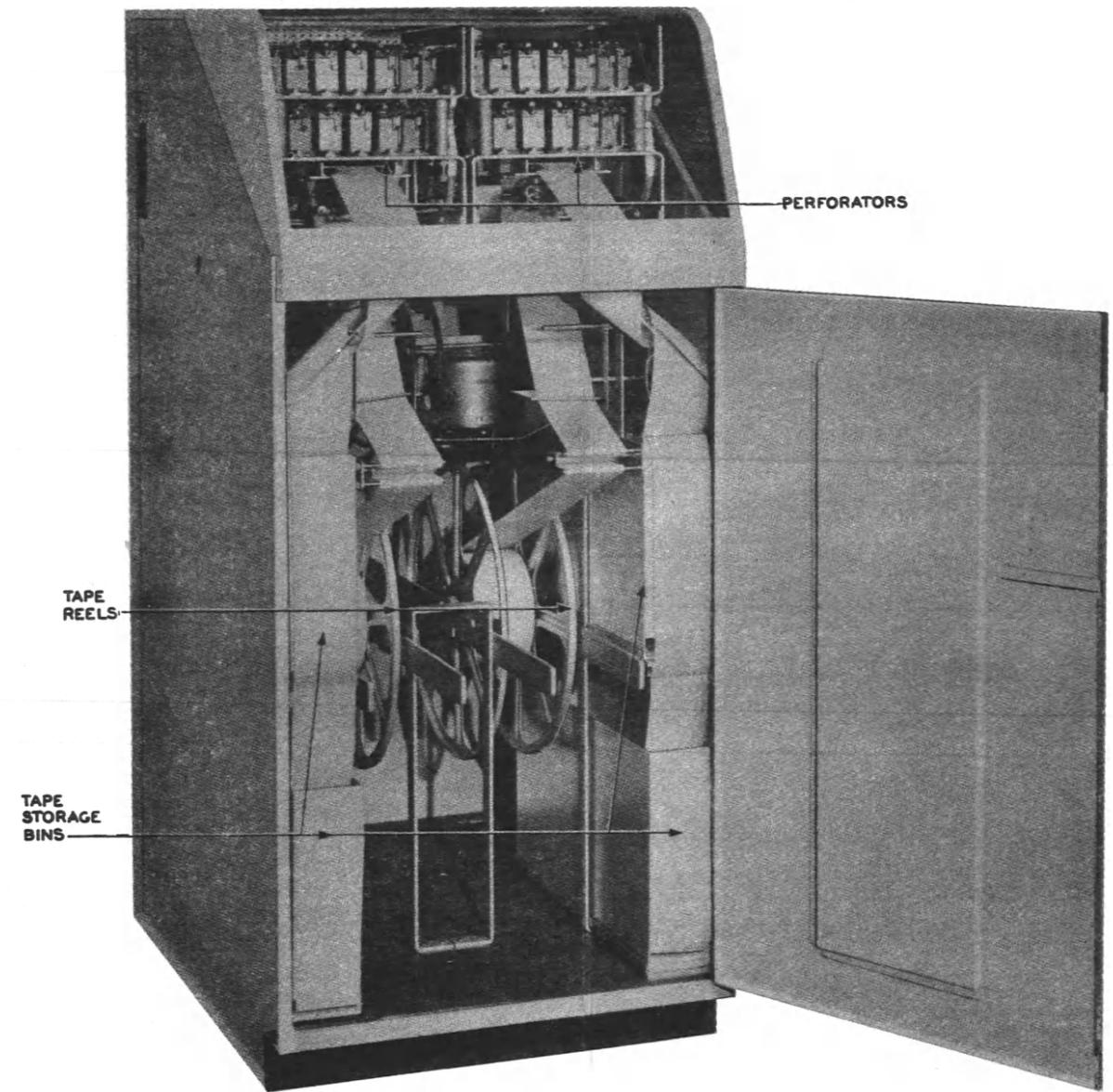


Fig. 6 - Central Office Perforator Cabinet Showing Location of Perforators, Tape Reels, and Tape Storage Bins

