SWITCHING SYSTEMS MANAGEMENT
NO. 5 CROSSBAR SYSTEM
EQUIPPED WITH ELECTRONIC TRANSLATION SYSTEM (5 ETS)
OPERATIONAL FEATURES
AUTOMATIC MESSAGE ACCOUNTING (AMA)

CONTENTS PAGE

1. INTRODUCTION

1.01 The purpose of automatic message accounting (AMA) is to provide automatic billing service for toll calls, coin calls, and message rate calls originating from one- and 2-party private branch exchange (PBX), or Centrex customers. Calls from 4-party and rural lines require an operator for identification of the calling number.

1.02 This section describes the functions, features, and applications of No. 5 Electronic Translation System (ETS) AMA including Local AMA (LAMA), Centralized AMA (CAMA), Automatic Number Identification (ANI), and Automatic Identified Outward Dialing (AIOD).

1.03 Whenever this section is reissued, this paragraph will contain the reason for reissue.

1.04 The title of each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

2. GENERAL

2.01 No. 5 ETS performs the AMA function by collecting billing information on customer dialed calls directly from the markers and trunks. The basic LAMA feature is always provided in No. 5 ETS offices and is similar to the LAMA-C feature of No. 5 crossbar offices. No. 5 ETS AMA features include the following:

LAMA (always provided)

ANI (optional)

AIOD (optional)

Remote Message Registers (RMR) (optional)

INWATS AMA (optional)

CAMA (optional).

3. LAMA

General

3.01 No. 5 ETS utilizes the No. 3A processor to replace the equipment normally required for recording calls on paper or magnetic tape. The processor obtains "initial entry" information by scanning the completing marker while the call is being set up. This is then translated and stored in a dedicated area of memory called the trunk register. Answer and disconnect information are obtained by scanning the supervisory relays in the associated trunk. This information is also stored in the trunk register. The processor then assembles the details of the call and forwards the information via a dedicated data link to a No. 1 Automatic Message Accounting Recording Center (AMARC). The AMARC automatically records call details on magnetic tape. No provision is made for local recording.

3.02 Figure 1 shows a block diagram of a typical No. 5 ETS LAMA installation. The diagram does not show the ANI, AIOD, or RMR features. The system uses duplicated processors, each attached to associated peripheral equipment. One processor acts as the active recorder and the other as a full time standby. Each processor interfaces with the No. 5 crossbar equipment via the distribute and scan equipment.

3.03 Each processor tracks the progress of all calls, from the initial completing marker usage until either abandonment or disconnect occurs. The active or on-line processor then assembles the call information into single-entry format, and the completed call records are forwarded through dedicated voice-grade data links to the AMARC for centralized recording on 1600 bits per inch (BPI) industry compatible, 9-track magnetic tape.

3.04 Reliability to protect against a single data link failure is achieved by providing a dialed backup data link for use in the event of a dedicated data link failure.

3.05 The system is arranged to provide ANI, an interface to AIOD equipment, and message register operation with multiple registrations for multiunit calls for motel/hotel determination of guest billing. Interface circuits are required for these features.

3.06 The ETS equipment has provision to handle a full size No. 5 crossbar marker group. It will accommodate 12 completing markers, 6 dial tone markers, and recording on up to 4800 trunks.

System Operation

3.07 The general flow of call information is shown in Fig. 2. The processor complex scans the markers at a basic 10 millisecond rate. Not all scan points are looked at each time, but only enough (less than 16) to track the marker through the various stages of the call. Then, as the "initial entry" becomes available, it is read by the processor and eventually stored in the trunk register dedicated to the trunk that will handle the call.

3.08 Trunks are scanned for call processing at a basic rate of 200 milliseconds. There are two supervision scan points per trunk, one associated with the supervision of the called party and one associated with the supervision of the calling customer. These scan points are used to detect the time the called party answers and the time the calling customer disconnects. The answer time is stored in the trunk register along with the disconnect time. The data are then ready to be formatted and transmitted to the AMARC when a data link becomes available. Single entry AMA recording is used.

3.09 A third scan point is provided per trunk to determine trunk busy/idle status. This third scan point is scanned at a 640 millisecond rate. Since this scan point is not involved in the AMA processing, it is not discussed further in this document.

3.10 The ETS will not allow a call to complete for certain failures. Any call on which a failure prevents the processor from identifying the trunk to be used will be blocked. This can happen during the transition period after installation or as a result of an equipment failure. The marker requires a verification signal from the processor before allowing a call to complete, thereby avoiding the problem of misbilling due to a quick trunk reseizure.

Call Processing

3.11 When the processor determines that a call is to be recorded, it stores the called number in the trunk register assigned to the selected trunk. The line equipment location obtained from the marker is translated to a calling (or billing) number by the use of the line translation table and the number is stored in the trunk register.

3.12 The line translation table also provides the billing class of the calling line. The billing class and the called area and office code are combined with other miscellaneous information to determine the type of call and the Message Billing Index (MBI). These are stored in the trunk register also. The initial entry information is now complete.

3.13 When the trunk scanning function recognizes that a call has been answered, the time at which the event occurred is stored in the trunk register. There is a fixed correspondence between the scan point representing called party answer on a given trunk and the memory address for the trunk register of the trunk; therefore, no translation is required when the time of a called party supervisory change is entered into the trunk register.

3.14 When calling party disconnects the trunk scanning function detects the event and records the time in the trunk register. All the information required for billing the call is now complete. After the trunk is released, the call record is formatted and transmitted to AMARC. Figure 2 shows a typical call record format.

3.15 The customer is considered to have answered if the call off-hook supervisory signal persists at least 2 seconds. The charging interval ends when the calling party disconnects. The system includes all timing adjustments required internally for delays, clock granularity, etc, so that the accounting center does not have to make any further adjustments.

Data Link Communication With AMARC

3.16 The AMARC is the recording facility for all No. 5 ETS AMA recording. The AMARC may be at the same location as the No. 5 ETS but is more likely to be a remote installation. The No. 5 ETS and AMARC ***must*** be in the same time zone.

3.17 Normal communication between the No. 5 ETS and AMARC is conducted over dedicated data link facilities. Arrangements are provided for a maximum of five dedicated data links. A dialed backup data link is provided to allow the AMARC to gain access to the No. 5 ETS processor through the direct distance dialing (DDD) facilities in the event of a dedicated data link failure. The line circuit associated with the dialed backup data link should be arranged for terminating service

only. In both cases the data links will operate at a 1200 bits per second data rate.

3.18 As shown in Fig. 1, the processor and AMARC interface directly via the dedicated data links. The data links operate in an asynchronous mode with a data block transmitted from the No. 5 ETS only in response to a polling message from the AMARC. The maximum size of a data block is 128 characters of 4 bits each. Each data block is capable of transmitting the call data of from one to four complete calls.

3.19 After transmitting a data block, the processor will wait for a new polling message from the AMARC before sending a new data block. After verification by the AMARC that the data block was received properly, a new polling message is sent to the No. 5 ETS. In the event the AMARC detects an error within a data block, it will request retransmission of that data block. If the No. 5 ETS processor does not have call record data to send in response to a polling message, a ***no data*** message wil be transmitted indicating this condition. The interface is therefore a continuous cycle of polling messages and data transmissions.

3.20 In the event that data communications between No. 5 ETS and AMARC are temporarily halted, No. 5 ETS will provide internal buffering for approximately 1000 call records (12K words of dedicated memory). In some cases additional buffer capacity will be available. This minimum capacity will be sufficient to cover the interval required for AMARC to determine that the dialed backup facility is required and establish this connection. When data link service is restored, No. 5 ETS will forward the call records accumulated during the out-of-service period to AMARC by the normal call processing routine.

