CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING

CAMA TANDEM—ANI AND ONI

DESCRIPTION

2-WIRE NO. 1 ELECTRONIC SWITCHING SYSTEM

CONTENTS PAGE

CONTENTS PAGE

FIGURES

CONTENTS PAGE

CONTENTS PAGE

1. GENERAL

1.01 This section describes ***centralized automatic message accounting (CAMA)*** features of the 2-Wire No. 1 ***Electronic Switching System (ESS).***

1.02 ***This section is organized so that*** the general feature definition can be obtained in Part 1. Also given in Part 1 is a general CAMA call sequence that introduces (1) No. 1 ESS CAMA tandem terminology and (2) the overall CAMA call processing sequence. The call sequence describes a CAMA call from its origination, in either a remote office or in the No. 1 ESS CAMA tandem office, to its completion through the No. 1 ESS CAMA tandem office, or to a line in the No. 1 ESS office. In Part 3 the equipment elements, such as types of trunks introduced in Part 1, are described in two parts; (1) No. 1 ESS CAMA Tandem Equipment Elements and (2) Equipment Elements External to CAMA Tandem Office. The same basic CAMA call sequences are described in the CAMA equipment elements description (Part 3) and external equipment elements description (Part 3) as in the general

CAMA call sequence (Part 1) only with more detail and by presenting the CAMA point of view and external equipment point of view, respectively.

1.03 CAMA provides facilities for:

(a) Serving local dial systems that do not have means for automatically charging station-to-station extra charge calls

(b) Charging calls from multiparty and QZ billing line customers that cannot be charged by local facilities

(c) Concentrating operator facilities for handling toll calls where they can be more efficiently used by several remote offices

(d) Serving offices in which local automatic charging facilities would be too expensive for the volume of traffic involved

(e) Concentrating the expensive charging equipment where it can serve several offices.

1.04 Identification of the calling customer may be made:

(a) By a CAMA operator—***operator number identification (ONI).***

(b) Automatically by the originating office which transmits the identification information to the No. 1 ESS CAMA tandem office over the trunk from the calling office—***automatic number identification (ANI).***

1.05 There may be a need for both of these methods of calling number identification in the same CAMA installation. Though the originating offices may be arranged for ANI, ONI is required to serve the calls from QZ and multiparty line customers. ONI is also required if an ANI failure occurs such as a failure by the ANI equipment in the remote office to determine the calling ***directory number (DN).*** Means are not available to automatically identify calling stations with these special types of lines.

1.06 QZ billing is a special billing arrangement that is used when a customer requires special toll call records (for example, when a customer requires special toll call billing per department or per contract agreement, etc). A QZ billing number is distinguished from a regular DN by digit 1, digit 2, and digit 3 (office code) of the DN. The QZ billing number has a 0 or 1 in the first digit. For example, a block of QZ billing numbers assigned to a customer could be 012-0001, 012-0002, and 012-0003; each number representing the customer's different department numbers. A station originating a toll call would contact the operator; the operator would key the QZ billing number into the ESS, thereby making an AMA record for that customer's department; then the operator would complete the call. Generally, QZ billing numbers beginning with 0 are used when originating toll calls from the customer's location and QZ billing numbers beginning with 1 (such as 15X-XXXX, 16X-XXXX, and 17X-XXXX) are used when originating toll calls from locations other than from the customer's location. A QZ billing number is used for AMA purposes only and is not translated by the ESS for call completion as regular DNs are.

1.07 Reference should be made to Table A for a list of valid originating office-No. 1 ESS CAMA tandem office situations that may occur requiring CAMA handling.

GENERAL SEQUENCE OF OPERATIONS

1.08 CAMA calls originating in local offices are routed to a No. 1 ESS CAMA tandem office on special trunk groups. Refer to Fig. 1 for typical CAMA-ANI and CAMA-ONI arrangements. When a customer in a local office dials a number requiring CAMA facilities, the originating office seizes an idle ***CAMA-ONI*** or ***CAMA-ANI outgoing trunk*** and outpulses the called number. (The type of trunk depends on the CAMA service requirements of the originating office.) These CAMA outgoing trunks may be either ***multifrequency (MF)*** or ***dial pulse (DP)*** types. The CAMA calls come into the CAMA tandem office on dedicated trunk groups consisting of ***CAMA-ONI*** or ***CAMA-ANI incoming trunks.*** These CAMA incoming trunks have appearances on the trunk link network in the CAMA office (never on a service link network). After the called number has been transmitted to the CAMA office, the CAMA office prepares to receive the calling DN either automatically using the ANI feature or by a CAMA operator using the ONI feature.

1.09 For ANI calls, the CAMA tandem office signals the originating office to begin transmission. The originating office returns, via

TABLE A

LIST OF VALID ORIGINATING OFFICE- NO. 1 ESS CAMA TANDEM OFFICE SITUATIONS

TYPE OF CAMA TRUNK USED	FLOWCHART REFERENCE	SITUATION	ORIGINATING OFFICE		CAMA TANDEM OFFICE
			OFFICE FACILITIES	ANI FAILURE OCCURRED	REQUIRES CAMA OPERATOR (ONI)
CAMA-ONI TRUNKS	MF FIG. 10A	CUSTOMER TOLL CALL	NO ANI, NO LAMA	NA	YES
	DP FIG. 11A				
	MF FIG. 10B	MULTIPARTY AND QZ BILLING CUSTOMER TOLL CALL	NO ANI, NO LAMA	NA	YES
	DP FIG. 11B				
	MF FIG. 10C	MULTIPARTY AND QZ BILLING CUSTOMER TOLL CALL	ANI, NO LAMA	NA	YES
	DP FIG. 11C				
	MF FIG. 10D	MULTIPARTY AND QZ BILLING CUSTOMER TOLL CALL	ANI, LAMA, NO OPER. FACILITIES	NA	YES
	DP FIG. 11D				
CAMA-ANI TRUNKS	MF FIG. 12A	CUSTOMER TOLL CALL	ANI, NO LAMA	NO	NO
	DP FIG. 13A				
	MF FIG. 12B	CUSTOMER TOLL CALL	ANI, NO LAMA	YES	NO
	DP FIG. 13B				
	MF FIG. 12C	MULTIPARTY AND QZ BILLING CUSTOMER TOLL CALLS	ANI, NO LAMA	NO	YES
	DP FIG. 13C				
	MF FIG. 12D	MULTIPARTY, QZ BILLING, AND ORIGINATING OFFICE ANI FAILURE CUSTOMER TOLL CALLS	ANI, LAMA	YES	YES
	DP FIG. 13D				
	MF FIG. 12E	MULTIPARTY AND QZ BILLING CUSTOMER TOLL CALL ORIGINATING IN THE NO. 1 ESS CAMA TANDEM OFFICE	ANI, LAMA	NO	YES (*Note*)

Note: IN THIS SITUATION, A MULTIPARTY OR QZ BILLING CALL ORIGINATES IN THE NO. 1 ESS, AND IS CONNECTED TO A CAMA-ANI OUTGOING TRUNK. THIS TRUNK LOOPS AROUND IN THE OFFICE, AND CONNECTS TO A CAMA-ANI INCOMING TRUNK; THEN IS COMPLETED LIKE A TYPICAL CAMA-ANI CALL.

NA — NOT APPLICABLE.

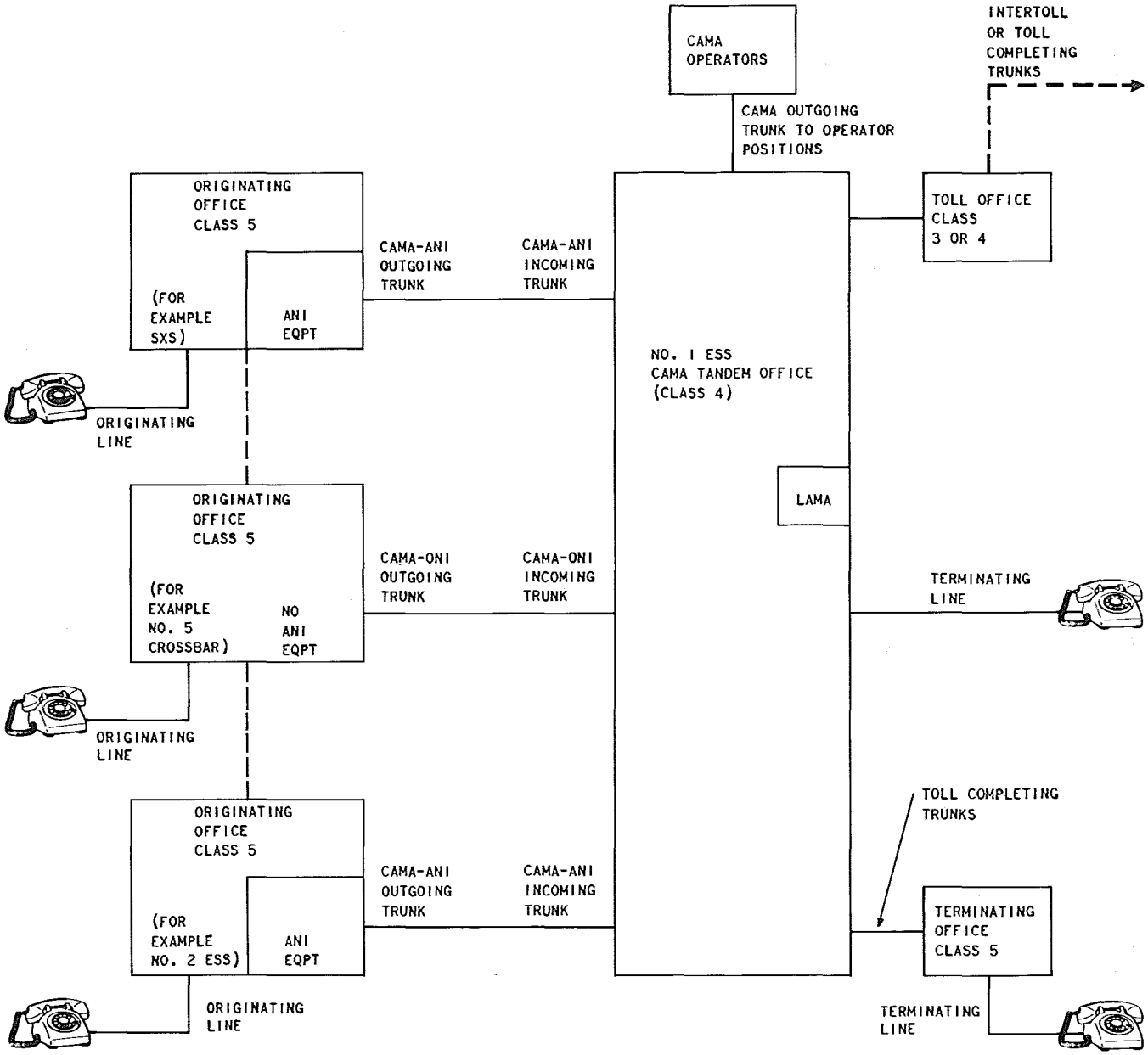


Fig. 1—Typical CAMA-ANI and CAMA-ONI Arrangement

MF signaling over DP or MF trunks, an information digit which specifies the type of handling required for that call and the calling DN (in most cases). If a DN is returned, AMA records are automatically made and the call is allowed to complete. If the information digit specifies that the call is to be QZ billed or that the call originated from a multiparty line, or if the originating office ANI equipment fails to operate properly, the call is forwarded to a CAMA operator who then attempts to determine the calling DN.

1.10 For ONI calls, the originating office sends the called DN via DP or MF pulsing over DP or MF trunks, respectively, to the CAMA tandem office. After receiving the called numbers, the CAMA office connects the CAMA incoming trunk to a ***CAMA operator trunk*** that terminates at a CAMA operator position. The operator attempts to ascertain the calling DN and transmits it to the CAMA tandem office for AMA records using MF pulsing. Then the call is allowed to complete. Refer to Fig. 2 for an illustration of a typical CAMA-ONI call arrangement.

2. CAPABILITIES AND RESTRICTIONS

NUMBER OF NUMBERING PLAN AREAS SERVED (AREA CODES)

2.01 CAMA trunks may originate in ***numbering plan areas (NPAs)*** (area codes) other than that of the No. 1 ESS office equipped with the CAMA machine. There is no limit to the maximum number of originating NPAs that can be handled by the No. 1 ESS CAMA tandem machine; however, no more than three NPAs are expected to be encountered. Figure 3 illustrates a No. 1 ESS CAMA tandem machine serving originating offices in three different NPAs.

2.02 Each CAMA incoming trunk group in the No. 1 ESS CAMA tandem office has the NPA of the originating office associated with it. This is accomplished with the ***CAMA incoming trunk group translator*** in the CAMA tandem office translations. If the CAMA office serves more than one NPA, this translator is used to determine the NPA which will be placed on the AMA record for the call. If the office serves only one NPA, no NPA entry is made on the AMA record for the call.

CALLING DIRECTORY NUMBER VALIDITY CHECKS

2.03 Each CAMA-ONI and CAMA-ANI incoming trunk group has associated with it in the CAMA office translations a set of legal NXX codes (office codes) that may be received on that trunk group as the first three digits of the calling DNs. This list of the NXX codes includes all valid NXX codes served by that trunk group. When a CAMA operator keys in the 7-digit calling DN after it is obtained from the calling party, the No. 1 ESS CAMA machine verifies that the office code keyed in is valid for that incoming trunk group and that the calling DN is not the same as the called DN. The first three digits of QZ billing numbers do not have to appear in this translator since the program checks for a 0 or 1 in the first digit of the office code. If either is present, it assumes a valid number.

2.04 The purpose of this test is to ensure as much as possible that the customer is giving the CAMA operator a valid calling DN.

2.05 When the CAMA office serves more than one NPA, the system verifies that the calling DN office codes received on ANI incoming trunks are valid for that trunk group. This check is not made when the CAMA office serves only one NPA. However, for all CAMA-ANI calls requiring operator assistance, the validity check is made to verify the DN received from the operator. These calls include ANI failures, multiparty, and QZ billing calls from CAMA-ANI trunk groups.

CALLS WAITING

2.06 In a No. 1 ESS CAMA tandem office, CAMA calls requiring operator handling for identification of the calling DN, are put in a queue and receive audible ringing when all occupied operator positions are busy. The calls waiting feature provides CAMA operators and the operator supervisor with a visual indication that calls are waiting in the queue, and also gives some indication of the number of calls waiting per occupied position.