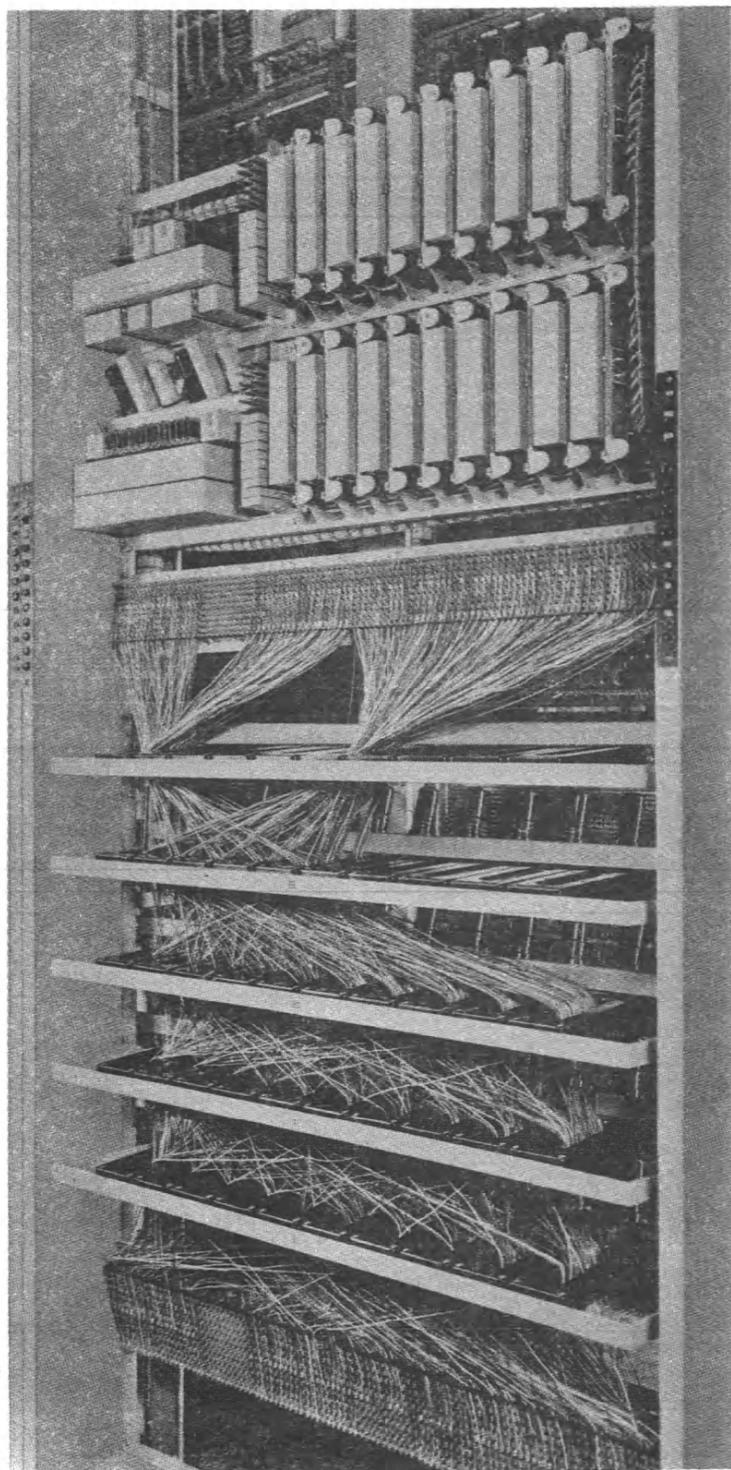


Fig. 7 - Translator Frame Showing Method of Running Jumpers Through Induction Coils