3.21 Since the dialed backup data link has a terminating line appearance in No. 5 crossbar, it is possible that this data link could be reached by anyone dialing the appropriate number. Accordingly, the No. 5 ETS has safeguards that prevent this line from being held out of service in the event this occurs. In addition, safeguards are provided to prevent an unknown source from using the dialed backup data link for illegal activity of any type.

3.22 If No. 5 ETS detects an incoming seizure (ringing) and fails to receive the "Data Link Start" message within 15 seconds after ringing is tripped, the data set will be restored to an on-hook condition and a teletypewriter (TTY) message provided to the local office maintenance personnel that this condition occurred.

3.23 No. 5 ETS will never acknowledge a "Data Link Start" message received over the dialed backup link unless this message contains the identity of a primary data link recognized by No. 5 ETS as one on which a positive trouble condition exists. AMARC will never include the identity of the dialed backup data link in a "Data Link Start" message transmitted over the dialed backup.

3.24 If No. 5 ETS has not received a polling message from AMARC over a primary data link for approximately three (3) minutes, and communications have not been established via the dialed backup data link for the affected primary, the processor will clear the associated buffer. This means that one data block would be lost when this condition occurs.

3.25 The No. 5 ETS will monitor the dialed backup and all primary data links continuously. Consequently, a switching sequence from primary to backup and from backup to primary per se does not occur. The signaling sequence when a dialed backup link is established (Data Link Start, Acknowledgement, etc) will ensure that the order of transmitting call record data blocks will be retained without loss of any data.

3.26 If the No. 5 ETS fails to receive a valid response from the AMARC on all primary data links within four seconds, an output message will be printed informing the local office maintenance personnel that this condition exists. Also, if the No. 5 ETS does not receive a valid response on any single data link within approximately 2 minutes and 30 seconds, a major alarm will be sounded and an output message will be printed informing the local office maintenance personnel of this condition.

3.27 In all cases, the No. 5 ETS will continue to monitor the primary and dialed backup data links until data communications are restored.

AMA Translation

3.28 AMA translation is required to determine first of all whether a call should be recorded

and then, if so, what type of call and, if required, what message billing index should be used. Collectively, these last two items are referred to as the billing treatment. Call types are listed in Table B.

3.29 The processor uses several pieces of information to determine the billing treatment. These are the customer's billing class, the called number, and in some cases, the route selected (eg, CCSA, route advance to WATS, or DDD). The billing class is stored in ETS memory on a per customer basis and is assigned by the network administrator.

Originating Line Translation

3.30 The function of the originating line translation is to determine all originating service characteristics of a line. The input to the translation is the line location which is designated by the line link frame, vertical group, horizontal group, and vertical file numbers, and the party identification where applicable. The translation is done in three steps: determination of per line data, expansion of line class number, and expansion of Compressed Office Code (COC) number.

3.31 The output of the per line translation will include the following AMA data:

- Line Class—A number in the range 0 to 1999
- Compressed Office Code—A number of range 1 to 62
- Billing Stations Digits—Four digit station number.

3.32 The output of the line class number translation will include the following AMA data:

- Screening Parameters—Used for billing, routing, and terminating screening
- Customer Group Number—Least significant two digits of line class number which identifies a centrex customer.

3.33 The output of the COC translation will be a three digit billing office code and a three digit billing area code assigned for the COC.

Billing Translation

3.34 The primary function of billing translation is to translate the dialed digits and screening data into a set of AMA parameters. Secondary functions of billing translation are to block calls with improperly dialed prefixes, to modify the routing treatment for calls that require special handling (coin, multiparty toll, etc), and to block toll calls from certain customers. The inputs to billing translation include the following:

(a) Billing Entry Code—Corresponds with the translation lead serving the particular electromechanical register (originating, incoming, or trunk)

(b) Number Plan Area Code

(c) Office Code

(d) Screening Parameters—Correspond to any of the screening parameters provided either in incoming trunks or by originating line translations.

3.35 Not all inputs are required on every type of call. For example, certain service calls of the "X11"-type and some types of centrex calls require only a billing entry code and a billing class parameter. Local and toll 7-digit calls require the two just mentioned plus the office code. Only 10-digit calls require all four items.

3.36 The output from a billing translation will be one of the following:

—Billing treatment (message billing index and call type, or a "no bill" indication)

—A diverted route index.

4. AUTOMATIC NUMBER IDENTIFICATION (ANI)

4.01 ANI is a feature used to forward the identity of the calling customer's line to a distant AMA office such as a Traffic Service Position System. Figure 3 illustrates a No. 5 ETS office arranged for ANI operation. Two interface circuits are required per marker group to provide the control between the transverter connector and the distribute and scan (DAS) circuit. These interface circuits appear as ANI transverters to the transverter connector and can serve simultaneous call requests from senders. Redundant interface circuits are

provided for service protection. The interface circuits are mounted on a miscellaneous relay rack and require part of one scan and one distribute unit each.

4.02 When a call originates that requires the use of the ANI feature, the trunk register will be marked to note that the call is non-AMA. No further AMA processing of the call will take place. However, since the sender requires the identity of the calling line, it will request this translation via the transverter connector. The transverter connector will select one of the two interface circuits and complete a connection between this circuit and the sender. The sender will ground leads corresponding to the calling line equipment number. The processor will use this number to interrogate the line translation data base and obtain the calling customer's billing number. This number is returned to the sender and after determining that the number was correctly registered in the sender, the processor will initiate a release. The interface circuit will then release.

5. AUTOMATIC IDENTIFIED OUTWARD DIALING (AIOD)

5.01 AIOD is a feature which provides a means for identifying the directory number of a PBX station placing a call via dedicated PBX trunks. Figure 4 illustrates a No. 5 ETS office arranged for AIOD operation. Two interface circuits are required to function as a control and connector circuit between the AIOD translator and the DAS equipment. Each interface circuit occupies a position in the AIOD translator preference and control circuitry and competes with others (ie, transverters and/or ANI outpulsers) for access to the AIOD translator. These interface circuits appear as ANI outpulsers to the AIOD translator rather than transverters.

5.02 The interface circuits are mounted on a miscellaneous relay rack. Each interface circuit is arranged to connect to a maximum of three AIOD translators.

5.03 When a call originates that requires the use of the AIOD feature, the ETS will handle this call in a normal manner. However, when the processor interrogates the line translation data base to obtain the class data and directory number, this line will be identified to the processor as an AIOD customer's line. The processor will then seize an idle interface circuit. In the meantime, the processor will obtain a four-digit number corresponding to the PBX trunk over which the call was originated and the identity of the particular AIOD translator to which the PBX trunk was assigned. This information is obtained from an AIOD translation table in the data base and must be provided by the network administrator. The four-digit number is then transmitted to the appropriate AIOD translator and station identification circuit after a connection is complete between the interface circuit and AIOD translator. The station identification circuit associates the four-digit trunk number with a calling number it has received via a data link to the PBX station equipment and passes this number back to the AIOD translator.

5.04 After the AIOD translator receives the PBX station number from the station identification circuit, this number is returned to the processor via the interface circuit. The processor will then store the PBX station number in the system trunk register corresponding to the trunk circuit selected and release the interface circuit and AIOD translator. ETS will then continue normal call processing.

5.05 No. 5 ETS can apply either message rate or flat rate billing class treatment to an AIOD call on a per AIOD line basis, but not on a per AIOD station basis.

6. REMOTE MESSAGE REGISTERS (RMR)

6.01 The RMR feature provides a means whereby a hotel/motel may keep a record (via message registers) of charge calls made from lines within the hotel/motel complex. Figure 5 shows a block diagram of a typical No. 5 ETS arranged for RMR operation. One RMR interface circuit is required for every 16 RMR lines served by the office. Interface circuits may be shared by two or more PBX customers. A No. 5 ETS office can serve a maximum of 512 RMR lines. The interface circuits are mounted on a miscellaneous relay rack and require one scan and one distribute point each.