2.07 This visual indication consists of 3 lamps, green, white, and red, that may be located in the same building as the No. 1 ESS CAMA tandem office or in a remote building. When none of the three lamps are lighted, no calls (or very few calls) are in the queue waiting for an available operator. If the green lamp is lighted, only a few

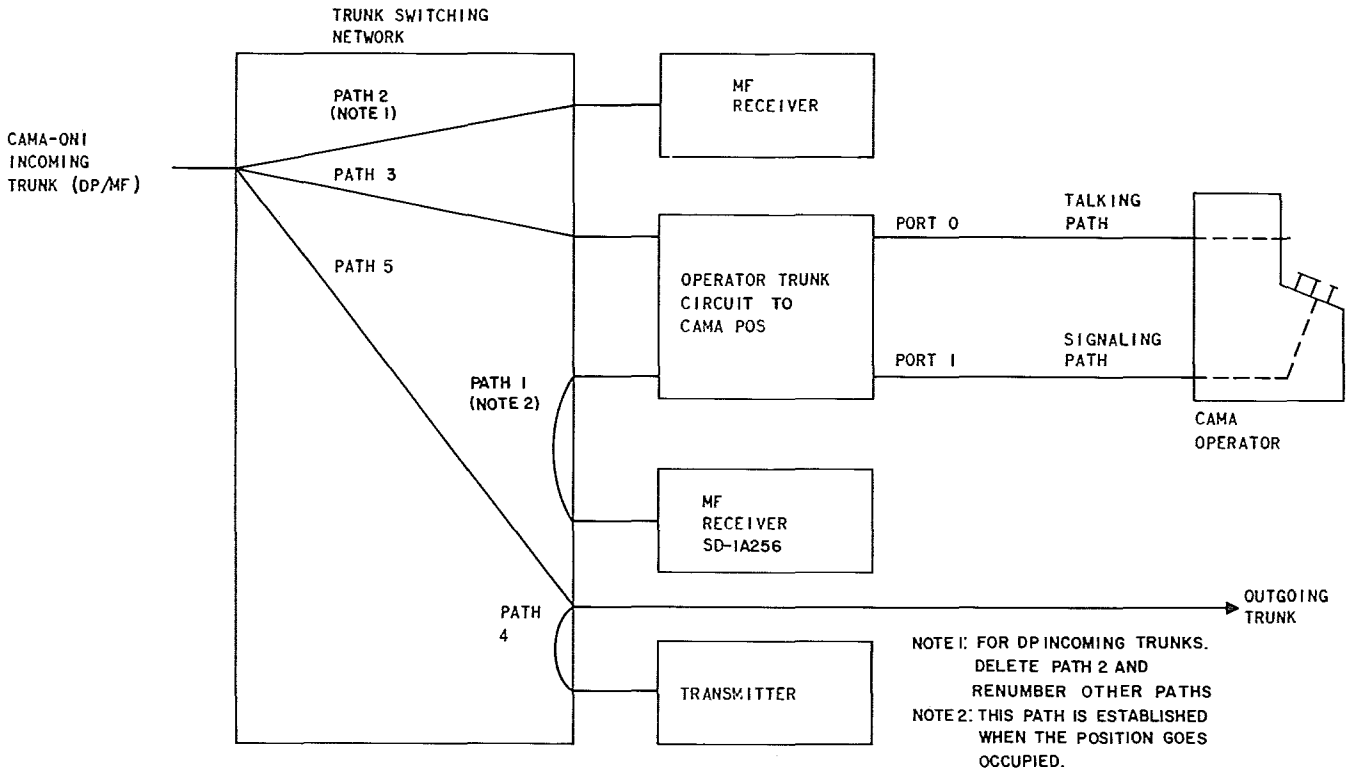


Fig. 2—CAMA-ONI DP/MF Call Arrangement in No. 1 ESS CAMA Tandem Office

calls are waiting. When the white lamp is lighted (green lamp stays lighted also), an approaching overload condition is identified. The lighting of the red lamp (green and white lamps remain lighted) signifies an existing overload condition.

2.08 Every six seconds the system calculates the number of calls waiting per occupied operator position by dividing the number of calls waiting in the queue by the number of occupied operator positions and then compares this value to a specified table of ratios stored in the system. The ratios used for lighting the lamps for three occupied operator team sizes are shown in Table B. During the comparison, if the number of calls waiting per occupied position just calculated is greater than or equal to the ratio stored in memory for that specified number of occupied operator positions (Table B), the lamp that has a ratio fulfilling the criteria is lighted (along with all lower priority lamps).

- Example 1: If there are four operator positions occupied and no calls are waiting, there would be 0/4 or 0 calls waiting per occupied position; therefore, no lamp would be lighted. Six seconds later, the system would recalculate the number of calls waiting per occupied operator position and then would compare the newly derived value with the stored ratio. Calls waiting lamps would then either remain in the same state (if queue length was unchanged) or would change.

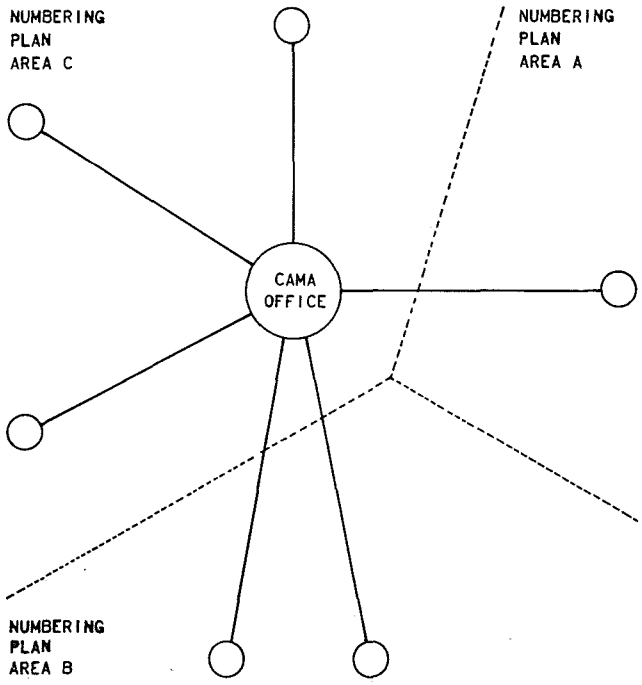


Fig. 3—CAMA Office and Served Offices

TABLE B

CALLS WAITING PER OCCUPIED POSITION

LAMP	OCCUPIED OPERATOR TEAM SIZE		
	1 - 4 OPERATORS	5 - 10 OPERATORS	OVER 10 OPERATORS
NO LIGHTS	0	0	0
GREEN	0.50	0.375	0.25
WHITE	0.75	0.625	0.50
RED	1.50	1.000	1.00

STORED RATIOS

- Example 2: If there are four operator positions occupied and ten calls are waiting in the queue, the system would calculate 10/4 or 2.5 calls waiting per occupied position. This ratio would be compared with the table of ratios stored in the system (Table B). The red lamp as well as the white and green lamps would be lighted, indicating an overload condition. The green lamp would be lighted since $2.5 > .5$; also, the white lamp would be lighted since $2.5 > .75$; the red lamp would be lighted since $2.5 > 1.5$. These three lamps would remain lighted for as many 6-second intervals as the ratio of calls waiting per occupied position remains greater than or equal to the stored table ratio of 1.5.

Since the system only changes the status of the calls waiting lamps every six seconds, it is possible

for the lamps to give erroneous readings for up to six seconds during rapidly fluctuating load conditions.

2.09 Figure 4 shows the calls waiting circuit arrangement used for the same and remote building operation.

CAMA SUSPENSION

2.10 CAMA suspension permits the CAMA operators to abandon their positions in case of an emergency without interrupting traffic. When this feature is activated, all calls offered to the No. 1 ESS equipment for CAMA service that require ONI operation are completed free of charge.

2.11 The CAMA suspension feature may be activated or deactivated via ***abandon switchboard (AS)*** key located near the CAMA operator's positions and associated CAMA suspension circuit (SD-1A317 and SD-1A318) or via maintenance ***teletypewriter (TTY)*** message. The TTY inputs take priority over the CAMA suspension circuit control.

2.12 When CAMA suspension is activated via TTY input message, a minor alarm is sounded in the central office. The system ignores the CAMA suspension circuit (key) and a TTY output message is printed at 6-minute intervals. The TTY output message indicates that CAMA suspension is still in effect. When CAMA suspension is ended via TTY message, scanning of the CAMA suspension circuit is resumed. If the circuit indicates no CAMA suspension, the system leaves CAMA suspension off. If the circuit indicates CAMA suspension, the system immediately turns CAMA suspension back on. If this condition is not desired, the circuit can be taken out of service before ending CAMA suspension via TTY message. When CAMA suspension is terminated, the TTY message printed out every six minutes is also terminated.

2.13 When CAMA suspension is activated via AS key, the CAMA suspension circuit is activated. The system performs a test on the CAMA suspension circuit to verify that there was an actual request; if the request is verified, CAMA suspension begins. A minor alarm is sounded in the central office and a TTY message is printed at 6-minute intervals indicating CAMA suspension is still in effect. If CAMA suspension is ended via AS key, the system performs a test on the circuit to verify the end request. When the end request is verified, the 6-minute TTY messages are suspended and a single TTY message is printed indicating CAMA suspension is terminated. A TTY message is available to remove the CAMA suspension circuit from service; in which case, CAMA suspension can only be activated or deactivated by a TTY message. The CAMA suspension circuit is ignored when it is out of service.

2.14 If CAMA suspension is in effect via CAMA suspension circuit, it can be ended via TTY by first taking the CAMA suspension circuit out of service and then ended via TTY input message.

2.15 Once a day at 2:00 a.m, the system performs a test on the CAMA suspension circuit. During the test, any circuit changes are ignored. If the test is successful, any circuit changes are then accepted. If the circuit fails the test, the circuit is removed from service, a major alarm is sounded, and a TTY message is printed giving the old state and test state of the CAMA suspension circuit ferrods. The ferrod states are then used by the system to identify faulty conditions via the Fault Combination Table (PR-1A069).

CAMA OPERATOR MONITORING FACILITIES

A. General

2.16 Monitoring facilities are provided so that the monitoring operator may monitor any one of the other positions to check the accuracy and the grade of service provided by the operators. Two arrangements of key monitoring facilities are discussed below:

(a) Monitoring from a combined CAMA position where a CAMA position is arranged for both monitoring and regular CAMA operation

(b) Monitoring from a modified 3C or 3CL cord switchboard.

Monitoring on CAMA calls to ***traffic service position system (TSPS)*** is done within the TSPS.

B. Combined CAMA and Monitoring Position

2.17 In order to use a CAMA position for monitoring, the CAMA position must be modified by the addition of a key and a display

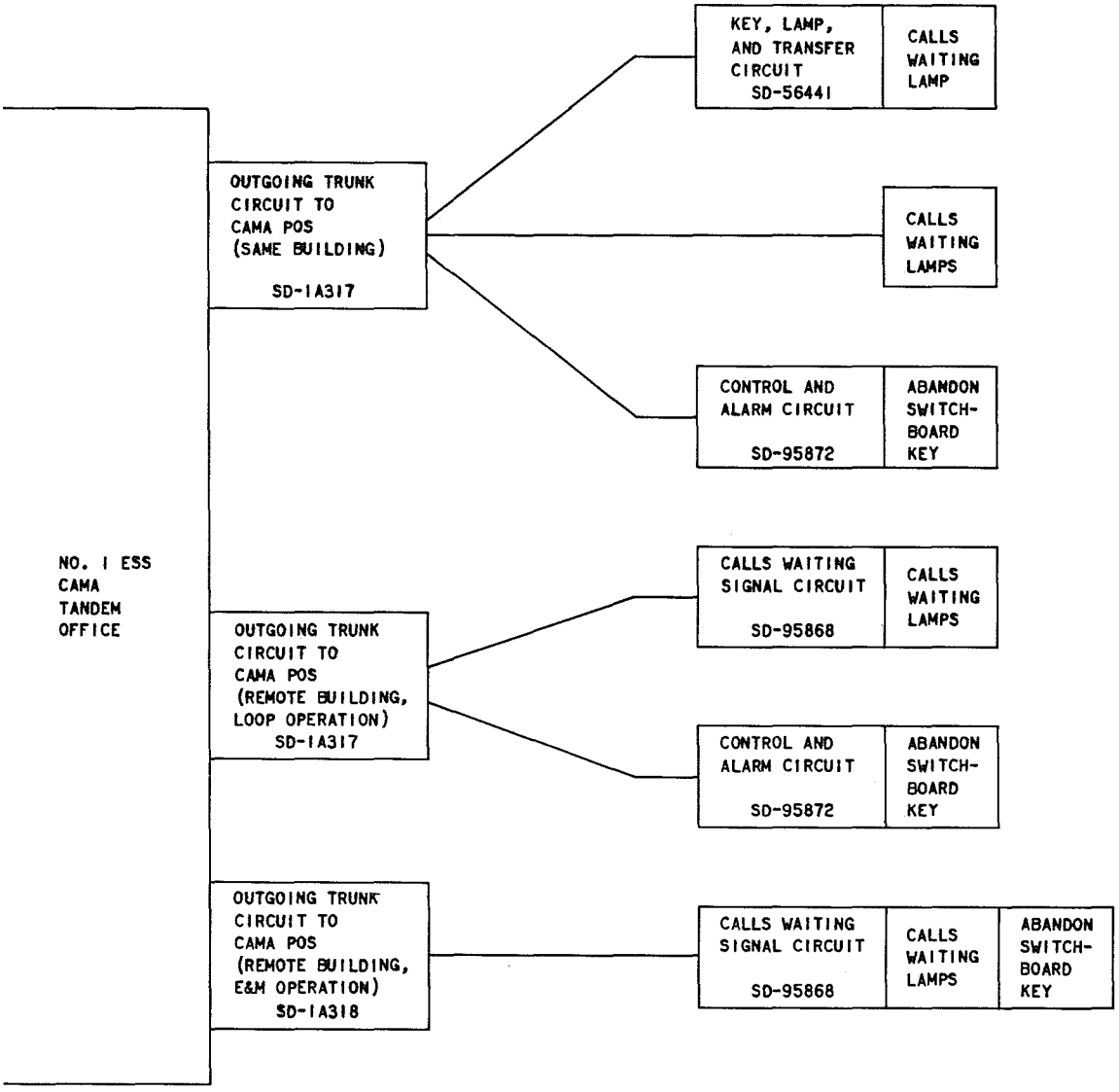


Fig. 4—Calls Waiting and CAMA Suspension Circuit Arrangement

panel. When the key is in the normal position, the operator position operates like a regular CAMA position. The operation of the key prepares this CAMA position for the monitoring operations and makes the position appear unoccupied to the No. 1 ESS. The modified CAMA position panel displays the keyed number and the number of the connected operator position.

2.18 The monitoring position operator selects the position to be monitored by keying in two digits on the MF keyset. The digits are translated by the associated position selecting circuit (SD-27013). Reference should be made to Fig. 5 for a block diagram of the monitoring arrangement for CAMA operator position. When an operating CAMA operator position is being monitored, the key monitoring circuit (SD-27013) displays the CAMA operator keyed numbers as well as all the necessary supervisory signals at the monitor position. The operating position is released by the operation of the ***position disconnect (PD)*** key on the monitoring position.