TYPE OF ENTRY

INITIAL ENTRY
BULK RECORD CALL
2 LINES

INITIAL ENTRY
DETAILED RECORD CALL
4 LINES

INITIAL
DETAILED RECORD CALL
5 LINES

ANSWER OR DISCONNECT
TIME - 1 LINE

HOUR - AT START OF
EACH HOUR

TAPE IDENTIFICATION
ENTRIES

TYPE OF ENTRY		INFORMATION RECORDED DIGITS					
		A	B	C	D	E	F
INITIAL ENTRY BULK RECORD CALL 2 LINES		CALLING NO.					
		OFFICE	TH	H	T	U	
		0	0	0	0	0	0
		MESSAGE INDEX			CALL IDENTITY INDEX		
		2	1	0-8	0	T	U
		0	0	0	0	0	0
INITIAL ENTRY DETAILED RECORD CALL 4 LINES		CALLED NO.					
		TH	H	T	U	STATION	
		0	0	0	0	0	0
		AREA CODE		CALLED NO. STRUCTURE		CALLED OFFICE CODE	
		0	0-9	0-2	A	B	C
		0	0	0	0	0	0
INITIAL DETAILED RECORD CALL 5 LINES		CALLING NO.					
		OFFICE	TH	H	T	U	
		0	0	0	0	0	0
		MESSAGE INDEX			CALL IDENTITY INDEX		
		2	3	0-9	0	T	U
		0	0	0	0	0	0
ANSWER OR DISCONNECT TIME - 1 LINE		CALLED					
		ENTRY NOT USED	NO. INDEX	CALLED OFFICE CODE			
		0	0-5				
		ENTRY NOT USED		NATIONAL AREA CODE			
		0	0	0	2-9	0,1	1,9
		0	0	0	0	0	0
HOUR - AT START OF EACH HOUR		CALLING					
		ENTRY OFF INDEX	CALLING NO.				
		0	0-9				
		0	0				
TAPE IDENTIFICATION ENTRIES		MESSAGE INDEX					
		ENTRY	INDEX	NOT USED	CALL IDENTITY INDEX		
		2	5	9	0	T	U
		0	0	0	0	0	0
		CALL IDENTITY INDEX					
		1	TENS	UNITS	TENTHS	T	U
		0	0	0	0	0	0
		HOUR					
		2	8	1	0	T	U
		0	0	0	0	0	0
		DAY					
		2	8	2	1	T	U
		0	0	0	0	0	0
		HOUR					
		2	8	1	1	T	U
		0	0	0	0	0	0
		REGULAR OR EMERGENCY RECORDER NO.					
		2	8	0	5 OR 6	T	U
		0	0	0	0	0	0
		DAY UNITS		MONTH			
		2	8	3	T	U	
		0	0	0	0	0	0
		DAY TENS		RECORDER GROUP			
		2	8	4			
		0	0	0	0	0	0

Fig. 8 - Typical AMA Entries

ACTUAL ENTRY	EXPLANATION OF ENTRY
284000	Day tens 0 Red. Gr. 00
283204	Day units 2 Month 04
280500	Recorder 00
281103	Hour 03
282102	Day 02
286000	Skip Splice
081010	Splice Pattern
-	Approximately
-	3:00 AM End of Tape Pattern
081010	800 Lines
284000	Day tens 0 Red. Gr. 00
283204	Day units 2 Month 04
280500	Recorder 00
281103	Hour 03
282102	Day 02
3:002 AM	Hour 03
3:00 AM	Hour 03
12:00 Midnight	Hour 00
11:00 PM	Hour 23
284000	Day tens 0 Red. Gr. 00
283104	Day units 1 Month 04
280500	Recorder 00
285500	Transfer Synchronous
281110	Hour 10
282101	Day 01
286000	Skip Splice
081010	Splice Pattern
-	Approximately
-	End of Tape Pattern
-	Red. 00 Returned to Service Between 10:00 AM & 11:00 AM
081010	35 Lines
284000	Day tens 0 Red. Gr. 00
283104	Day units 1 Month 04
280500	Recorder 00
285500	Transfer Synchronous
281108	Hour 08
282101	Day 01
286000	Skip Splice
081010	Splice Pattern
-	Approximately
-	End of Tape Pattern
-	Red. 00 Removed From Service Between 8:00 AM and 9:00 AM
081010	35 Lines
284000	Day tens 0 Red. Gr. 00
283104	Day units 1 Month 04
280500	Recorder 00
285500	Transfer Synchronous
281108	Hour 08
282101	Day 01
286000	Skip Splice
081010	Splice Pattern
-	Approximately
-	3:00 AM End of Tape Pattern
081010	800 Lines
284000	Day tens 0 Red. Gr. 00
283103	Day units 1 Month 03
280500	Recorder 00
281103	Hour 03
282101	Day 01
286000	Skip Splice
081010	Splice Pattern
-	Approximately
-	3:00 AM End of Tape Pattern
081010	800 Lines
284000	Day tens 0 Red. Gr. 00
283103	Day units 1 Month 03
280500	Recorder 00
281103	Hour 03
282101	Day 01
3:002 AM	Hour 03
3:00 AM	Hour 03
12:00 Midnight	Hour 00
March 31	Hour 00

Fig. 9 - Explanation of Some Special Entries Recorded on the Central Office Tape

- NOTES
- The month is advanced after the 3:00 AM end-of-tape pattern. The calendar day is advanced at midnight.
 - The tape is read backwards in the initial sorting stage in the accounting office.
 - Date and other information is recorded by numerals as follows, preceded by a three or four-digit entry number.