6.02 When a call originates that requires the RMR feature, the processor identifies this line from the class data in the line translation data base. The combination of this class data and the message billing index associated with the dialed code allows the processor to determine the initial and overtime intervals and the number of pulses required for each interval. The initial interval

pulses are scored immediately following the end of the charge verification period and the overtime pulses are scored at the beginning of each overtime interval. Provision is made for varying the number of register operations with the time-of-day.

6.03 Calls from RMR lines are recorded as conventional message rate calls. If it is not possible to score the RMR, these calls will not be recorded. There will be no remote scoring for calls from RMR lines that dial 411. These calls will be recorded, however, as "no charge" for disposition by the accounting center.

7. CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING (CAMA)

7.01 The CAMA feature enables a No. 5 ETS office to act as a center for creating call records primarily for billable calls originating outside the ETS marker group. Figure 6 shows a block diagram of a typical No. 5 ETS office arranged for CAMA operation.

7.02 A CAMA call will enter the No. 5 ETS via the CAMA incoming trunk. An incoming register is attached to the trunk and will receive the called number from the distant office as well as determining the trunk number, trunk link frame number, and the trunk class number. The incoming register will then request a completing marker to which it will pass the above information.

CAMA First Marker Usage

7.03 The completing marker, through information received from the ETS, will determine that the call is to have CAMA handling. A CAMA sender will be selected which will be attached to the CAMA incoming trunk. The CAMA sender will request the distant office, via the incoming trunk, to send the calling number.

7.04 After receiving the calling number, the CAMA sender requests a program controlled transverter (PCTV) to which it will pass the trunk number, calling, and called numbers. The processor will read the scan points and from the trunk number determine the trunk register assigned to that particular trunk. An initial entry will then be made into the trunk register. The sender will then release the PCTV and bid for a completing marker for the completion of the call.

CAMA Second Marker Usage

7.05 After the marker has been attached to the sender, it will receive the incoming trunk number and the called number. The use of the marker will be to complete the call either to a subscriber in the same CAMA marker group (local completion) or to tandem through to a distant office.

CAMA Recording

7.06 CAMA incoming trunks are equipped with supervisory scan points. When the trunk is seized, the S1 (or equivalent) relay will be operated which in turn will operate the S1 scan point and the progress will be noted in the respective trunk register. When the call is answered, the CS (or equivalent) relay will be operated, in turn operating the CS scan point and the progress noted in the trunk register. When the called subscriber disconnects, the CS scan point will ultimately be released and noted in the trunk register. The ETS will then format the call in the normal manner to be forwarded to the AMA recording center.

7.07 The outgoing (tandem) trunk used in the completion of the call will also be equipped with scan points but these will be ineffective when the outgoing trunk is used in a tandem mode.

8. INWATS AMA

8.01 INWATS is a form of inward only long distance service which permits a subscriber to receive calls over the DDD network which originate in specified service areas without cost to the calling party. Two INWATS offerings currently exist, namely Interstate INWATS and Intrastate INWATS. These are separate and distinct services offered under different tariffs. Intrastate INWATS calls should be blocked from Interstate INWATS lines and vice versa. AMA records (LAMA or CAMA) are made at originating offices on all INWATS calls. These records are not used for billing, but are needed for intercompany settlements, Division of Revenue, and traffic engineering.

8.02 Special numbering, routing, screening, and line usage measurements for billing are employed to provide INWATS. The routing and screening functions are accomplished using 3-digit and 6-digit translation and code conversion, all of which are standard features included in the No. 5 ETS route translation software. Reference should

be made to Bell System Practices (BSP), Section 781-030-100, Notes on Distance Dialing, and Dial Facilities Management Practices (DFMP), Division F, Section 5 for further details on INWATS service. No. 5 ETS offices are capable of performing all INWATS roles except that of a terminating screening office for interstate INWATS calls.

8.03 No. 5 ETS offices may be arranged to provide terminating AMA records for the billing of INWATS calls with output in standard single entry format to the AMARC. This is illustrated in Fig. 7. The output to the AMARC includes daily overflow counts for each line group.

8.04 The following is a summary of basic INWATS features with No. 5 ETS offices.

Routing Features

- All numbers for interstate INWATS must be reserved in "blocks of ten" to provide band subscription identification at the TSO.
- All numbers for intrastate INWATS must be reserved in "hundreds blocks" to enable terminal screening.
- 6-digit translation and code conversion to perform the functions of an originating screening office and terminating screening office.
- 8-digit translation for intrastate INWATS routing and screening when NX2 codes are shared with several offices.

AMA Features

- INWATS lines are "terminating" only and must be arranged for hunting. (A minimum of two lines is required for interstate INWATS groups.)
- Each INWATS line group requires per call recording of its usage (off-hook time and message counts) for billing and administrative purposes. No. 5 ETS offices achieve this via the INWATS AMA feature.
- Each INWATS line group requires overflow registrations when all lines are busy. No. 5 ETS offices achieve this via the INWATS AMA feature and provide daily transmission to the AMARC at 11:00 pm.
- Single entry output to AMARC.

8.05 The number of overflows per INWATS directory number is recorded daily and transmitted to the AMARC. Each transmission can handle the overflow count for 5 INWATS directory numbers (hunt group). Accordingly, the number of transmissions will be determined by the number of INWATS directory numbers assigned in a given office. The data does not include the NPA of the associated directory numbers. The network administrator must therefore exercise caution in assigning INWATS numbers for intrastate INWATS if an AMARC system records intrastate INWATS calls for more than one NPA. This is necessary to prevent duplicate numbers for two different customers from appearing on the same AMARC tape.

8.06 The call duration is recorded somewhat differently for INWATS calls. The answer (connect) time will be recorded as described in 3.11. However, the call will be recorded as having terminated at the initial recognition of either party disconnecting after the minimum charge duration criterion have been satisfied.

9. AMA TRAFFIC MEASUREMENT

9.01 Reference should be made to DFMP, Division H, Section 19f(2). System measurements for AMA are a subset of those provided by the ETS. The following AMA registrations are provided.

Plant

Designation	Registration	Register Capacity
DLR	AMARC Data Link Retransmits (1 per AMARC Data Link)	10,000
LRTA	LAMA Recordable Toll Attempts	100,000
LRNTA	LAMA Recordable Nontoll Attempts	100,000
AA	ANI Attempts	10,000
AF	ANI Failures	10,000
CRLCE	Call Records Lost When 5 ETS Capacity Exceeded	10,000
RALT	Recordable Attempts Lost Due to Trouble	10,000
CRLT	Call Records Lost Due to Trouble	10,000
RAHF	Recordable Attempts Handled Free*	10,000
TNIF	Telephone Number Identification Failures	10,000
ARA	AIOD Attempts	100,000
AIODF	AIOD Failures	10,000

*CAMA only

Note: All registrations provided by the ETS are distributed by the measurement registration connector (MRC) circuit via groups of output leads. Plant registrations have fixed assignments in the first group of MRC leads. With the exception of the AMARC data link retransmit registration which is provided per data link, a single output lead is provided for each registration. The scaling for these registrations is controlled by input messages from the traffic or maintenance terminals. Scaling of 0 (register unassigned) or 1, 10 or 100 may be specified. The scaling must be specified such that the total registrations (after scaling) will not exceed 1800 per high day busy hour and will not exceed the capacity of the register for a 30 day period (10,000 or 100,000).

Traffic

LAMA recordable toll attempts
LAMA toll messages
LAMA recordable nontoll attempts
LAMA nontoll messages
Call records by types
ANI attempts
AIOD attempts
AMARC data link load
Call records lost when data link capacity exceeded
Calls blocked by code blocking feature (per code)
Individual hunt group terminating peg and overflow count (used for INWATS line circuit peg count if required)

10. TIMING

10.01 Call duration is determined by the processor to a resolution of 0.4 seconds using a clock whose accuracy is better than 0.1 percent. Time of day is recorded with a tolerance of 30 seconds and is maintained to this accuracy through the use of time synchronization messages received from the AMARC.