2.19 When a call is received by the CAMA position, the monitor receives an order tone. The monitor is able to hear all conversation between the calling customer and the CAMA operator. A display of the number keyed in by the CAMA operator appears before the monitor. The display of the keyed number may be deleted by the monitor operating the register ***reset (RS)*** key.

2.20 If the CAMA operator deletes the keyed number by depressing the RS key and rekeys in the called number, the monitoring display is extinguished and the monitor reset lamp in the indicator display panel is lighted. This lamp is locked in until the CAMA operator begins to key again and is extinguished by the subsequent keying of the first digit.

2.21 If a CAMA operator receives a reorder signal from the system, the monitoring operator receives a flashing lamp at the time of reorder. If the CAMA operator operates the PD key, two lamps are lighted on the indicator display panel at the monitoring position.

C. Modified 3C or 3CL Monitoring Position

2.22 The 3C or 3CL operator positions used for key monitoring must be modified to monitor CAMA calls to selected 3C and 3CL positions. A jack is furnished at the monitoring position for each position to be observed. The monitor operator selects the position to be monitored by inserting a cord into the jack associated with the position to be monitored. Reference should be made to Fig. 6 for a block diagram of the monitoring arrangement for 3C and 3CL positions.

CAMA TRUNK MAINTENANCE FACILITIES

A. CAMA-ANI and CAMA-ONI Incoming Trunks

2.23 The No. 1 ESS trunk maintenance philosophy concerning CAMA-ANI and CAMA-ONI incoming trunks does not provide for routine automatic operational testing. Therefore, only manual verification of these trunks is possible from the ***trunk and line test panel (TLTP)*** or the ***supplementary trunk test panel (STTP).*** Trunk testing procedures are given in Section 231-130-301.

B. CAMA Operator Trunks

2.24 The system provides automatic routine trunk maintenance testing on CAMA operator trunk circuits; CAMA operator trunk diagnostic. This diagnostic tests both ports of the two-port CAMA operator trunk circuit. This diagnostic may also be requested from the TLTP, STTP, or maintenance TTYs.

2.25 If the CAMA outgoing trunk is traffic busy, the CAMA operator trunk diagnostic cannot be requested from the TLTP, STTP, or maintenance TTY. The trunk must be made maintenance busy before the diagnostic request is allowed. To make the outgoing trunk maintenance busy, it is necessary to have the CAMA operator position unoccupied [headset removed from ***position occupied (PO)*** jack].

> ***Note:*** As implied, a separate communications link is required between the CAMA operator and the central office in order to perform the trunk diagnostic.

C. CAMA Operator Position Exercise

General

2.26 The main purpose of CAMA operator position exercise is to provide a fast and easy method of verifying that a CAMA operator position is good or bad; and if bad, to give an indication of what

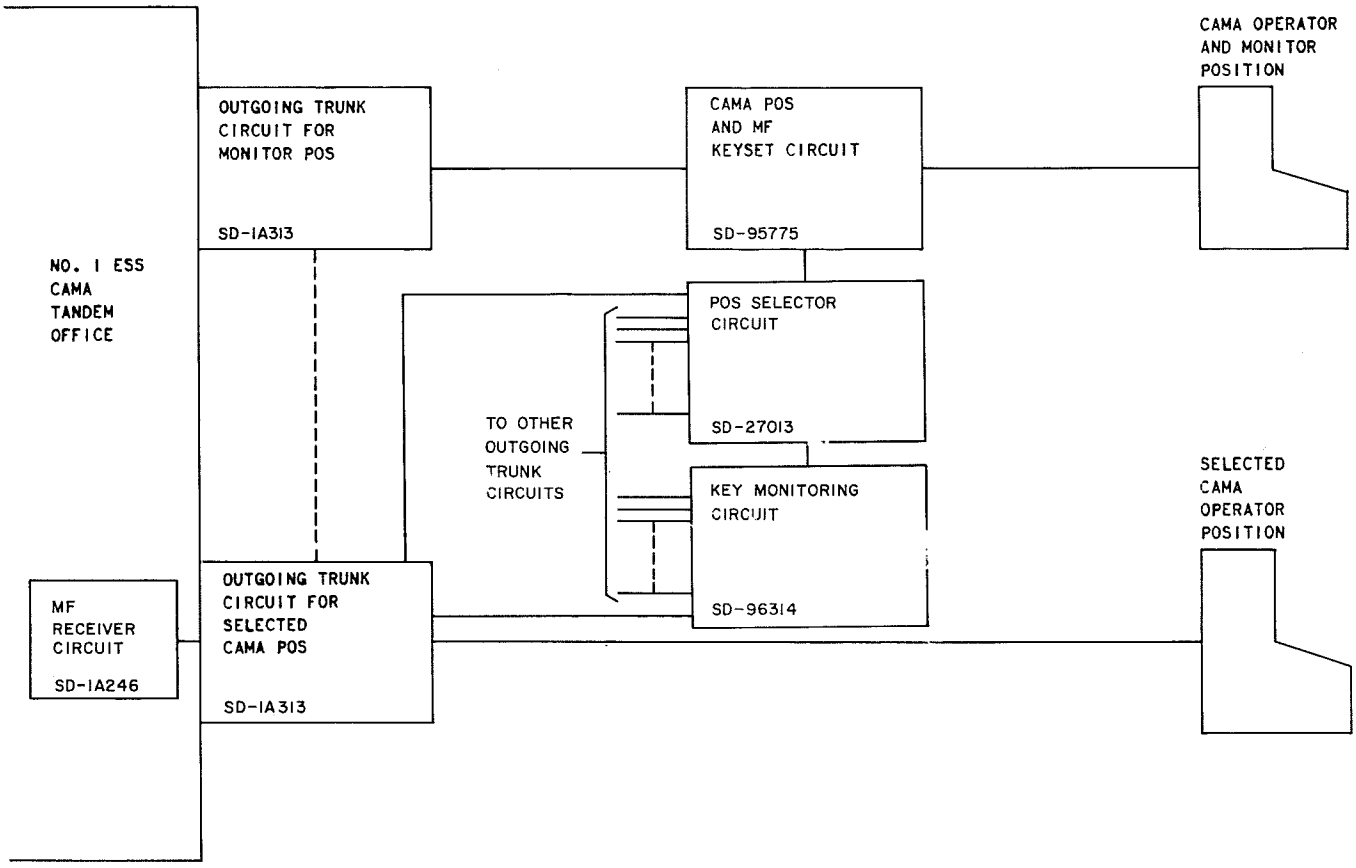


Fig. 5—Monitoring Arrangement for CAMA Operator Position

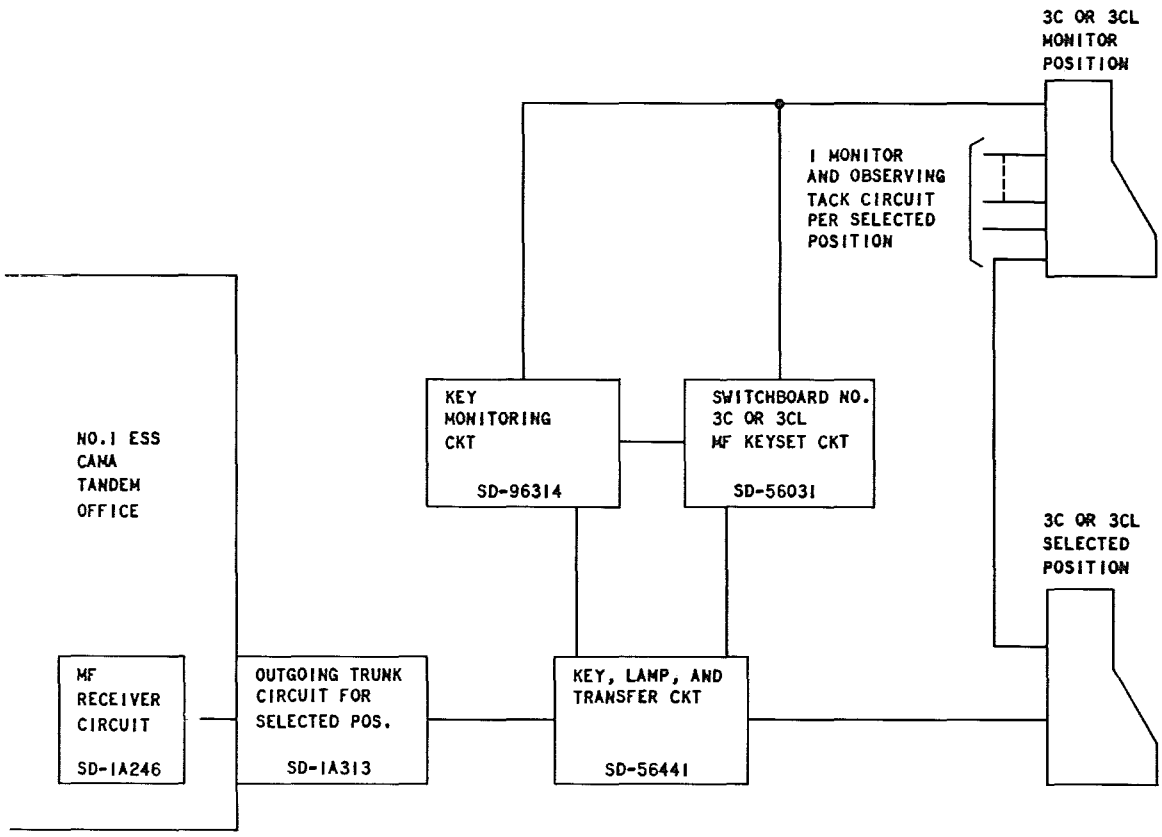


Fig. 6—Monitoring Arrangement for 3C and 3CL Operator Position

is faulty. The operator position exercise verifies the operation of the following:

(a) MF keyset

(b) RS key

(c) PO jack

(d) PD key

(e) Talking and keying paths of a CAMA operator position.

The exercise may be requested either manually from the central office TLTP, STTP, or maintenance TTYs (via TTY message), or automatically by personnel at the CAMA operator position. Pass and fail indications after each individual test are returned to the CAMA operator position. This enables the personnel at the CAMA operator position to know which tests passed and which tests failed. The passing or failing results of the exercise are also printed out on the TTY using existing messages used in diagnosing trunks and service circuits.

2.27 Before the CAMA operator position exercise is started, the CAMA operator trunk diagnostic is automatically performed. If the diagnostic fails, the exercise is not started.

Requesting CAMA Operator Position Exercise From TLTP, STTP, or Maintenance TTY

2.28 The CAMA operator position exercise cannot be requested from the TLTP, STTP, or maintenance TTY if the CAMA outgoing trunk is traffic busy. This trunk must be made maintenance busy before the test is requested. To make the outgoing trunk maintenance busy, it is necessary to inform the CAMA operator at the CAMA operator position to go position unoccupied (remove the headset from PO jack). After the trunk is made maintenance busy, the CAMA operator position should be returned to the occupied state and then the exercise can begin.

Note: As implied, a separate communications link is required between the CAMA operator and the central office in order to perform the exercise.

2.29 The exercise may be initiated by requesting a single diagnostic on either ***trunk network number (TNN)*** (port 0 or port 1) of the CAMA operator trunk. The second digit of the 2-digit test code must be a 1. If it is a 0, only the diagnostic on the CAMA operator trunk is performed. If anything other than a 0 or 1 is used, an output message is printed indicating that the test is not available. No further action is required until the system prints out a TTY message. After analyzing this output message, the CAMA operator trunk can be either idled (thereby making the position available for service) or left maintenance busy for further testing or repair.

Requesting Operator Position Exercise from CAMA Operator Position

2.30 Unlike initiating CAMA operator trunk diagnostic from the TLTP, STTP, or maintenance TTY, no assistance from central office personnel is required by the personnel at the CAMA operator position when requesting the exercise (providing that the CAMA operator trunk is not out-of-service or maintenance busy). Under normal operation, the system waits five seconds after detection of a PO signal before making that position available for handling calls. Within this five seconds, an MF digit (or digits) must be received from the CAMA operator position. If no digit is received by the No. 1 ESS during this 5-second interval, normal CAMA traffic will be routed to this CAMA operator position.

2.31 When an exercise request is detected by the No. 1 ESS, the CAMA operator trunk is placed in the ***trunk out-of-service (TOS)*** state and control is turned over to the CAMA diagnostic program. The system returns steady high tone to the CAMA operator position. It may be several minutes before the exercise request is processed by the No. 1 ESS in the case of a busy office. Steady high tone remains the entire time the CAMA operator trunk stays out-of-service, which means that no more calls are routed to that position. If the CAMA operator position goes into position unoccupied state while the trunk is in the TOS state, the exercise request is cancelled.

2.32 When the exercise request is processed and the diagnostic on the CAMA operator trunk is started, the TOS tone terminates. After the diagnostic is finished, three 500 ms high tone beeps separated by 500 ms of no tone are sent to the CAMA operator position signifying the beginning of the CAMA operator exercise. At the end of

the exercise the passing or failing results are printed out on the maintenance TTY and the CAMA trunk is idled, making the CAMA operator position available for service.

Description of CAMA Operator Position Exercise Test

2.33 Three 500 ms high tone beeps separated by 500 ms of no tone sent to a CAMA operator by the No. 1 ESS signifies the start of the CAMA operator position exercise. If the operator trunk diagnostic previously run fails, the position exercise will not be started; a TTY message is printed indicating the failures.

Note: If a CAMA operator trunk fails the diagnostic, it will not be removed from service.

2.34 After the three 500 ms high tone beeps are received at the operator position, the ***CAMA supervisory (CS)*** lamp is lighted steady. The system begins 6-second timing when the CS lamp is lighted. During this 6-second interval, the RS key must be operated, thereby sending a reset digit to the system. If the system determines the reset digit is invalid, the CS lamp is lighted at 120 ipm for 1.5 seconds, then is returned to steady. If no reset digit is received within six seconds, a time-out occurs, a TTY output message is printed out, and the CAMA operator position exercise is terminated. If the reset digit is valid, the system sends a 75 ms low tone beep to the CAMA operator position.

2.35 Following the 75 ms low tone beep, indicating valid reset digit, or following the 120 ipm/steady CS lamp, indicating invalid reset digit, MF digits 1 through 9 and 0 must be keyed into the system in sequence. The same pass, fail, and time-out indicators used for the reset digit are also used for the MF digits. The next digit may only be keyed after either the 75 ms tone beep is heard or the CS lamp has returned to steady (after flashing) and must be keyed within six seconds.

2.36 The RS key may be used throughout the MF digit part of the exercise providing it functioned correctly in its own test. The following options are available using the RS key during the digits part of the exercise.