Hour	00-23
Day	01-31
Month	01-12
Recorder	00-19
Recorder Group	00-99

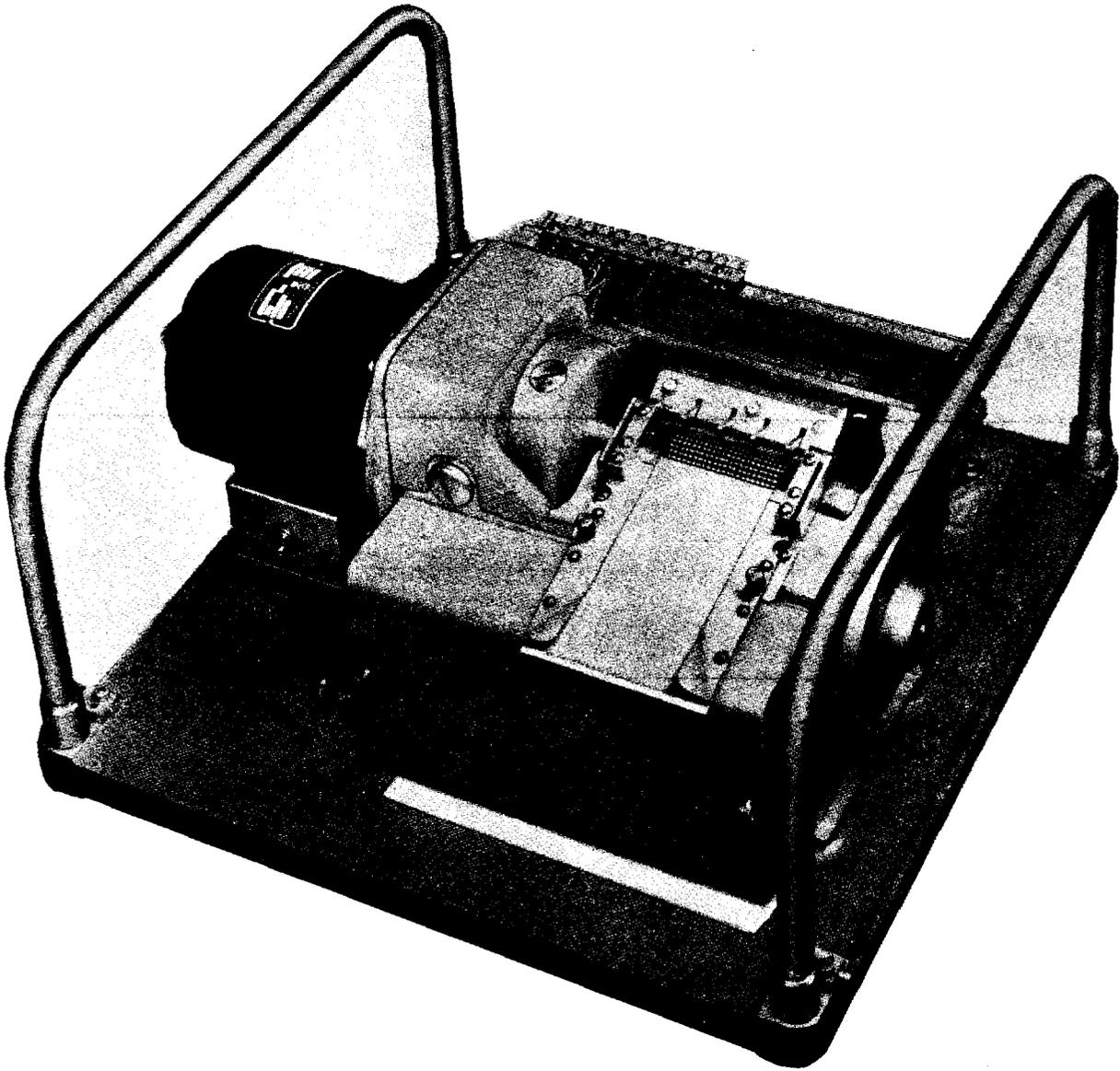


Fig. 11 – AMA Reader