10.02 The processor applies an adjustment to the indicated call duration to ensure that the recorded duration is equal to or less than the actual call duration. This assures that the customer is never overcharged. The adjustment is applied to the answer time so that the disconnect time will remain as measured. The magnitude of the adjustment will be equal to or less than one second. The time of disconnect is taken as the time the calling customer goes on-hook. The processor is not presently capable of reporting cases where the calling customer disconnects a significant length of time after the called customer.

10.03 A charge verification period of approximately 2 seconds occurs at the beginning of each AMA call. Call duration timing starts at the beginning of the charge verification period.

11. MISCELLANEOUS CONSIDERATIONS

Call Observing

11.01 No. 5 ETS is arranged to permit both line and trunk observing. In addition, arrangements are provided for complaint observing on a per line basis.

(a) ***Line and Trunk Observing***—In this case, the appropriate "observed" indication must be included in the A2 data group for all recorded calls. An observed indication is provided to No. 5 ETS from the completing marker on these calls as an indication that this particular call was observed from an observers position. All unanswered calls are recorded. All message rate calls are recorded using the call type 18 format. The trunk identification is included on all call records.

(b) ***Complaint Observing***—When a charge call is originated by a customer on a line designated for complaint observing, the marker scanner will obtain information from the marker and pass it to the processor. The processor will translate the line equipment number into a calling number and will determine that the associated "complaint observed" bit is set. The resulting call record format used for recording these calls is identical to that described for line and trunk observing except the "observed" indication ***will not*** be provided in data group A2. The trunk identification is always recorded and all unanswered calls are recorded.

Long Duration Calls

11.02 In some instances a customer may originate a call that is left in progress for an extended period of time. The call record format is designed to provide an indication when a call has been in progress longer than 24 hours. This indication is provided by the Midnights Passed Digit (MPD) in data group C. This digit will indicate the number of consecutive midnights a call has been in progress.

11.03 Since the MPD digit can accommodate a maximum of only 9 midnights, the system must be arranged to continue the billing process after the call has progressed beyond the ninth midnight. Accordingly, when this condition occurs, the billing will be terminated before the 10th midnight is reached and this portion of the call recorded with a MPD of 9. The billing process will then continue with a new call record that contains an answer time in data group A3 equal to the disconnect time recorded when the previous call record was terminated. This process will be repeated until the call terminates.

11.04 A maintenance message will be generated each midnight the call is in progress after the call has been in progress for at least 24 hours.

Unanswered Calls

11.05 Unanswered calls are recorded under several circumstances. In all cases, when an unanswered call is recorded, it is identified by the following characteristics:

(a) A "traffic sampled - no charge" indication in data group A2

(b) The associated trunk circuit release time will be recorded in data group A3

(c) Data group C will be recorded using dummy characters.

11.06 Unanswered calls are recorded under the following conditions:

(a) Call types 01, 08, 09, 11, and 25 during the Network Completion Study (NCS)

(b) All calls that would normally be recorded if the call was answered and the completing marker has provided an indication that the call is being line or trunk observed

(c) All calls that are complaint observed.

Traffic Sampling

11.07 The No. 5 ETS office is arranged for recording calls on a sampled basis. These calls can be recorded on a per line or per trunk group basis. Implementation is via a teletypwriter or DATA SPEED® 40 access terminal. The format of the recorded call must be specified by the network administrator at the time the translations for this feature are implemented. These calls will always be recorded with the "traffic sampled" indication in the A2 data group. All unanswered calls will be recorded when this feature is in effect.

11.08 No. 5 ETS will record calls with the "traffic sampled" indication under other conditions independent of this feature. These include:

(a) All CCSA-type calls.

(b) All NCS calls.

(c) The "traffic sampled - no charge" indication is used to indicate full business day WATS for TC11 and TC25 records.

Minimum Chargeable Duration (MCD)

11.09 A call record will be identified for charging only when the called party off-hook condition has persisted continuously for at least two seconds.

Minimum Recordable Duration

11.10 All calls that would normally be recorded if the MCD criterion were satisfied will be recorded if called party off-hook supervision is detected that is not of sufficient duration to satisfy the two-second MCD requirement. However, in no case will the call be recorded unless the off-hook signal has persisted continuously for at least two successive scans. The No. 5 ETS scan interval is 200 milliseconds.

12. REFERENCES

Dial Facilities Management Practices

DFMP Division H, Section 5b(1)—No. 5 Crossbar Automatic Message Accounting

DFMP Division H, Section 5b(5)—No. 5 Crossbar Operational Features, Local Automatic Message Accounting—Computerized (LAMA-C)

TABLE A

AMA DATA GROUP DESCRIPTIONS

DATA GROUP	DESCRIPTION
V	Start of Entry Character - This character identifies the beginning of a call record.
TC	Type Call - This data group identifies the type of call being recorded. Table B of this section describes the call types in more detail.
A2	Information Digits and Service Features - This data group is used to provide information pertinent to the call that is not conveyed within the call type. A brief description of these digits that are applicable to No. 5 ETS are as follows. First Information Digit 0 - Not Service Observed - Not Traffic Sampled - Charge 1 - Service Observed - Not Traffic Sampled - Charge 2 - Not Service Observed - Traffic Sampled - Charge 3 - Service Observed - Traffic Sampled - Charge 4 - Not Service Observed - Traffic Sampled - No Charge 5 - Service Observed - Traffic Sampled - No Charge 6 - Service Observed - Not Traffic Sampled - No Charge 7 - Not Service Observed - Not Traffic Sampled - No Charge Second Information Digit 0 - Not operator dialed, Not Operator identified, No Time Change 4 - Operator Identified (Implies not operator dialed, no time change) Service Feature Digits 00 - All other 01 - Coin Originated (i e , coin zone) 08 - INWATS
A3	Connect Time - This data group is used to record the time at which answer occurred. The time is recorded in hours, minutes, seconds and 1/10 seconds. The circuit release time will be recorded in this data group for unanswered calls.
B2	Calling Party Number - This data group is used to record the billing telephone number of the calling customer. Arrangements are provided for a maximum of 62 unique originating office codes.
C	Disconnect Time and Midnight Passed Digit - This data group is used to record the time at which the call terminates and whether the call has been in progress over midnight. The time is recorded in hours, minutes, seconds and 1/10 seconds. The first digit contains the midnights passed information. This data group will be filled with dummy digits for unanswered calls.

TABLE A (Cont)

AMA DATA GROUP DESCRIPTIONS

DATA GROUP	DESCRIPTION
D	Called Number - This data group is used to record the called number. On calls where an NPA was not dialed, the first three digits will be dummy digits. One exception is, if 1+555+1212 or 555+1212 is dialed, the HNPA will be included or the three digit called NPA if this call is recorded as type 01.
G	Message Billing Index (MBI) - This data group is used to designate the rate treatment applied to locally dialed message rate calls. In addition, the MBI data group is used to indicate the WATS band for recording station-identified WATS calls. The system is arranged to record a maximum of 15 unique MBIs (1-15) for rate treatment and 16 MBIs (0-15) for WATS band identification.
J	Calling NPA - This data group is used for recording the calling NPA. This data group will be included for all calls recorded by No. 5 ETS.
Y	Entry Extender Character - This character is used to indicate that some optional data groups are included within the call record. The optional data groups initially used by No. 5 ETS are M, P, Q, U40 and U100.
M	Optional Data Group Identifier - This data group consists of two characters used to identify which optional data groups are recorded. First Digit 1 - Q only 2 - P only 3 - P and Q Second Digit 0 - Neither R, S nor T
P	U-Data Group Indicator - This data group indicates which U- data groups are provided. No. 5 ETS will record 00040 or 00100 in this data group as an indication that the U40 or U100 data groups are provided with this call record. In the event that both the U40 and U100 data groups are required, No. 5 ETS will record 00140 in this data group.
Q	Trunk Identification - This data group is used to record the identity of the trunk circuit used to handle the call. The digits recorded will identify the trunk scan matrix, the scan row and bit position of the trunk scan matrix assignment. The first two digits identify the trunk scan matrix, the third and fourth digits identify the scan row and the fifth and sixth digits identify the bit position.