(1) Operation of the RS key cancels the results of the last digit, enabling that digit to be retried without incurring a failure. This action can be done more than once on any one digit.

(2) Operation of the RS key twice contiguously cancels the results of all digits that have been keyed. This enables the digit test to be restarted, beginning with digit 1.

The following operations of the RS key cause the exercise to terminate with a TTY failure message printed:

(1) Detection of three reset digits contiguously

(2) Detection of two sets of reset digits at any time during the digits test

(3) Detection of a total of 30 digits including reset digits.

2.37 After the last digit (digit 0) has been received, the system times for six seconds, waiting to receive either a reset digit or PD digit. The reset digit signals the system to use the reset option where the last digit is cancelled and must be retyped. If the system receives the PD digit and it passes, the CS lamp is extinguished, and the exercise is ended. If the CS lamp did not extinguish, the PD function failed. If the PD key did not work, the system times out and terminates the exercise with a TTY failure message.

2.38 At the end of the exercise or when the exercise is deliberately terminated early due to a failure, the CS lamp is extinguished and steady high tone is returned to the attendant for ten seconds. This signals the personnel at the CAMA position that the test is ended. During this ten-second interval the CAMA position must be put in an unoccupied state to avoid a failure message being printed on the maintenance TTY.

D. Transmission Testing of all CAMA Trunks

CAMA-ANI and CAMA-ONI Incoming Trunks

2.39 Transmission tests are available for CAMA-ANI and CAMA-ONI incoming trunks. Calls to type 100, 101, 102, and 105 test lines can be made on CAMA-ANI and CAMA-ONI incoming trunks. Two DNs are provided for each of these test lines; one placing the incoming trunk in the tandem (through-switched) mode and the other, in the local (terminating) mode. Calls to the 105 test line

require no ANI information on ANI trunks and no operator assistance on ONI trunks. This allows automatic transmission testing on these trunks. Calls to all other test lines either require ANI information or operator assistance.

2.40 CAMA-ANI and CAMA-ONI trunks may also be accessed by the NO. 1 ESS STTP or TLTP for manual trunk testing.

CAMA Operator Trunks

2.41 CAMA operator trunks may be accessed by the TLTP or STTP for transmission tests. To access these trunks, it is necessary that the CAMA position be initially unoccupied. Tests may be performed on either of the transmission pairs by selecting the corresponding part of the CAMA operator trunk. Trunk testing procedures are given in Section 231-130-301.

3. EQUIPMENT DESCRIPTION

NO. 1 ESS CAMA TANDEM EQUIPMENT ELEMENTS

A. CAMA-ONI Incoming Trunks

3.01 CAMA-ONI incoming trunks coming into the No. 1 ESS CAMA tandem office may handle the following types of traffic:

(a) Customer toll calls that originate in an office not having ANI or LAMA equipment (MF and DP trunks)

(b) Multiparty and QZ billing customer toll calls that originate in an office not having ANI or LAMA equipment (MF and DP trunks)

(c) Multiparty and QZ billing customer toll calls that originate in an office having ANI equipment, but not having LAMA facilities (MF and DP trunks)

(d) Multiparty and QZ billing customer toll calls that originate in an office having ANI and LAMA facilities, but not having operator services to handle toll calls (MF and DP trunks).

3.02 The incoming CAMA-ONI traffic is received on dedicated incoming trunk groups [designated CAMA-ONI incoming trunks via ***trunk group number (TGN)*** translations]. Each trunk group receives either immediate dial DP or wink start MF signaling from the originating office. The types of trunks that may be used for incoming CAMA-ONI traffic are listed in Table C.

3.03 When a seizure is detected on an MF type CAMA-ONI incoming trunk, it is connected to an MF receiver, and a wink start signal is sent to the originating office. A KP pulse, dialed number, and ST pulse are then received from the originating office. The called number is received using present digit collection and permanent signal partial dial techniques. The called number formats received from the originating office on MF trunks are shown in Table D. After the ST pulse is received from the originating office, an off-hook signal is sent to the originating office and the MF receiver connection is taken down.

3.04 When a seizure is detected originating in a remote office on a DP type CAMA-ONI incoming trunk, immediate dial operation is expected; therefore, no connection is made to a receiver. Only the called number is received in the office when immediate dial operation is used. The called number is received using present digit collecting techniques. Normal permanent signal and partial dial, as well as abandon actions, will be taken during called number digit collection. This provides a maximum 8-16 seconds to elapse without a digit received or between digits before putting the trunk on the high and wet list. The called number formats received from the originating office or DP trunks are shown in Table E. After the last digit of the called number is received from the originating office, the CAMA-ONI (MF or DP) incoming trunk is connected to Port 0 of the CAMA operator trunk and then an off-hook signal is sent to the originating office.

3.05 In the meantime, the originating office sets up the talking path between the customer and the CAMA-ONI outgoing trunk.

TABLE C

CAMA-ONI AND CAMA-ANI INCOMING TRUNKS

SD NUMBER	SUPV	2 OR 4 WIRE CIRCUIT	SIGNALING	START DIAL SIGNAL	FRAME TYPE
SD-1A192	LOOP	2W	MF	WINK	UNIVERSAL TRUNK FRAME
SD-1A311	LOOP	2W	DP	IMMEDIATE	SPECIAL FRAME*
SD-1A312	E&M	2W	MF	WINK	UNIVERSAL TRUNK FRAME
SD-1A163	E&M	2W	DP	IMMEDIATE	MISC. TRUNK FRAME
SD-1A236	E&M	4W	MF	WINK	MISC. TRUNK FRAME
SD-1A237	E&M	4W	DP	IMMEDIATE	MISC. TRUNK FRAME

* This frame is a modification of the frame used for SD-1A220 by-link trunks.

TABLE D

CALLED NUMBER FORMATS FOR CAMA-ONI AND CAMA-ANI MF TRUNKS

TYPE OF DIALED NUMBER	DIGITS SENT FROM ORIGINATING OFFICE TO CAMA OFFICE		
THREE DIGIT DN	KP(12)	411	ST
SEVEN DIGIT DN	KP(12)	NXX-XXXX	ST
TEN DIGIT DN	KP(12)	NXX-NXX-XXXX	ST

TABLE E

CALLED NUMBER FORMATS FOR CAMA-ONI AND CAMA-ANI DP TRUNKS

TYPE OF DIALED NUMBER	DIGITS SENT FROM ORIGINATING OFFICE TO CAMA OFFICE
THREE DIGIT DN	411
SEVEN DIGIT DN	NXX-XXXX
TEN DIGIT DN	NXX-NXX-XXXX

B. CAMA-ANI Incoming Trunks

3.06 CAMA-ANI incoming trunks coming into the No. 1 ESS CAMA tandem office may handle the following types of traffic:

(a) Customer toll calls originating in an office having ANI equipment, but not having LAMA facilities (MF or DP)

(b) Customer toll calls originating in an office having ANI equipment and no LAMA facilities, but encountering an ANI failure (MF or DP trunks)

(c) Multiparty and QZ billing customer toll calls originating in an office having ANI equipment, but not having LAMA facilities (MF or DP trunks)

(d) Multiparty, QZ billing, and originating office ANI failure customer toll calls originating in an office having ANI and LAMA facilities, but not having operator services to handle toll calls (MF or DP trunks)

(e) Multiparty and QZ billing customer toll calls originating in the No. 1 ESS CAMA tandem office which has LAMA and ANI facilities, but requires CAMA handling for toll calls (MF trunks).

3.07 Incoming CAMA-ANI traffic is received on dedicated incoming trunk groups (designated CAMA-ANI incoming trunks via trunk group number translations). Each trunk group receives either by-link DP or MF signaling from the originating office. The types of trunks that may be used for incoming CAMA-ANI traffic are listed in Table C.

3.08 When a seizure is detected on a CAMA-ANI incoming MF trunk, it is connected to an MF receiver and a wink start dial signal is sent to the originating office. A KP (12) digit, called DN, and ST pulse is then returned by the originating office. The called number formats received from the originating office on MF trunks are shown in Table D. The called number is collected using present digit collecting techniques.

3.09 When a seizure is detected on a CAMA-ANI incoming DP trunk, immediate dial operation is expected; no start dial wink signal is sent to the originating office and only the called number is received from the originating office. After receiving the last digit of the called number, an MF receiver is connected to the incoming trunk. The called number formats received from the originating office on DP trunks are shown in Table E. The called number is collected using present digit collecting techniques.

3.10 After receiving the last digit of the called number and connecting an MF receiver in the case of DP trunks, or receiving the ST digit in the case of MF trunks, an off-hook signal is sent to the originating office by the incoming trunk circuit. This off-hook signal is referred to as an ANI request signal and remains for the duration of the entire call. Scanning is then started for the calling DN from the originating office ANI equipment. All digits are ignored from the originating office until a KP signal is received. The calling number MF formats that may be used on CAMA-ANI MF or DP incoming trunks are illustrated in Table F.

3.11 Following the KP digit is an information digit that identifies the type of handling required by the calling customer, and additional information (if any) to follow. Information digits for CAMA-ANI incoming MF and DP trunks are as follows.

INFORMATION DIGIT	FUNCTION
0—	Calling station has been identified; billing number will follow.
1—	Multiparty or special billing; billing number will not follow.
2—	ANI failure; calling DN will not follow.
3—	Same as information digit 0, but call serviced observed.
4—	Same as information digit 1, but call serviced observed.
5—	Same as information digit 2, but call serviced observed.

TABLE F

CALLING NUMBER MF SIGNALING FORMATS
FOR CAMA-ANI MF OR DP TRUNKS

FUNCTION	FORMAT	COMMENTS
STATION IDENTIFIED	KP 0 NXX-XXXX ST	
	KP 3 NXX-XXXX ST	SERVICE OBSERVED
MULTIPARTY OR QZ BILLING DN	KP 1 ST*	
	KP 4 ST*	SERVICE OBSERVED
ANI FAILURE	KP 2 ST*	
	KP 5 ST*	SERVICE OBSERVED

* THE ST DIGIT IS NOT RECEIVED FROM A STEP-BY-STEP OFFICE.

Following information digits 0 and 3, a calling (billing) DN is received. Then an ST digit is received designating the end of the transmission. If eight seconds elapse between the transmission of the ANI request signal and the reception of the calling DN and the ST signal, or if other than two frequencies are received for a digit, or an illegal ST signal is received, or if other than a 7-digit calling DN is received, the call is considered an ANI failure and is routed to a CAMA-ONI operator.

3.12 After the calling DN is collected it is placed along with the proper NPA (if any incoming trunk group in the office is from a foreign NPA) on the AMA record of the call. All calls are billed as toll calls, AMA Type 01. The call is then routed to the called number, located either locally or in a distant office, in the normal manner. The routing is determined by using the screening line equipment number associated with the incoming trunk group (via 3- or 6-digit translator).

3.13 When information digit 1, 2, 3, 4, or 5 is received, the call is routed immediately to an operator for number identification. Since the ST signal is received from all offices over CAMA DP or MF incoming trunks, except from step-by-step offices, the No. 1 ESS ignores an ST signal if it is received after these information digits.

3.14 During switching of the incoming trunk, off-hook supervision is maintained toward the originating office. If a disconnect signal is received from the originating office, the call is considered ended.

C. CAMA Operator Trunks

3.15 A CAMA operator trunk is seized from the list of available operator trunks, as described in 3.26 and 3.27, in the No. 1 ESS CAMA office for ONI calls. The operator trunk terminates at one of the following operator positions:

(a) CAMA position (Fig. 7)

(b) Modified 3C or 3CL switchboard (Fig. 8)

(c) TSPS system (Fig. 9).

The CAMA operator trunk circuits are hard wired to the CAMA operator position for cases (a) and (b). Reference should be made to Table G for the types of CAMA operator trunks.

3.16 After the called DN has been received from the originating office, the CAMA incoming trunk is connected to Port 0 of a 2-Port CAMA operator trunk circuit that is located on the

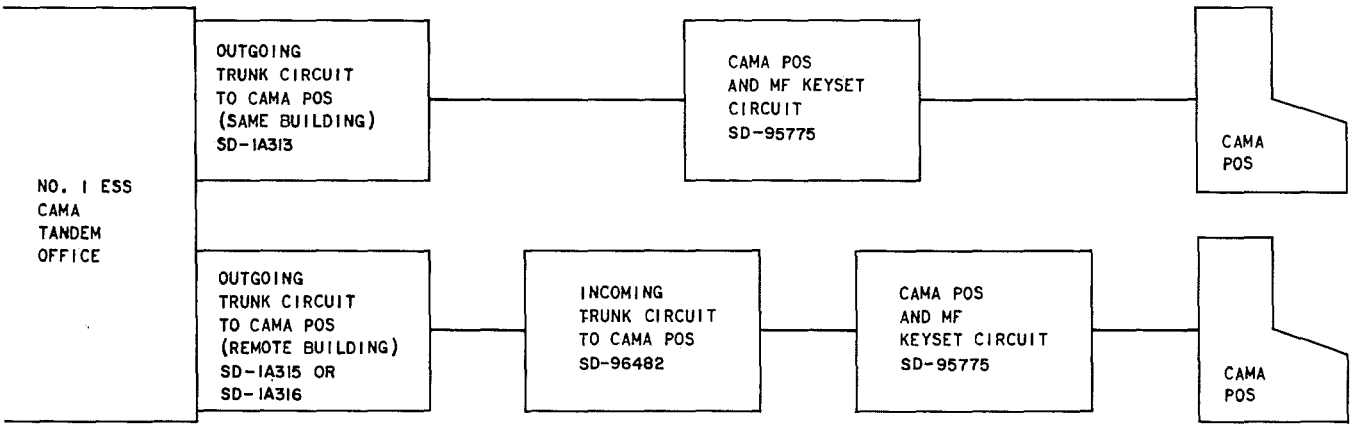


Fig. 7—CAMA Arrangement to CAMA Operator Position (Same and Remote Building)