TABLE A (Cont)

AMA DATA GROUP DESCRIPTIONS

DATA GROUP	DESCRIPTION
U40	Customer Group Number Identification - This data group is used to provide customer group number identification. It provides for identification of different customers within the same originating NNX code.
U100	Timing Indicator - This data group is used to indicate calls recorded where the called customer off-hook duration did not persist long enough to record a "charge" indication for the call. These calls are referred to as Minimum Recordable Duration (MRD) calls. No. 5 ETS will record the digit "two" in this data group for these calls.

TABLE B

LAMA CALL TYPES

TYPE OF CALL / DATA GROUP		V	TC	A2	A3	B2	C	D	G	J	Y	M	P	Q	U 40	U 100
STATION PAID TOLL		X	01	X	X	X	X	X		X	X	X	X	X	X	X
DTWX		X	08	X	X	X	X	X		X	X	X	X	X	X	X
CCSA		X	09	X	X	X	X	X		X	X	X	X	X	X	X
WATS		X	11	X	X	X	X	X		X	X	X	X	X	X	X
WATS AFR		X	25	X	X	X	X	X	X	X	X	X	X	X	X	X
INWATS		X	29	X	X	X	X			X	X	X	X			X
BULK BILLED	MR TIMED	X	16	X	X	X	X		X	X	X	X	X	X		X
BULK BILLED (USRP)	MR TIMED	X	31		X	X	X		X	X						
DETAIL BILLED	MR TIMED	X	22	X	X	X	X	X	X	X	X	X	X	X		X
MR OBSERVED	MR TIMED	X	18	X	X	X	X	X	X	X	X	X	X	X		X
LOCAL DIRECTORY ASSISTANCE		X	30	X	X	X				X	X	X	X	X		X

CALL TYPE	DESCRIPTION
01	Station Paid Toll Calls requiring this format are identified by the office toll dialing plan and No. 5 ETS billing translation. This format is used for recording all direct dialed station paid toll calls (both 7 and 10 digit). All coin calls (including coin zone) recorded for division of revenue purposes use this format. The A2 data group will identify these calls as being coin originated. This data group will also indicate these as "traffic sampled - no charge" calls. Toll information calls are recorded using this format. The recorded called number will indicate the dialing plan used for these calls (i e , NPA4110000 or NPA5551212). It should be noted that the burden of preventing unwarranted charges on these calls rests with the accounting center if answer supervision is returned. Local directory assistance calls that are normally recorded using call call type 30 format that are line or trunk observed will be recorded using this type of format since the call type 30 format does not include the A2 data group for providing the observed indication.

TABLE B (Cont)

LAMA CALL TYPES

CALL TYPE	DESCRIPTION
08	Station Paid DTWX This format is used for recording calls from DTWX lines. A call requiring this particular format must be identified by the No. 5 ETS billing translation.
09	CCSA This format is used for recording calls originating from CCSA customer lines or trunks. A call requiring this format is identified by the No. 5 ETS billing translation or trunk group billing class depending upon whether CCSA customer group or trunk group recording is provided.
11	WATS This format is used for recording WATS calls where the call is billed to a WATS billing number assigned by the telephone company. A call requiring this format is identified by the No. 5 ETS billing translation or by the trunk group billing class in the case of CCSA customer alternate routing to this trunk.
25	WATS This format is used for recording WATS calls where the call is billed to the originating station rather than a WATS billing number such as for call type TC 11. A call requiring this format is identified by the No. 5 ETS billing translation or by the trunk group billing class in the case of CCSA alternate routing to this trunk. The WATS band is recorded in data group G in all cases.
29	INWATS This format is used for recording Inward Wide Area Telecommunications Service (INWATS) call data. A call requiring this format is identified by the billing class assigned to the terminating line.
16	Bulk Billed - Message Rate (MR) Timed This format is used for recording message rate calls where the A2 data group is required and type call 31 cannot be used. Calls requiring this format are not identified by the No. 5 ETS billing translation, but instead, are identified by the conditions that necessitate the use of the A2 data group. These conditions include calls of minimum recordable duration, calls that are operator identified, and observed calls.
31	Bulk Billed - Usage Sensitive Rate Plan - MR Timed This format is used for recording message rate calls where it is not necessary to record the called number details. Calls requiring this format are identified by the No. 5 ETS billing translation. Calls the require the A2 data group will be recorded as call type 16 which includes the A2 data group.
22	Detail Billed - MR Timed This format is used for recording message rate calls where it is necessary to record the called number details. Calls requiring this format are identified by the No. 5 ETS billing translations or by a "detail billed" indication that can be optionally associated with each individual MBI.

TABLE B (Cont)

LAMA CALL TYPES

CALL TYPE	DESCRIPTION
18	MR Observed - MR Timed This format is used for recording all message rate calls that are service or complaint observed. Calls requiring this format are identified by an observed indication provided by the completing marker or by a "complaint observed" indication optionally associated with the calling line.
30	Local Directory Assistance This format is used for recording local directory assistance charge calls. Calls requiring this format are identified by the local office directory assistance dialing plan and No. 5 ETS billing translation.