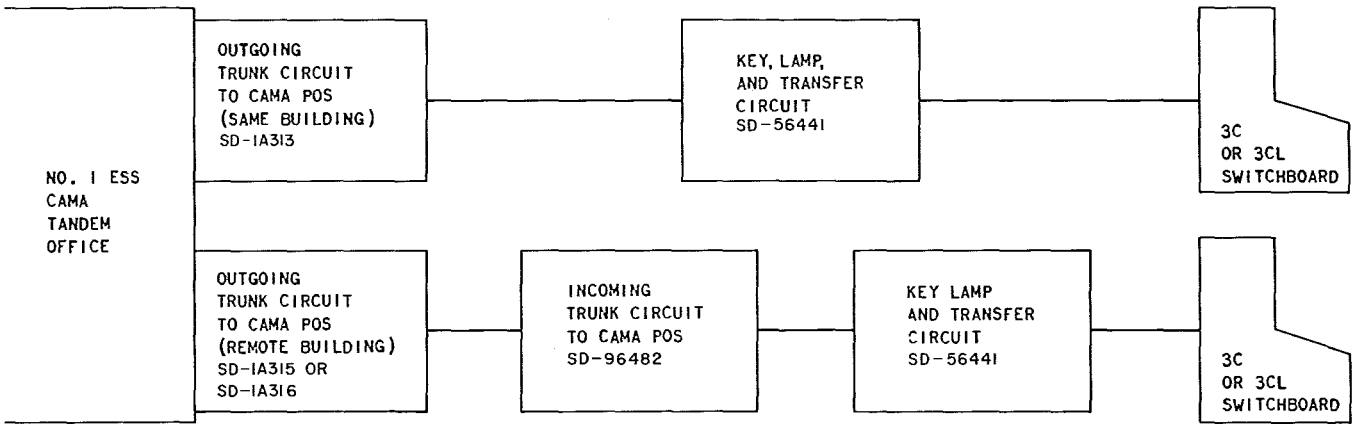


Fig. 8—CAMA Arrangement to Modified 3C or 3CL Switchboard (Same and Remote Building)

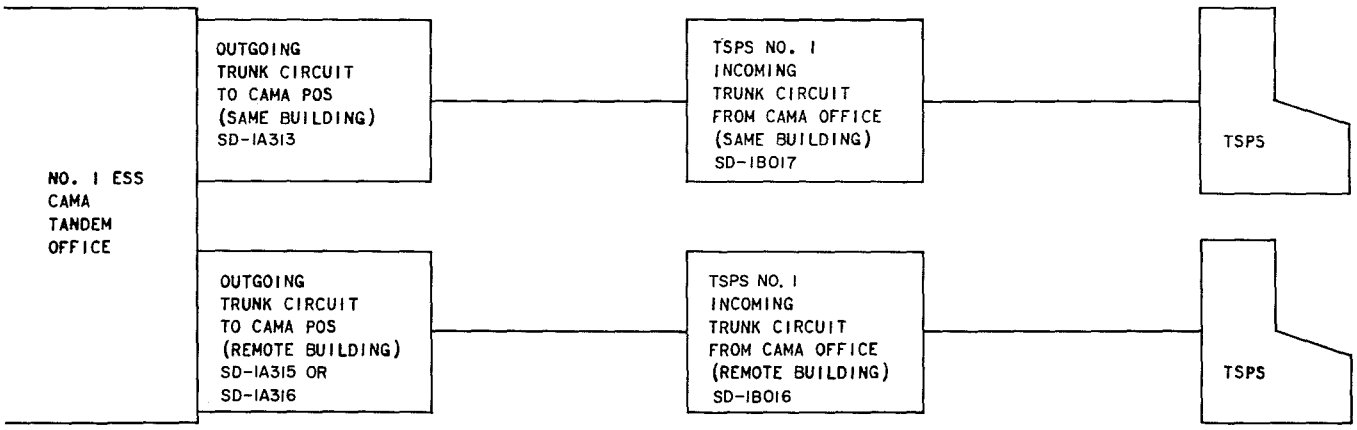


Fig. 9—CAMA Arrangement to TSPS (Same and Remote Building)

TABLE G

CAMA OPERATOR TRUNKS

USE	SD NUMBER	SUPV	FRAME TYPE
OUTGOING TRUNK TO CAMA SAME BLDG	SD-1A313	DIRECT	MISC. TRUNK FRAME
OUTGOING TRUNK TO CAMA REMOTE	SD-1A315	LOOP	MISC. TRUNK FRAME
OUTGOING TRUNK TO CAMA REMOTE	SD-1A316	E & M	MISC. TRUNK FRAME
CALLS WAIT CAMA SUSPENSION SAME BLDG	SD-1A317	DIRECT	MISC. TRUNK FRAME
CALLS WAIT CAMA SUSPENSION REMOTE	SD-1A317	LOOP	MISC. TRUNK FRAME
CALLS WAIT CAMA SUSPENSION REMOTE	SD-1A318	E & M	MISC. TRUNK FRAME

miscellaneous trunk frame in the CAMA office (Fig. 2). Port 1 of the CAMA operator trunk circuit is connected to an MF receiver from a dedicated trunk group and this network path remains established until the operator headset is unplugged, signaling the position is unoccupied.

3.17 Operator trunk circuits are always in one of three broad states.

(a) ***Unoccupied***—The operator position associated with the trunk circuit is unoccupied and, therefore, the circuit is not available for handling calls.

(b) ***Occupied and Busy***—The operator position associated with the trunk circuit is occupied and the operator is busy handling a call.

(c) ***Occupied and Idle***—The operator position associated with the trunk circuit is occupied and is available for handling a CAMA call.

These three states should not be confused with the CAMA operator trunk circuit states for Port 0 and Port 1 (Table H). Only a CAMA outgoing operator trunk circuit that is in the occupied and idle state can be selected by the CAMA office for processing a CAMA-ONI call.

3.18 If no CAMA outgoing operator trunk circuit is idle when a connection is required, the system puts the incoming call in a queue for an idle operator. The incoming trunk is disconnected from the receiver and connected to an audible ringing trunk and is held there indefinitely, although the expected hold time is a maximum of 24 seconds. If the queue for idle operator is already maximum length when a call is incoming, the call is routed to common overflow (trunk group and equipment overflow).

3.19 The queue for an idle operator has a dynamically changing maximum length which is calculated by the system to be four times the number of occupied operator circuits; however, if there are no operator positions occupied, the maximum length of the queue is four.

TABLE H

CAMA OPERATOR TRUNK CIRCUIT STATES

STATE	CAMA OPERATOR TRUNKS – PORT	
	PORT 0	PORT 1
UNOCCUPIED	IDLE	IDLE
OCCUPIED AND IDLE	IDLE	TANDEM ONI
OCCUPIED AND BUSY	VARIABLE *	TANDEM ONI

* DETERMINED BY THE STAGE OF THE CALL DURING ANY GIVEN TIME.

EQUIPMENT ELEMENTS EXTERNAL TO CAMA TANDEM OFFICE

A. CAMA-ONI Outgoing Trunks (Originating Office)

3.20 A CAMA-ONI outgoing trunk is seized in a remote office when a customer originates CAMA calls as described in 3.01. These trunks are referred to as CAMA-ONI incoming trunks after they terminate at the No. 1 ESS CAMA tandem office.

3.21 CAMA-ONI outgoing trunks may be either DP or MF trunks. If the outgoing trunk uses MF signaling, a start dial wink signal must be received from the CAMA tandem office before outpulsing is allowed. (The CAMA office must detect a seizure on a particular incoming trunk before it transmits a start dial wink signal.) If the CAMA-ONI outgoing trunk uses DP signaling, then immediate dial operation is used; no start dial signal is received. (Most CAMA-ONI outgoing trunks using DP signaling will be used between step-by-step originating offices and a No. 1 ESS CAMA tandem office.) After the start dial wink signal has been received (if applicable), the originating office outpulses the entire called number to the No. 1 ESS CAMA tandem office. For MF outgoing trunks, the called number is prefixed with a KP (12) digit and ends with an ST pulse. If the call originated in an office using DP outgoing trunks, the prefix digit is required, but is absorbed by the originating office in the process of setting up the switching path from the customer to the CAMA-ONI outgoing trunk. The outpulsed digits, in this case, are directly generated by the customer's subset. After the last digit is outpulsed over a DP CAMA outgoing trunk or after the ST pulse is sent over an MF CAMA outgoing trunk to the CAMA office, an off-hook signal is received from the CAMA office. (The off-hook signal is maintained for the entire length of the call.) A talking path is then established between the customer and the CAMA-ONI outgoing trunk for offices using MF outgoing trunks. This path already exists in the case of step-by-step originating office. The No. 1 ESS CAMA tandem office then determines the calling party address using the CAMA operator, routes the call as specified by the called number, and makes the proper AMA records without any further signaling to the originating office.

3.22 As previously stated, the off-hook signal from the No. 1 ESS CAMA tandem office is maintained for the duration of the call. If the called party disconnects, the CAMA office performs disconnect timing before taking down the call and sending an on-hook signal to the originating office. If the calling party disconnects, an on-hook signal is sent to the No. 1 ESS CAMA tandem office to denote the end of the call.

B. CAMA-ANI Outgoing Trunks (Originating Office)

3.23 A CAMA-ANI outgoing trunk is seized in a remote office when a customer originates CAMA calls as described in 3.06. In the case of multiparty and QZ billing toll calls originating in the No. 1 ESS CAMA tandem office, calls are routed to CAMA-ANI outgoing MF trunks as if the No. 1 ESS were sending the call to a remotely located CAMA office. But, in this case, the outgoing trunk loops around and is handled in the same manner as regular incoming CAMA calls (on CAMA-ANI incoming trunks). After termination in the No. 1 ESS CAMA tandem office, CAMA-ANI outgoing trunks are referred to as CAMA-ANI incoming trunks. Also, CAMA-ANI outgoing trunks may be either DP or MF type trunks. If the outgoing trunk uses MF signaling, a start dial wink signal must be received from the CAMA tandem office before outpulsing is allowed. (The CAMA

office must detect a seizure on a particular incoming trunk before it transmits a start dial wink signal.) If the CAMA-ANI outgoing trunk uses DP signaling, immediate dial operation is used; no start dial wink signal is sent. After outpulsing the last digit of the called number (in the case of DP trunks) or the ST digit (in the case of MF trunks), an off-hook signal is received from the CAMA tandem office. This off-hook signal is referred to as an ANI request signal and remains for the duration of the call. The originating office then outpulses a KP digit, an information digit 0 (indicating the calling DN will follow), the calling DN which was received from the ANI equipment, and an ST digit using MF signaling. If the originating customer is a multiparty line or a special billing class line, the information digit 1 is outpulsed and no calling number is outpulsed. This type of call requires CAMA-ONI handling in the No. 1 ESS CAMA tandem office. If the ANI equipment in the originating office fails to determine the calling DN, the information digit 2 is outpulsed and a calling DN is not outpulsed. The CAMA-ONI feature is also required to handle this type of call properly. The originating office then connects a talking path from the subscriber line appearance to the CAMA-ANI outgoing trunk, and thereby to the CAMA tandem office, and then supervises for disconnect.

3.24 As previously mentioned, the off-hook signal from the No. 1 ESS CAMA tandem office is maintained for the duration of the call. If the called party disconnects, the CAMA office performs disconnect timing before taking down the call and sending an on-hook signal to the originating office. If the customer abandons the call after the seizure of the CAMA-ANI outgoing trunk, but before the talking path is established, a disconnect signal is sent to the CAMA tandem office to terminate the call.

C. Operator Positions

3.25 CAMA operators may be a CAMA position, modified 3C or 3CL switchboard, or a TSPS. Each operator position has an appearance on the No. 1 ESS CAMA trunk switching network through the CAMA operator trunk circuit. Each type of operator position may be located either in the same building as the No. 1 ESS, or located in a remote building. Refer to Fig. 7, Fig. 8, and Fig. 9 for interfacing circuits used for operator positions. Also, refer to Table I for definition of operator positions keys, lamps, and audible signals.

3.26 Initially, the operator position and CAMA operator trunk circuit are in the ***unoccupied state*** (meaning the operator is not available for handling calls). When an operator plugs a headset into the operator position console, a seizure is sent to the No. 1 ESS CAMA office via outgoing trunk circuit. When this signal is received, an MF receiver from the dedicated CAMA trunk group is connected to Port 1 of the CAMA operator trunk. If no receiver is available from the pool, a TTY message is printed and a connection is made between a system MF receiver trunk group and Port 1 of the operator trunk. The system times for five seconds during which time any digits that are received from the CAMA position are interpreted as a request for a position exercise. (Refer to Part 2 for a description of CAMA trunk maintenance facilities—CAMA operator position exercise.) If no digits are received, the CAMA operator position is considered to be in the occupied and idle state and, therefore, available for handling calls. Thus, whenever a CAMA operator position goes occupied and idle, a CAMA register 1, associated with the path between the operator and receiver is placed on the available operator link list. When a CAMA-ONI call requires an operator, this link list is searched for an available operator.

3.27 If the CAMA operator position is taken out-of-service either manually or by the system, a TOS tone (steady high tone) is given to the operator. The CAMA operator trunk may be on either the high and wet list or the TOS list. If the trunk is on the high and wet list, the operator may return the position to service by unplugging the headset and then plugging it back in. If the trunk is on the TOS list, the trunk cannot be restored to service by the operator; the TOS tone will remain.

3.28 When a CAMA call is being directed to a specified operator position, that operator receives both visual and audible indications. Audible zip tones are received via operator headset indicating an incoming CAMA call and type of incoming call and then the CS lamp is lighted steady. One long tone, from 0.75 to 1.0 seconds duration identifies a CAMA call resulting from ANI failure; two short tones 100 ms duration each, but separated by 100 ms of silence, identifies a normal incoming CAMA-ONI call, multiparty call, or QZ billing call. At this point during call processing, an appropriate phrase is used by the operator requesting the calling DN. Upon receiving the calling DN, the operator

TABLE I

OPERATOR POSITION
KEYS, LAMPS, AND AUDIBLE SIGNALS

	KEYS, LAMPS, OR TONE	COMMENTS	OPERATOR POSITION
KEYS	MF KEY SET	Multifrequency key set	CAMA and 3CL
	PD KEY	Position disconnect key	
	RS KEY	Reset key	
	TR KEY	Transfer key	3CL only
LAMPS	CS LAMP	CAMA supervisory lamp • 120 IPM - Oper. Reorder • STEADY - Seizure • DARK - Idle	CAMA and 3CL
	CW LAMP	Calls waiting lamp • STEADY - One or more calls waiting • DARK - No calls waiting	3CL only
	TR LAMP	Transfer Lamp • STEADY - Transfer effective (able to handle CAMA traffic) • DARK - Transfer not effective	3CL only
AUDIBLE TONES	SINGLE LONG TONE	0.75 - 1.00 seconds duration indicates ANI failure call	CAMA and 3CL
	TWO SHORT TONES	100 ms each duration indicates ONI call	
	STEADY HIGH TONE	Trunk out-of-service	
	SINGLE LOW TONE	800 ms of low tone indicates pass on CAMA operator position exercise	

Note: Reference should be made to Section 250-100-101 for the description of the TSPS position.

keys it into the No. 1 ESS CAMA office. After receiving seven digits from the operator, the system waits for one second to ensure that no more digits will be received. (This is a normal CAMA-ONI call processing situation.) Refer to Table J for complete information concerning the system's processing of operator signals. The progress of the normal CAMA-ONI call is exemplified by the shaded blocks of data in Table J, starting with State 1, First Digit.

3.29 The CAMA office now does a calling DN validation check using the CAMA incoming trunk group translator to ensure that the customer has given the calling DN (not the called DN) and to verify that the calling DN given by the customer is valid for the particular CAMA ANI or ONI trunk handling the CAMA call. A check is made for a QZ billing DN by verifying that a 0 or 1 appears in the NXX code. If a 0 or 1 does appear in the first or second digit, the QZ billing DN is assumed to be valid.

3.30 If the calling DN is valid, the path between the CAMA incoming trunk and the CAMA operator Port 0 is abandoned. The CAMA operator position is put back into the ***occupied and idle state,*** the CS lamp is extinguished, and then the CAMA call is allowed to complete.

3.31 If the calling DN, which was keyed into the system, is invalid, the CAMA office goes through a reorder procedure. The CS lamp is flashed at 120 ipm and voice transmission to the customer is possible. The operator may then do one of two things.

(1) Initiate a procedure to clear the reorder condition by depressing the RS key which clears the CAMA office register that receives the calling DN. After the register has been cleared by the system, the CS lamp is lighted steady. The operator reconfirms the calling DN and then keys it into the CAMA office. If the DN is valid, the CS lamp is extinguished and the call is completed. The operator trunk is then put into the occupied and idle state. If the DN is identified invalid again, the reset procedure may be reinstituted or a position disconnect (or abandon) procedure may be instituted.

(2) Initiate a position disconnect by depressing the PD key which signals the CAMA office to disconnect the call. This action connects regular overflow to the CAMA incoming trunk and puts the operator trunk in an occupied and idle state.

4. TYPICAL OPERATING SEQUENCE FLOWCHARTS

4.01 This part gives flowcharts illustrating the typical operating sequences of CAMA call situations listed in Table A.

4.02 Refer to Fig. 10 for the following (MF trunks).

(a) Customer dials toll call that originates in an office not having ANI or LAMA.

(b) Multiparty or QZ billing customer dials toll call that originates in an office not having ANI or LAMA.

(c) Multiparty or QZ billing customer dials toll call that originates in an office having ANI equipment, but not having LAMA.

(d) Multiparty or QZ billing customer dials toll call that originates in an office having ANI and LAMA, but not having toll operator facilities.

4.03 Refer to Fig. 11 for the following (DP trunks).

(a) Customer dials toll call that originates in an office not having ANI or LAMA.

(b) Multiparty or QZ billing customer dials toll call that originates in an office not having ANI or LAMA.

(c) Multiparty or QZ billing customer dials toll call that originates in an office having ANI equipment, but not having LAMA.

(d) Multiparty or QZ billing customer dials toll call that originates in an office having ANI and LAMA, but not having toll operator facilities.

4.04 Refer to Fig. 12 for the following (MF trunks).

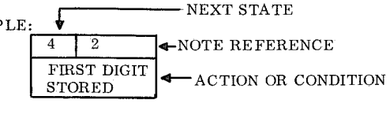
(a) Customer dials toll call that originates in an office having ANI equipment, but not having LAMA facilities.

TABLE J

SYSTEM PROCESSING OF CAMA OPERATOR SIGNALS

INPUT→ / STATE ↓	FIRST DIGIT	SECOND DIGIT	THIRD DIGIT	FOURTH DIGIT	FIFTH DIGIT	SIXTH DIGIT	SEVENTH DIGIT	ILLEGAL DIGIT	RS KEY	TIME-OUT	PD KEY	ABANDON (CALLING PARTY)
0 - ILLEGAL (NO CONNECTION TO OPERATOR)	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR
1 - NORMAL DIGIT COLLECTION	1 FIRST DIGIT STORED	1 SECOND DIGIT STORED	1 THIRD DIGIT STORED	1 FOURTH DIGIT STORED	1 FIFTH DIGIT STORED	3 SIXTH DIGIT STORED TIME FOR 5 SEC	2 ERROR	2 4 DIGITS CLEARED REORDER GIVEN	1 DIGITS CLEARED	2 ERROR	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN
2 - REORDER (AFTER 1 ILL DIGIT OR TIME-OUT OR INVALID DIGIT)	2 DIGIT IGNORED	2 DIGIT IGNORED	2 DIGIT IGNORED	2 DIGIT IGNORED	2 DIGIT IGNORED	2 ERROR	2 ERROR	2 DIGIT IGNORED	4 REORDER REMOVED	2 ERROR	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN
3 - NORMAL DIGIT COLLECTION FOR 7th DIGIT (ON 5-SECOND TIMING, NO REORDER)	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	7 SEVENTH DIGIT STORED TIME FOR 1 SEC	2 4 DIGITS CLEARED REORDER GIVEN	1 DIGITS CLEARED	1 4 DIGITS CLEARED REORDER GIVEN	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN
4 - NORMAL DIGIT COLLECTION AFTER REORDER (NO TIMING, NO REORDER)	4 FIRST DIGIT STORED	4 SECOND DIGIT STORED	4 THIRD DIGIT STORED	4 FOURTH DIGIT STORED	4 FIFTH DIGIT STORED	6 TIME FOR 5 SEC	2 ERROR	5 TIME FOR 5 SEC	4 DIGITS CLEARED	2 ERROR	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN
5 - DIGIT COLLECTION BEFORE TONE (ILL DIGIT AFTER STATE 4 - ON 5-SECOND TIMING, NO REORDER)	5 TIMING RESET FIRST DIGIT STORED	5 TIMING RESET SECOND DIGIT STORED	5 TIMING RESET THIRD DIGIT STORED	5 TIMING RESET FOURTH DIGIT STORED	5 TIMING RESET FIFTH DIGIT STORED	5 TIMING RESET SIXTH DIGIT STORED	3 PATH TAKEN DOWN	5 TIMING RESET	5 TIMING RESET DIGITS CLEARED	3 PATH TAKEN DOWN	3 PATH TAKEN DOWN	3 PATH TAKEN DOWN
6 - DIGIT COLLECTION FOR 7th DIGIT AFTER REORDER (ON 5-SECOND TIMING)	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	7 TIME FOR 1 SEC	5 TIMING RESET	4 DIGITS CLEARED	2 4 DIGITS CLEARED REORDER GIVEN	3 PATH TAKEN DOWN	3 PATH TAKEN DOWN
7 - TIME FOR ONE SECOND AFTER DIGIT 7 (ON 1-SECOND TIMING)	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 4 DIGITS CLEARED REORDER GIVEN	4 DIGITS CLEARED	2 1 INVALID VALID	3 PATH TAKEN DOWN	3 PATH TAKEN DOWN

EXAMPLE:



NOTE 1: IF INVALID NUMBER: OFF 1-SECOND TIMING, DIGITS CLEARED, REORDER GIVEN, NEXT STATE =2.
IF VALID NUMBER: OFF 1-SECOND TIMING, CALL PROCEEDS, PATH TAKEN DOWN

NOTE 2: AN ERROR INITIATES A TTY OUTPUT MESSAGE INDICATING THE TYPE OF ERROR; then the call is taken down.

NOTE 3: WHENEVER A PATH IS TAKEN DOWN THERE IS NO NEXT STATE.

NOTE 4: REORDER GIVEN TO OPERATOR MEANS THAT THE CS LAMP FLASHES AT 120 IPM.

(b) Customer dials toll call that originates in an office having ANI equipment and not having LAMA facilities, but encountering ANI failures.

(c) Multiparty or QZ billing customer dials toll call that originates in an office having ANI equipment, but not having LAMA facilities.

(d) Multiparty or QZ billing customer dials toll call, or ANI failure occurs when a regular customer dials toll call that originates in an office having ANI and LAMA, but not having toll operator facilities.

(e) Multiparty and QZ billing customer dials toll call that originates in No. 1 ESS office which has LAMA and ANI facilities, but requires CAMA handling.

4.05 Refer to Fig. 13 for the following (DP trunks).

(a) Customer dials toll call that originates in an office having ANI equipment, but not having LAMA facilities.

(b) Customer dials toll call that originates in an office having ANI equipment and no LAMA facilities, but encountering an ANI failure.

(c) Multiparty or QZ billing customer dials toll call that originates in an office having ANI equipment, but not having LAMA facilities.

(d) Multiparty or QZ billing customer dials toll call, or ANI failure occurs when regular customer dials toll call that originates in an office having ANI and LAMA, but not having toll operator facilities.

5. CAMA TRAFFIC COUNTS

5.01 The No. 1 ESS memory and data processing features are used to accumulate and store specific items of traffic counts for the CAMA feature. Traffic registers, which are used to store this data, can be read when a TTY printout is requested or when the traffic data is automatically printed out in accordance with an assigned time schedule.

5.02 CAMA traffic counts are as follows.

(a) ***Service Usage***—Usage count taken at 100-second intervals of the number of CAMA operator trunks which are occupied with service calls.

(b) ***Positions Occupied Usage***—Usage count taken at 100-second intervals of the number of CAMA positions in the occupied state, regardless of whether a call is being handled or not.

(c) ***CAMA Positions Peg Count***—Peg count of the total number of calls handled by all the positions.

(d) ***ONI Peg Count***—Peg count of the total number of calls requiring operator identification because they were received from an ONI trunk group or from an ANI trunk group with an information digit indicating multiparty line or special billing class line. This count should not include calls routed to the operator due to an ANI failure.

(c) ***ANI Time-Out Peg Count***—Peg count of the number of calls routed to an operator because ANI information was not received within time-out interval.

(d) ***ANI Failure Peg Count***—Peg count of the number of calls routed to an operator because the ANI failure information digit was received.

(e) ***Position Disconnect Peg Count***—Peg count of the number of times an operator disconnects by the use of the PD key.

(f) ***CAMA Queue Peg Count***—Peg count of the number of calls placed in queue to wait for an idle operator.

(g) ***CAMA Queue Usage***—Usage count taken at 10-second intervals of the total number of calls waiting on the CAMA operator queue.

(h) ***Delay Limiting Loss (Queue Overflow)***—Count of calls given overflow treatment because they encountered a full CAMA operator queue.

(i) ***Match Check Failure Count***—Peg count of the total number of times that the number keyed in by the operator is the same as the called number.

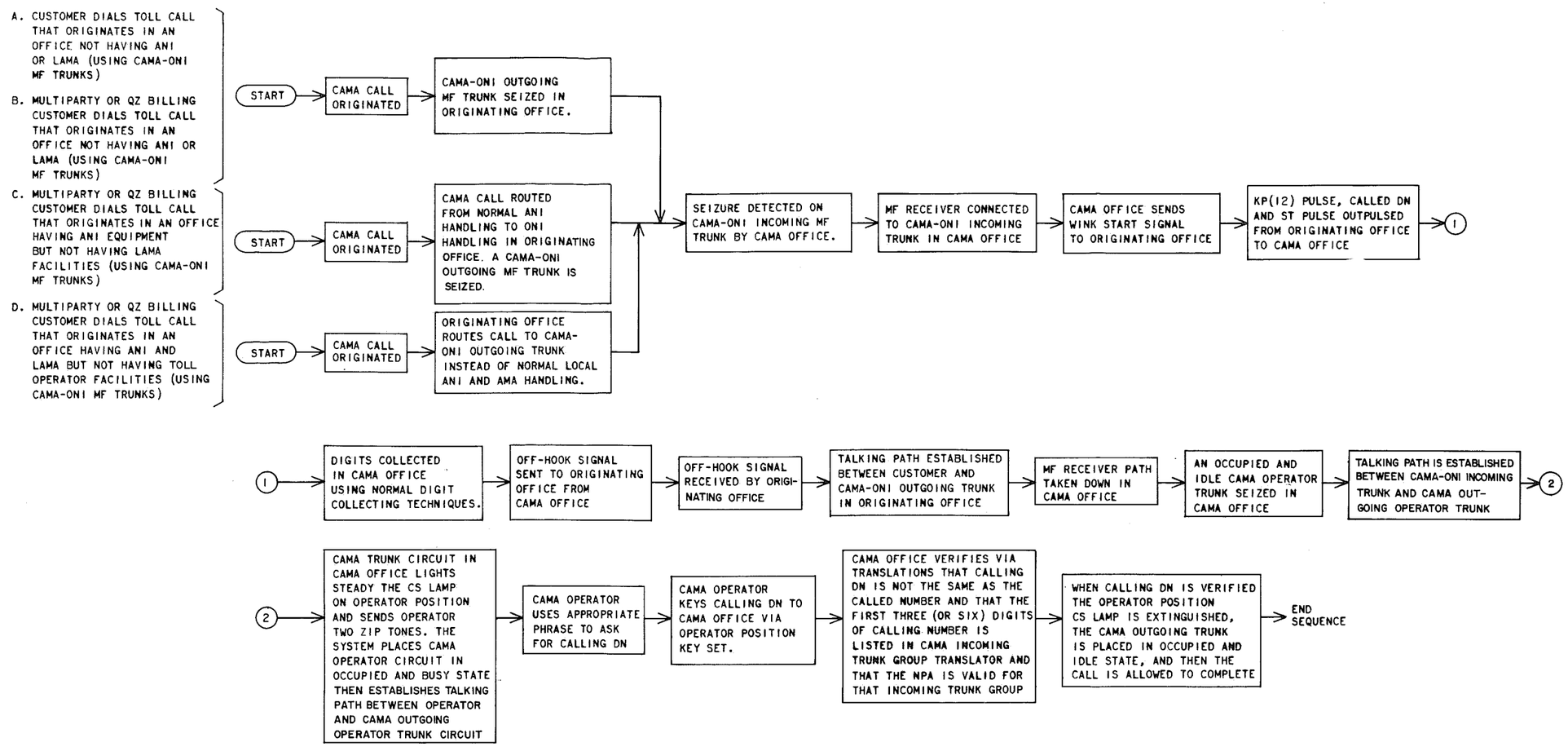


Fig. 10—Typical CAMA-ONI Calls (Using CAMA-ONI MF Trunks)