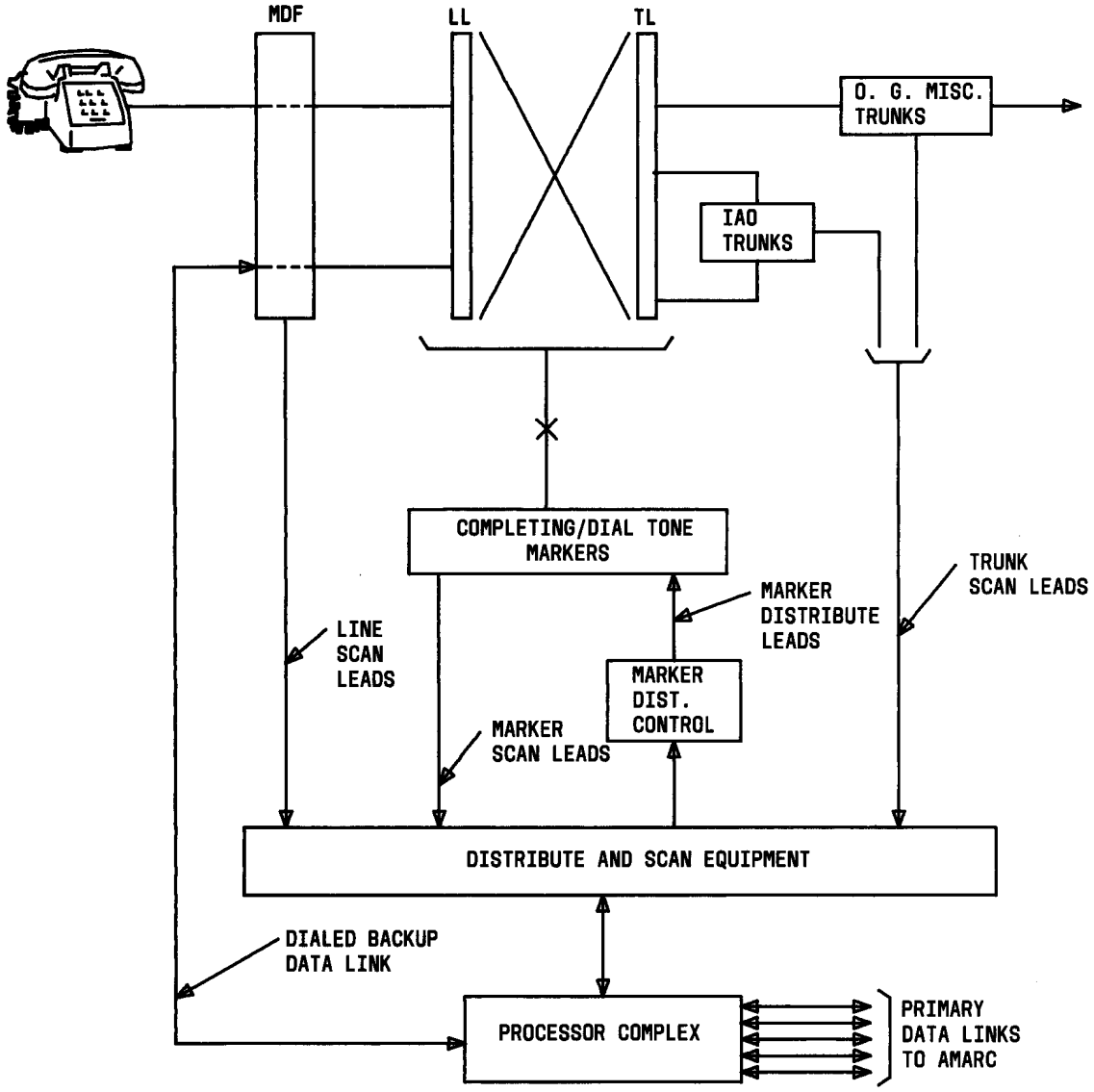
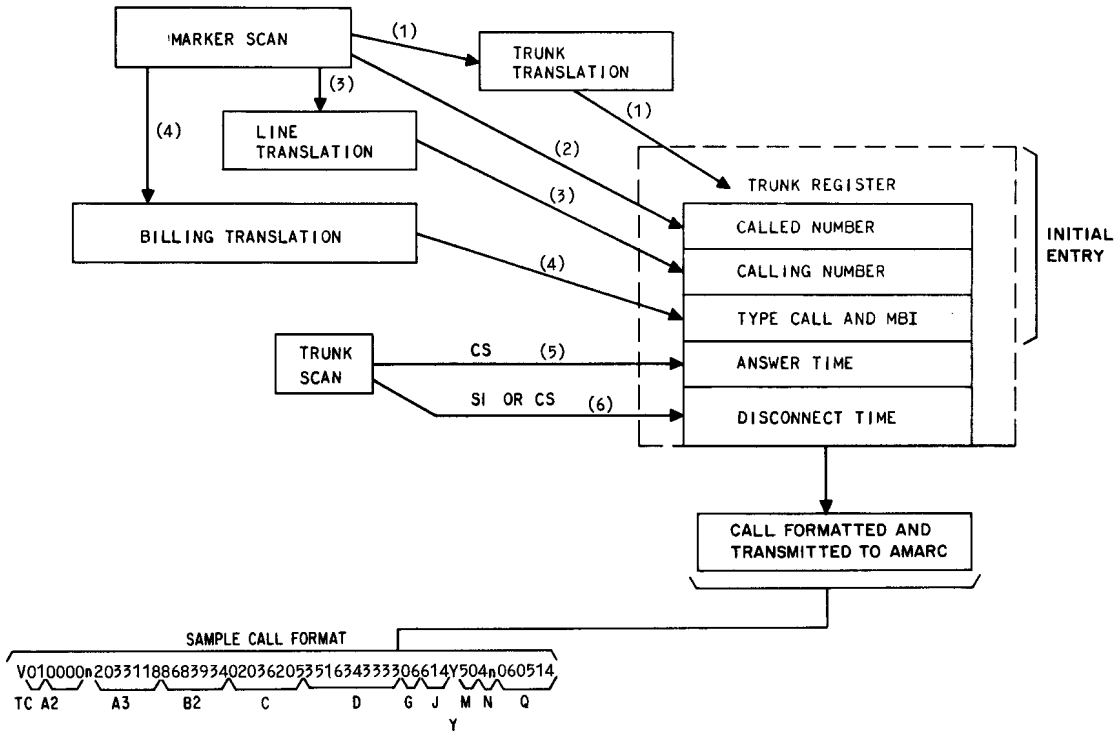


Fig. 1—No. 5 ETS LAMA Block Diagram (3.02, 3.17)



DATA GROUP *	DESCRIPTION
(V)	START OF ENTRY CHARACTER
TC	TYPE CALL, (TOLL, DTWX, CCSA, WATS, MR....ETC)
A2	IST & 2ND INFORMATION DIGITS, SERVICE FEATURES, (COIN. PICTUREPHONE®, DATAPHONE®, RMR.)
A3	CONNECT TIME
B2	CALLING NUMBER
C	MIDNIGHTS PASSED AND DISCONNECT TIME
D	CALLED NUMBER
G	MESSAGE BILLING INDEX (RATE TREATMENT)
J	CALLING NPA
(Y)	ENTRY EXTENDER CHARACTER (ADDITIONAL INFORMATION)
M	OPTIONAL INFORMATION
N	OVERSEAS NUMBER EXPANDER
Q	TRUNK NETWORK NUMBER (TRUNK SCANNER NUMBER, ROW, AND BIT)
n	NONCHECK DUMMY
U40	CUSTOMER GROUP IDENTIFICATION
U100	TIMING INDICATOR

* FOR A MORE COMPLETE DESCRIPTION OF EACH DATA GROUP SEE TABLE A.

Fig. 2—No. 5 ETS LAMA Call Record (3.07, 3.13)

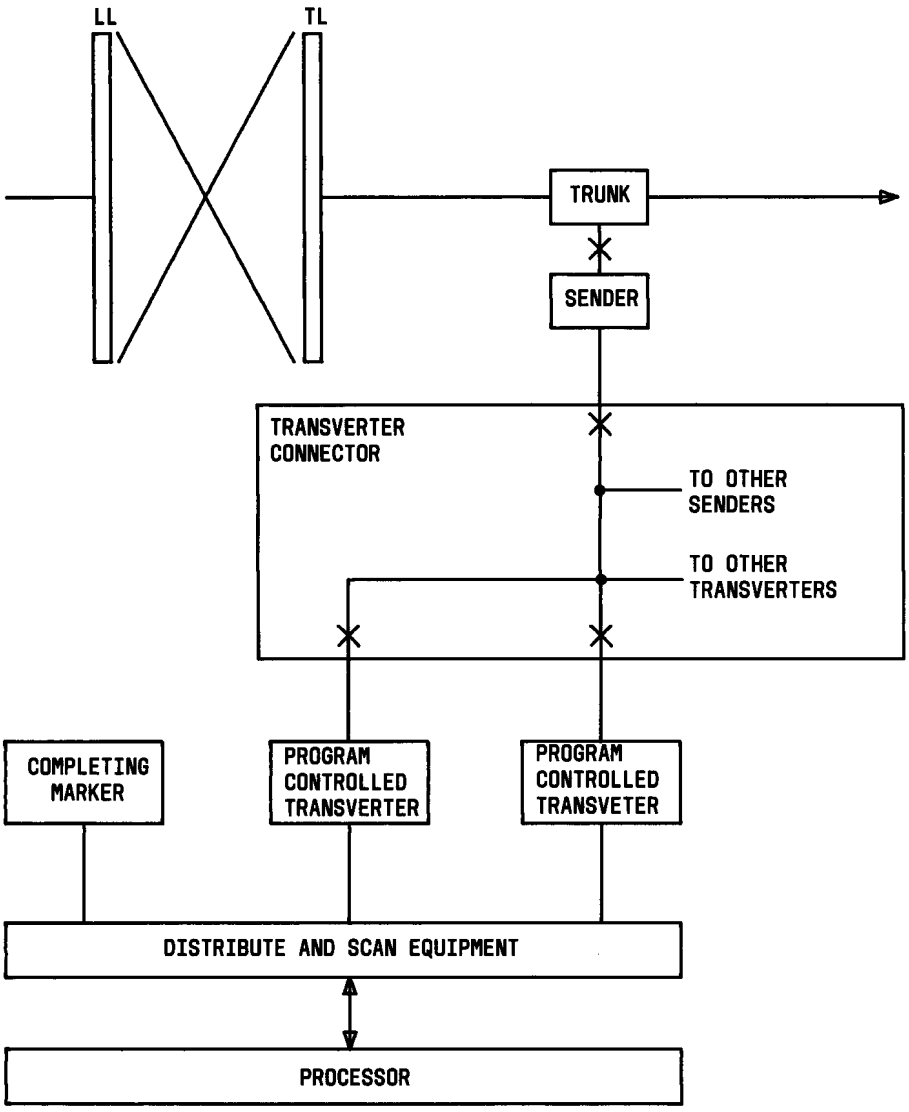


Fig. 3—No. 5 ETS Arranged for ANI (4.01)

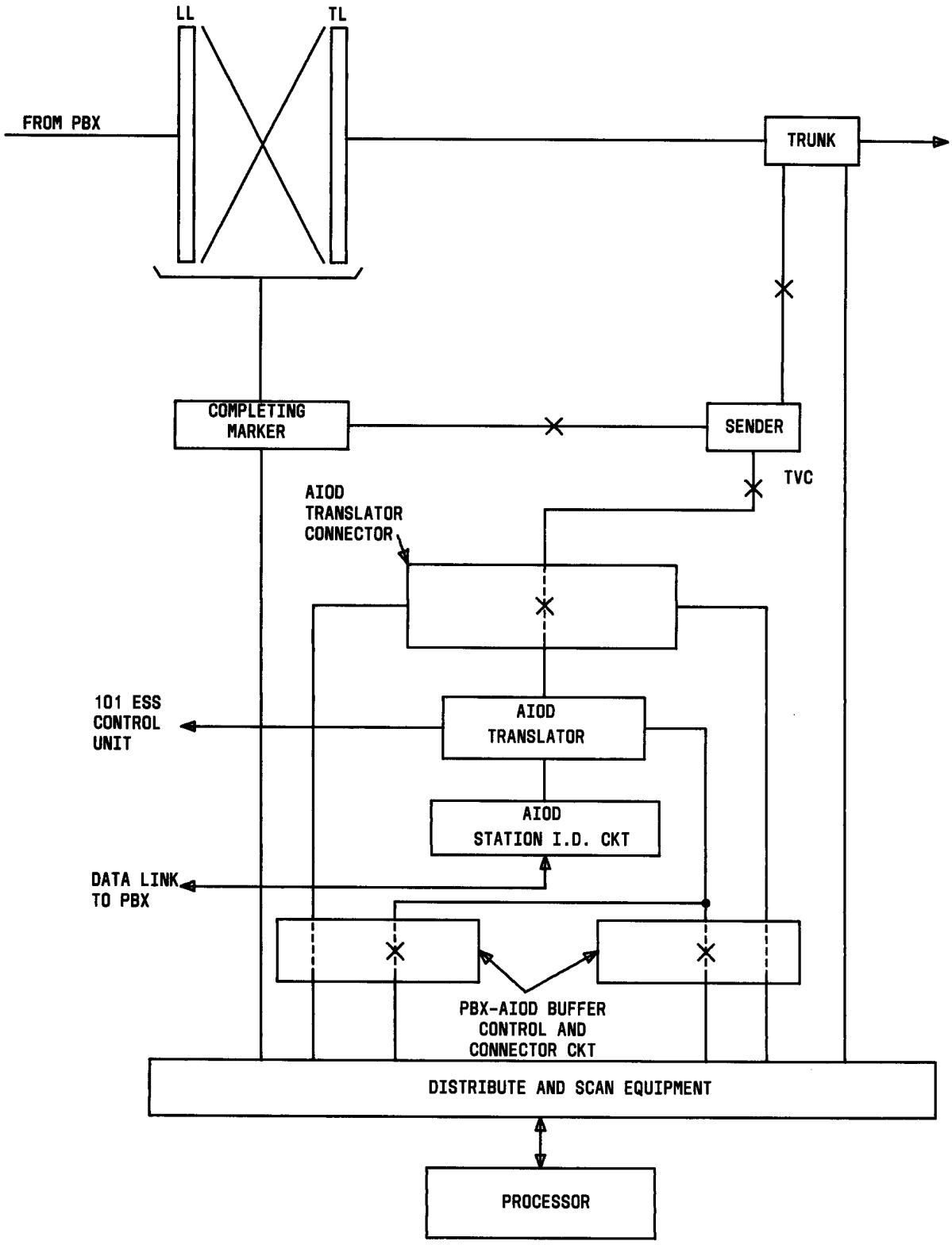


Fig. 4—No. 5 ETS Arranged for AIOD (5.01)

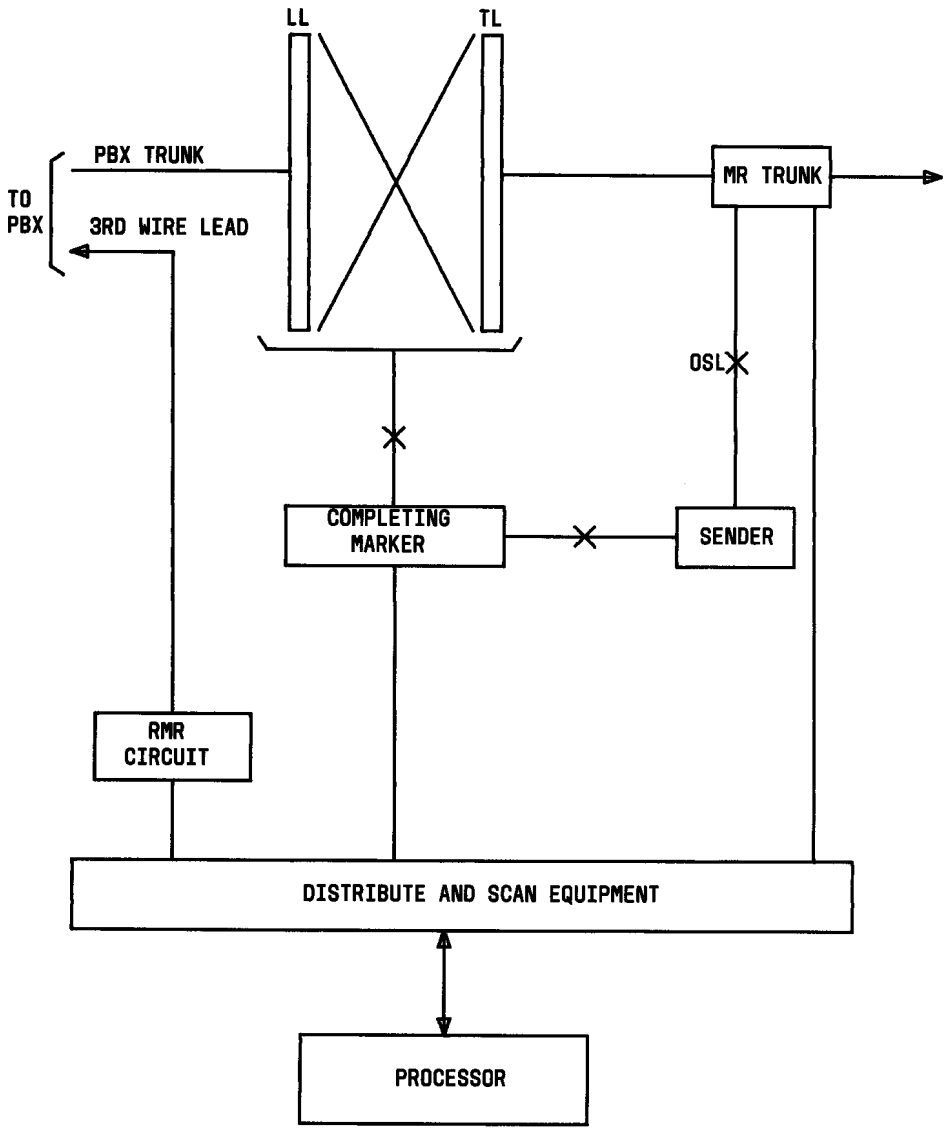


Fig. 5—No. 5 ETS Arranged for RMR Operation (6.01)