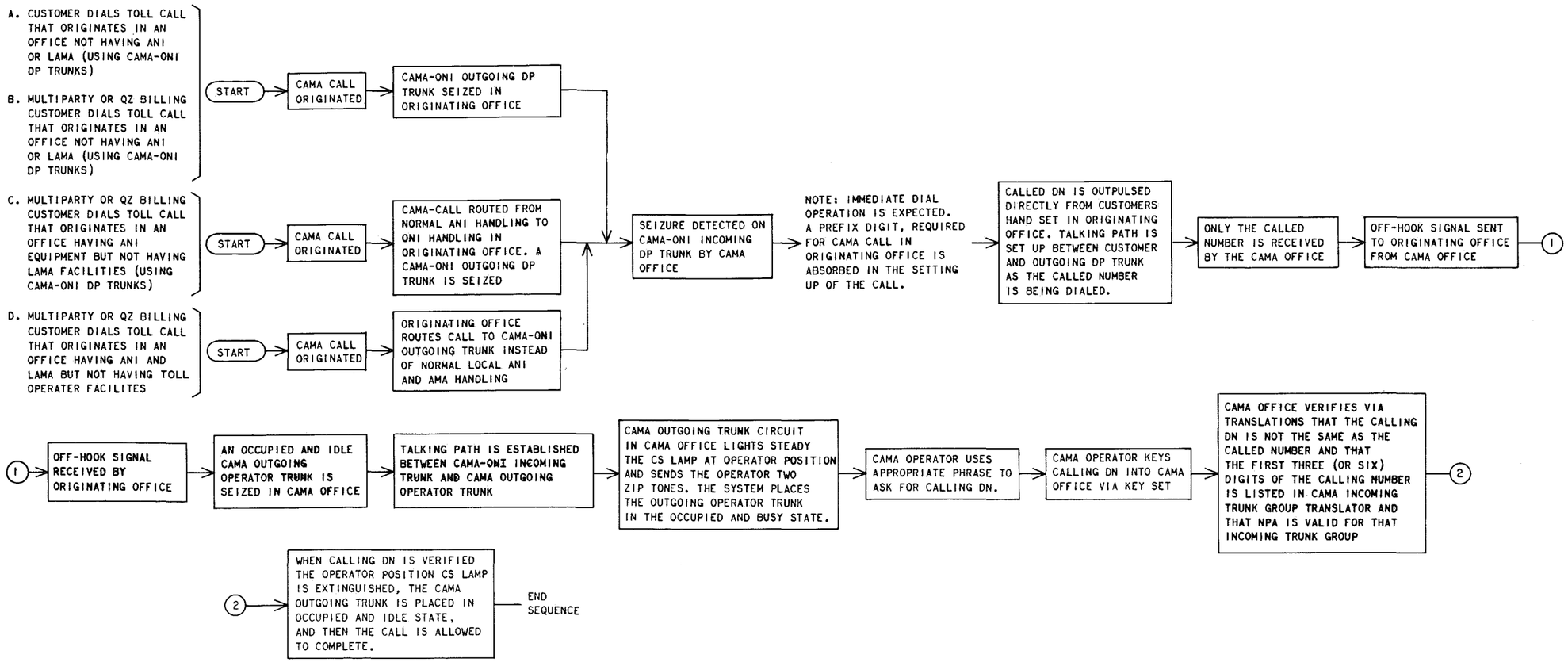


Fig. 11—Typical CAMA-ONI Calls (Using CAMA-ONI DP Trunks)

A. CUSTOMER DIALS TOLL CALL THAT ORIGINATES IN AN OFFICE HAVING ANI EQUIPMENT BUT NOT HAVING LAMA FACILITIES (USING CAMA-ANI MF TRUNKS)

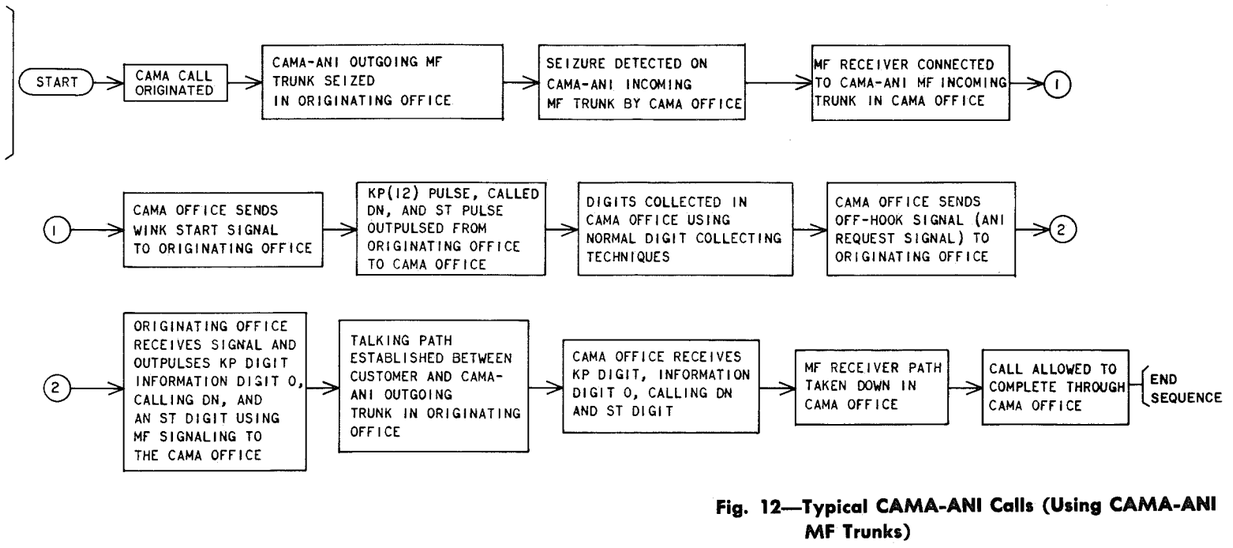


Fig. 12—Typical CAMA-ANI Calls (Using CAMA-ANI MF Trunks)

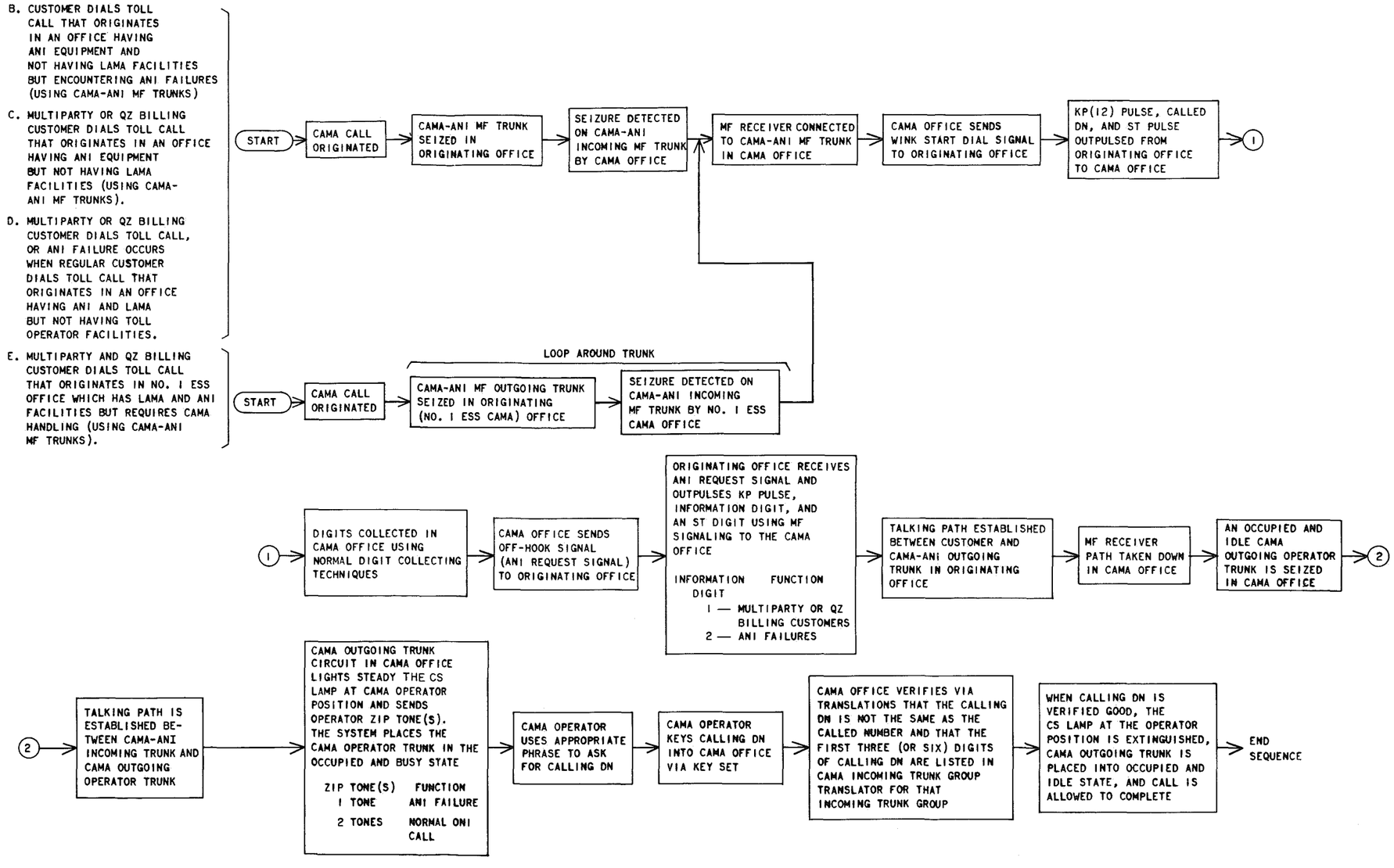


Fig. 12—Typical CAMA-ANI Calls (Using CAMA-ANI MF Trunks) (cont)

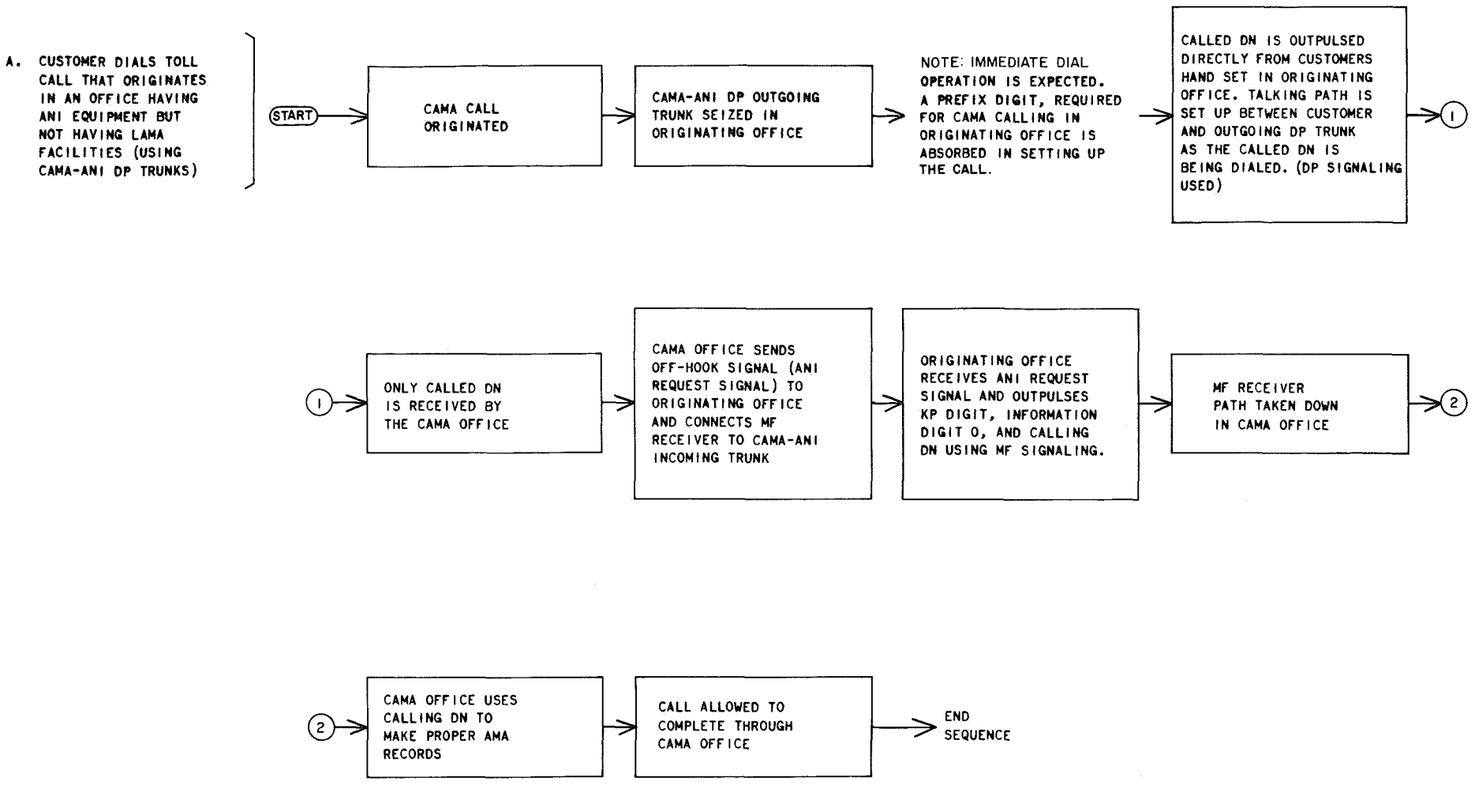


Fig. 13—Typical CAMA-ANI Calls (Using CAMA-ANI DP Trunks)

B. CUSTOMER DIALS TOLL CALL THAT ORIGINATES IN AN OFFICE HAVING ANI EQUIPMENT AND NO LAMA FACILITIES BUT ENCOUNTERING AN ANI FAILURE (USING CAMA-ANI DP TRUNKS)

C. MULTIPARTY OR QZ BILLING CUSTOMER DIALS TOLL CALL THAT ORIGINATES IN AN OFFICE HAVING ANI EQUIPMENT BUT NOT HAVING LAMA FACILITIES (USING CAMA-ANI DP TRUNKS)

D. MULTIPARTY OR QZ BILLING CUSTOMER DIALS TOLL CALL, OR ANI FAILURE OCCURS WHEN REGULAR CUSTOMER DIALS TOLL CALL THAT ORIGINATES IN AN OFFICE HAVING ANI AND LAMA BUT NOT HAVING TOLL OPERATE FACILITIES

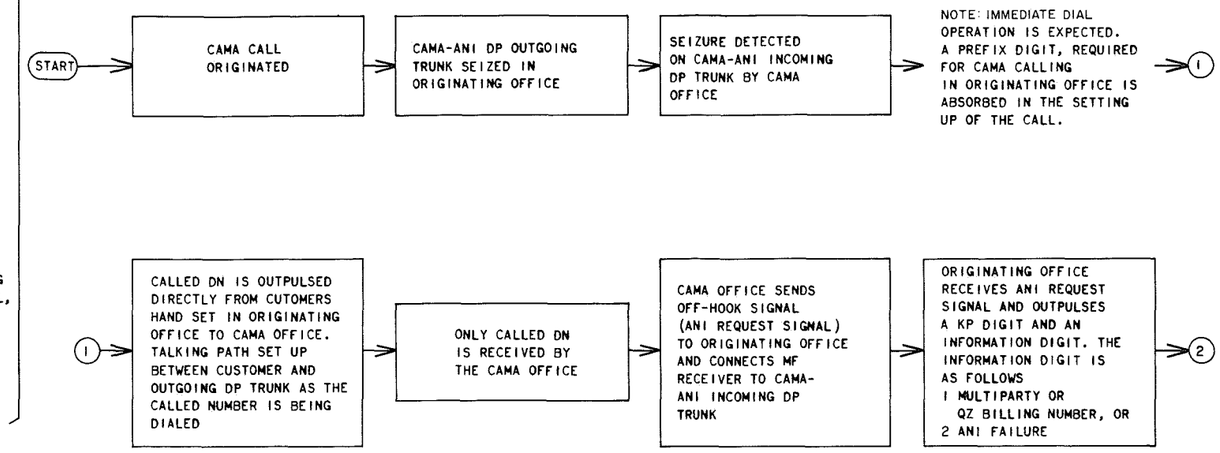


Fig. 13—Typical CAMA-ANI Calls (Using CAMA-ANI DP Trunks) (cont)

(j) ***Wrong Calling Code Peg Count***—Peg count of the total number of times the office code keyed in by the operator is not an office code that could originate over the trunk group on which the call arrived.