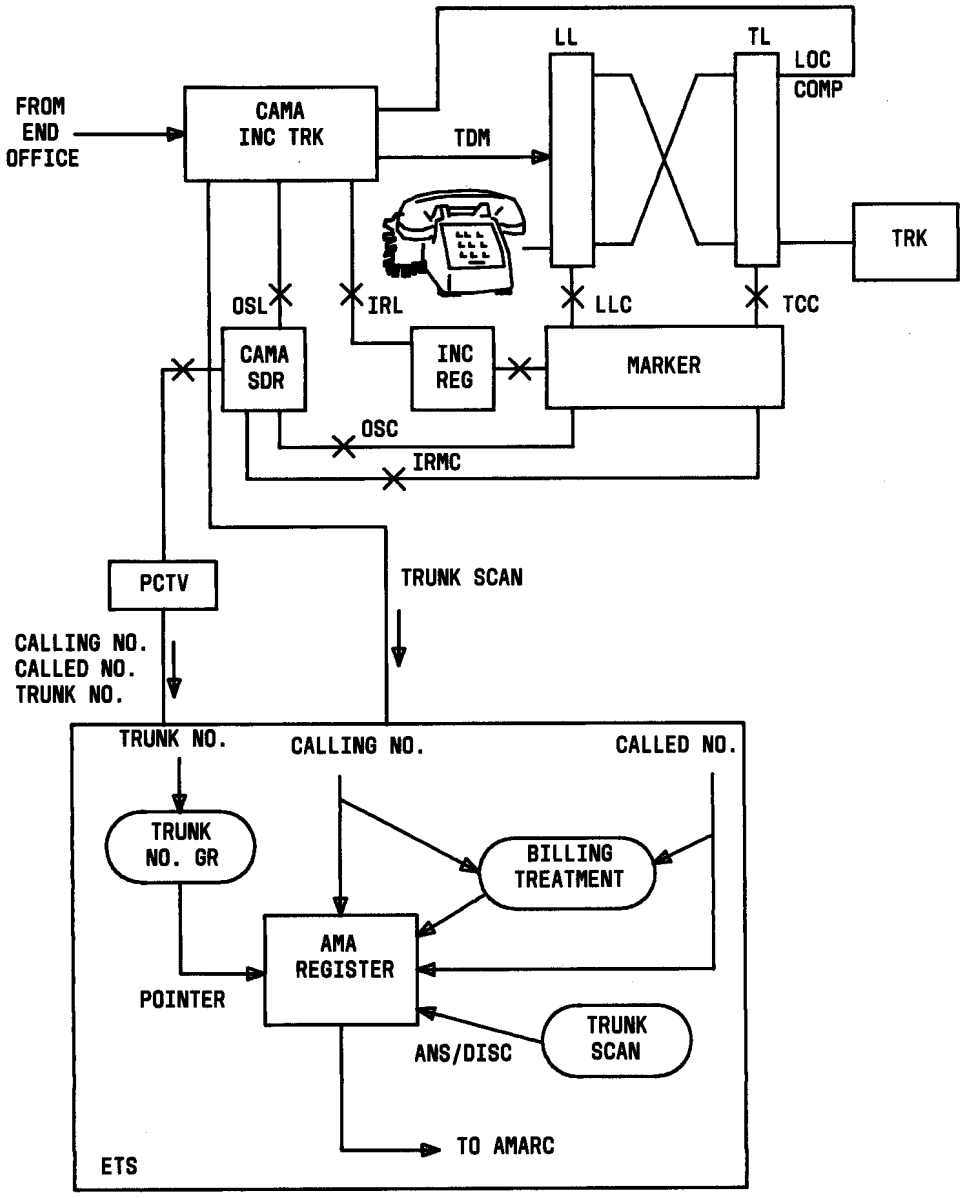


Fig. 6—No. 5 ETS Arranged for CAMA Operation (7.01)

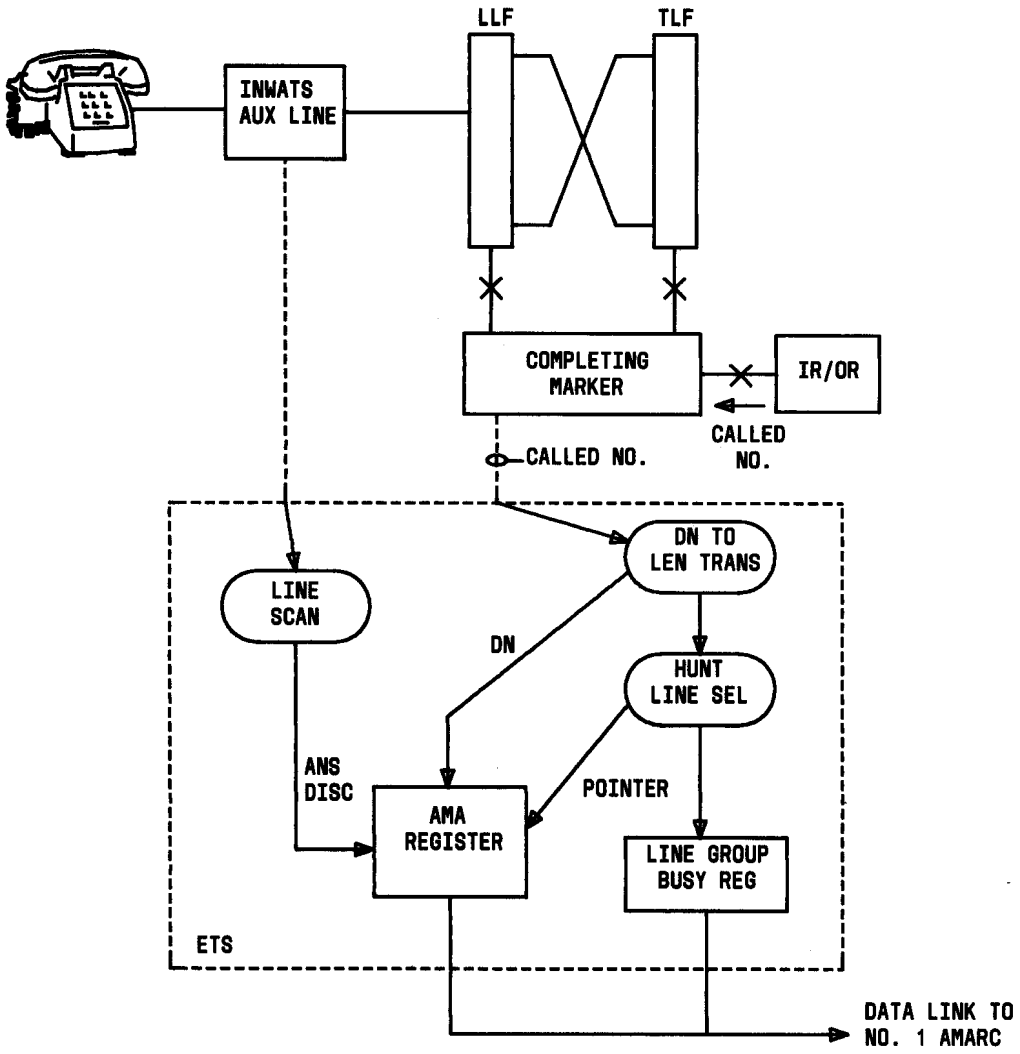


Fig. 7—No. 5 ETS INWATS AMA Recording (8.03)