(k) ***Misrouted CAMA Treatment Peg Count***—Peg count of the number of calls given intercept treatment for superfluous prefixes as a result of a nontoll call received over a CAMA trunk group.

(l) ***Total AMA Entries Peg Count***—Peg count of the total number of CAMA calls recorded by the AMA facilities. This count should include calls not answered.

6. CAMA TRANSLATION DESCRIPTION

6.01 This part gives CAMA translations that are required in an operational No. 1 ESS CAMA tandem office. The translational areas (Fig. 14) that are required for CAMA are:

(a) CAMA incoming trunk translations

(b) CAMA operator trunk translations

(c) Rate and route translations.

Only the CAMA incoming trunk group translator is described in detail since it is unique to CAMA service.

6.02 Refer to Table K for the sequence of CAMA translations required for calls from seizure in the CAMA office through completion of the calling number collection. Various types of CAMA calls referenced in Table K are as follows.

EXAMPLE	DESCRIPTION
1—	CAMA-ANI calls over MF incoming trunks
2—	CAMA-ANI calls over DP incoming trunks
3—	CAMA-ONI calls over MF incoming trunks
4—	CAMA-ONI calls over DP incoming trunks
5—	CAMA-ANI failures over MF incoming trunks
6—	CAMA—ANI failures over DP incoming trunks.

CAMA INCOMING TRUNK GROUP TRANSLATOR

6.03 The CAMA incoming trunk group translator (Fig. 15) is a special translator used by the CAMA program to ensure that a customer has given a CAMA operator a valid calling DN. The master head table annex contains the address of the 64 word CAMA head table. Each CAMA head table word contains either an auxiliary block address or all zeros. The input parameter to this head table is the ***CAMA trunk group (CTG)*** number (Fig. 16) which is derived from an auxiliary block in the trunk group number translator for CAMA-ONI or CAMA-ANI trunks. Each CAMA head table address points to a CAMA auxiliary block containing the following:

(a) NPA for the entire incoming trunk group

(b) A list of all legal NXX codes for this trunk group.

6.04 For CAMA-ONI operation, this list contains all NXX codes that are allowed to come in on that particular trunk group (except for QZ billing calls).

6.05 A list of valid NXX codes for CAMA-ANI operation is provided in case operator assistance is required. These calls include ANI failures, multiparty, and QZ billing calls from CAMA-ANI trunk groups.

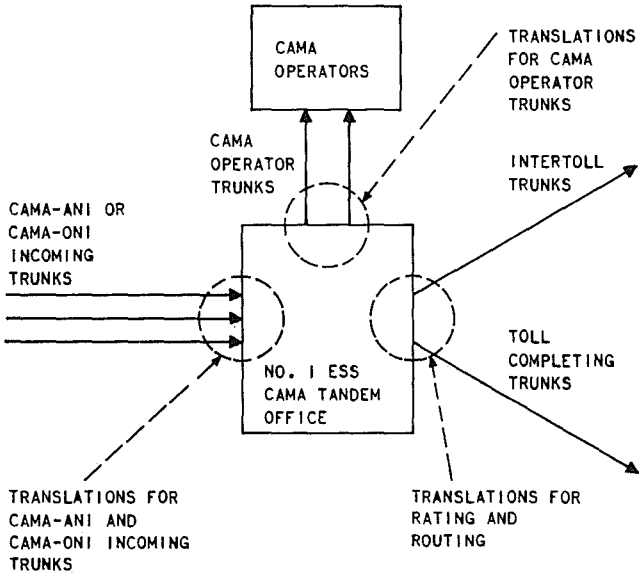


Fig. 14—CAMA Office Translations

TABLE K

CAMA CALL TRANSLATION SEQUENCE FROM INCOMING TRUNK SEIZURE THROUGH CALLING DN COLLECTION

TIME SEQUENCE	TYPE OF CALL	TRANSLATION	INPUT	OUTPUT	OUTPUT USE
START	2,4,6	MSN TRANSLATION	ICT MSN	ICT TNN	Identify CAMA ICT which has been seized
	1,3,5	MSN TRANSLATION	ICT MSN	ICT TNN	Identify CAMA ICT which has been seized
				TPI	Direct control to proper program to handle seizure
	1,3,5	TSN (UNIVERSAL) TO TNN TRANSLATION	ICT UTSN	ICT TNN	Identify CAMA ICT which has been seized
				SPI	Direct control to proper program to handle seizure
	ALL	TNN TO TGN TRANSLATION AND TCC TRANSLATION	ICT TNN	ICT TGN	Use as input to TGN translation
				ICT TCC	Determine type of supervision, type of pulsing, CPI, start dial signal, etc. (Note: Start dial signal is none for DP and wink for MF)
	ALL	TGN TRANSLATION	ICT TGN	ICT TRUNK GROUP DATA	Designates CAMA-ANI or CAMA-ONI incoming trunk group data which is used to route the call to an operator or automatically to find calling DN.
				ICT CAMA TRUNK GROUP INDEX	CAMA trunk group index is used as input to CAMA incoming trunk group translator for CAMA-ONI and CAMA-ANI failure calls.
				ICT SCREENING LEN	Used as input to LEN originating and AMA translations
	1,3,5	TNN TO PEN TRANSLATION	RECEIVER TNN	RECEIVER AUX ADDRESS	Used for change in circuits and scans on MF receiver
	1,3,5	TNN TO PEN	ICT TNN	ICT AUX ADDRESS (MISC ICT) ICT UTSN (UNIV ICT)	Used for change in circuit and scans on MF receiver.
	ALL	LEN ORIGINATING AND AMA TRANSLATIONS	ICT SCREENING LEN	SCREENING LEN PTW, NOGR, CHART CLASS	3-digit translation input; screening LEN determines rate and route treatment of called directory number for the CAMA ICT TGN.

TABLE K

CAMA CALL TRANSLATION SEQUENCE FROM INCOMING TRUNK SEIZURE THROUGH CALLING DN COLLECTION (Cont)

TIME SEQUENCE	TYPE OF CALL	TRANSLATION	INPUT	OUTPUT	OUTPUT USE
 FINISH	ALL	3-DIGIT TRANSLATION	D1, D2, D3 ICT CHART CLASS ICT NOGR	CALL TYPE, NAC, NOC, RI, CHART INDEX	Determines call type (intraoffice 7-digit, interoffice 10-digit, interoffice 7-digit, FAT, etc) and rate and route treatment
	2,4,6	TNN TO PEN TRANSLATION	ICT TNN	ICT AUX ADDRESS (MISC ICT) ICT UTSN (UNIV ICT)	Used for change in circuit and scans on CAMA ICT
	2,4,6	TNN TO PEN	RECEIVER TNN	RECEIVER AUX ADDRESS	Used for change in circuit and scans on CAMA ICT
	3,4,5,6	CAMA INCOMING TRUNK GROUP TRANSLATION	D1, D2, D3 of CALLING DIRECTORY NUMBER CAMA INCOMING TRUNK GROUP INDEX	INDICATION TO OPERATOR WHETHER D1, D2, AND D3 ARE LEGAL FOR THAT CAMA INCOMING TRUNK GROUP.	Used to decide whether to complete call or return call to CAMA operator for recharging.
				CALLING OFFICE NPA	Placed on AMA tape if office serves more than one NPA.

LEGEND

AMA — AUTOMATIC MESSAGE ACCOUNTING
AUX — AUXILIARY BLOCK
CPI — CIRCUIT PROGRAM INDEX
FAT — FOREIGN AREA TRANSLATOR
ICT — INCOMING TRUNK CIRCUIT
LEN — LINE EQUIPMENT NUMBER
MSN — MASTER SCANNER NUMBER
NAC — NORMALIZED AREA CODE
NOC — NORMALIZED OFFICE CODE
NOGR — NUMBER GROUP NUMBER
NPA — NUMBER PLAN AREA
PEN — PERIPHERAL EQUIPMENT NUMBER
PTW — PRIMARY TRANSLATION WORD
RI — ROUTE INDEX
SPI — SUPERVISORY PROGRAM INDEX
TCC — TRUNK CLASS CODE
TGN — TRUNK GROUP NUMBER
TNN — TRUNK NETWORK NUMBER
TPI — TRUNK PROGRAM INDEX
UTSN — UNIVERSAL TRUNK SCANNER NUMBER

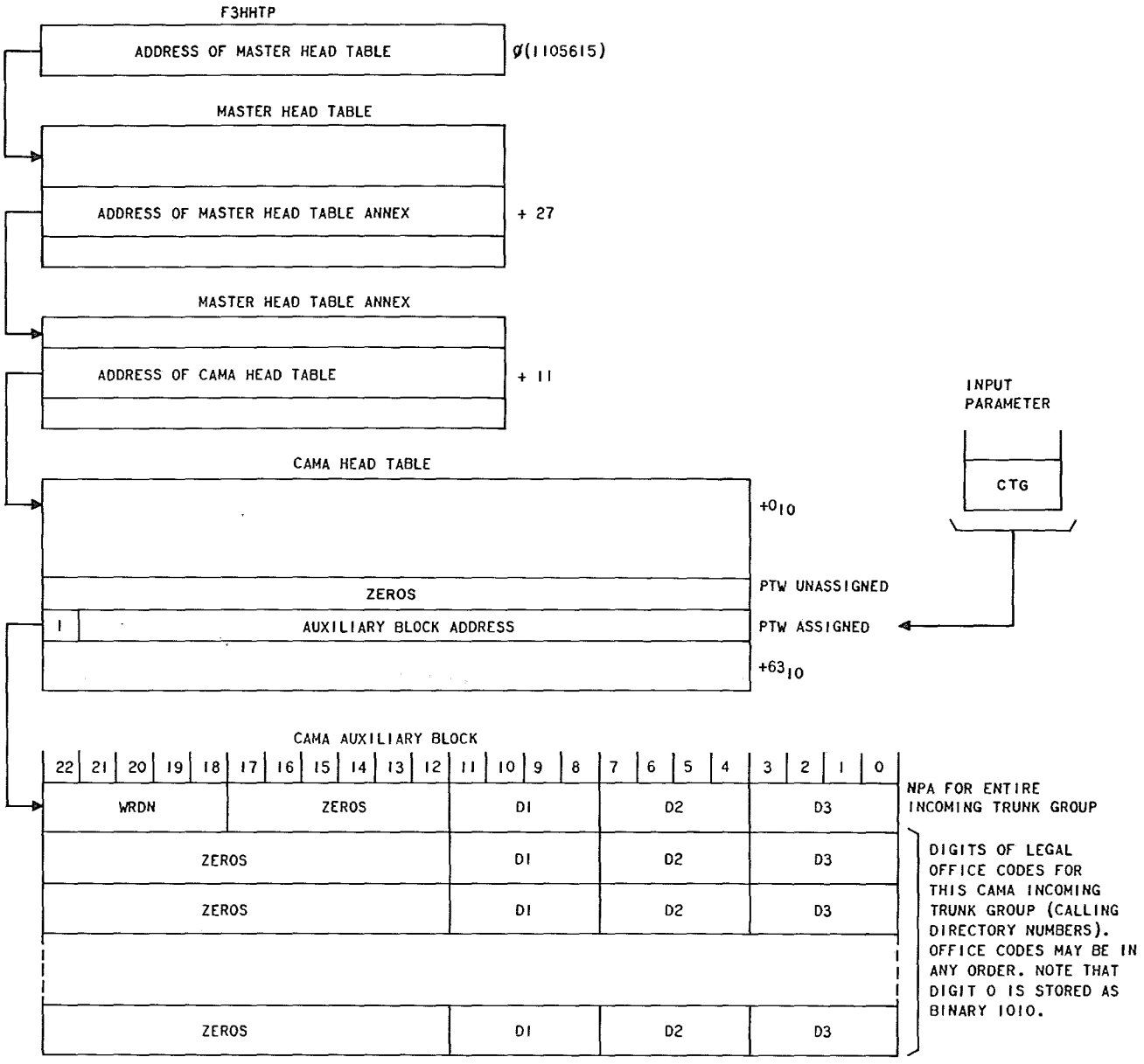
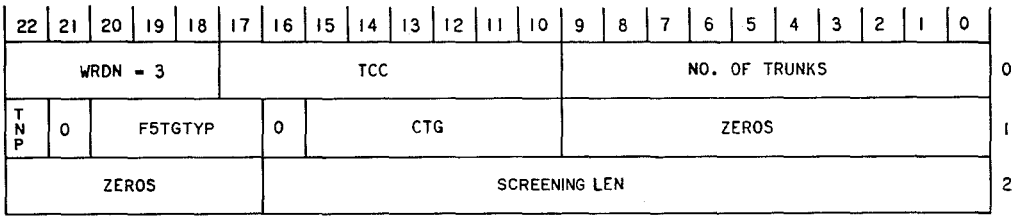
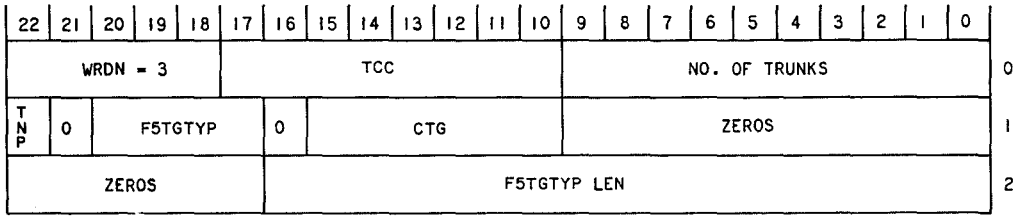


Fig. 15—CAMA Incoming Trunk Group Translator



F5TGTYP = 1000
A. CAMA-ANI INCOMING TRUNKS
AUXILIARY BLOCK



F5TGTYP = 1001
B. CAMA-ONI INCOMING TRUNKS
AUXILIARY BLOCK

Fig. 16—Trunk Group Number Auxiliary Blocks for CAMA-ANI and CAMA-ONI Incoming Trunks