CALL TRACE (3E3)

SOFTWARE SUBSYSTEM DESCRIPTION

NO. 3 ELECTRONIC SWITCHING SYSTEM

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1. GENERAL

1.01 This section provides a functional description of the software required to perform call tracing operations in No. 3 Electronic Switching System (ESS) offices. This document is for offices using the 3E3 generic programs. Offices using the SO-2 Issue 4 generic will use Section 233-151-110 (Call Trace SO-2 Issue 4 SSD No. 3 ESS). Acronyms used in this document can be found in Table A.

1.02 Whenever this section is reissued, the reason(s) for reissue will be listed in this paragraph.

1.03 Part 4 contains a glossary of terms, abbreviations, and definitions which will assist in understanding this document. In addition, the term originating equipment (OE) number is used interchangeably with terminal equipment number (TEN). The directory number (DN) is interchangeable with telephone number in this document.

1.04 Information contained in this document will also aid in accessing the software listings which contain detailed program functions and coded software instructions. Two programs perform most call tracing functions:

CTRACR—Resident portion of the call trace program (PR-3H005)

CTRACN—Nonresident call trace program (PR-3H079).

1.05 CTRACR is a resident program which contains the following subroutines:

CLISR—Searches the calling line identification (CLID) table

OCT—Traces outgoing calls

PDFE—Sets up a CLID table entry for printing

ICT—Traces incoming calls.

The subroutines may be invoked by another call tracing routine or another program.

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1.06 A teletypewriter (TTY) input message regarding a tracing function results in CTRACN, a nonresident program, being brought into memory for execution as shown in Fig. 1. CTRACN is a collection of the following subroutines:

MESREC—Processes TTY input messages for tracing functions and passes control to the appropriate nonresident tracing routine

CLIENT—Enters a number into the CLID table

CLIDEL—Deletes a number from the CLID table

CCT—Traces current calls

DIGFIX—Aligns digits for CLID table.

2. SUBSYSTEM FUNCTIONAL DESCRIPTION

2.01 Call tracing programs identify calling and called lines in a No. 3 ESS office to determine the source of nuisance and threatening calls and to identify lines in emergency situations. Resident program CTRACR and nonresident program CTRACN are used in the field to determine troubled trunks, junctors, and lines. The programs are also capable of handling the following call situations:

- In-progress calls
- Incoming calls
- Outgoing calls.

IN-PROGRESS CALLS

2.02 An in-progress trace is normally requested by an operator to identify a line in an emergency situation. An in-progress trace is a 1-time effort. It runs as a multiscan function; therefore, when another multiscan function is active, it must be completed or aborted before the request for an in-progress trace is accepted. The ABT:MSF; action-options! The TTY input message may be used to abort an active multiscan function. An in-progress trace is invoked by a TTY input message which indicates either the DN or the TEN (Fig. 2) of one side of the connection. The TTY output message states whether the other party is a line or trunk. The group and member number is printed for a trunk. A telephone number is printed for a 1-party line or a private branch exchange (PBX). An OE number is printed for a multiparty line. If the line is a call waiting line, another message will be printed to show the third party involved if any. Following are the two possible input message formats:

(a) TRC:OE (aa,bcde)!

where aa = concentrator group

b = concentrator

c = switch group

d = switch

e = input level

(b) TRC:TN (aaa,bbbb)!

where aaa = office code

bbbb = telephone number.

2.03 The subroutine MESREC in CTRACN is given control to determine the type of input message received. The MSG table is scanned and the type of message is determined. MESREC then passes control to location CCTDN for current call trace handling when the directory number is supplied. The directory number is translated into the TEN. Location CCTTEN is given control when the TEN is supplied in the TTY message.

2.04 Subroutine CCT (current call trace) is invoked by the TTY input message. The OE or DN of either side of the stable call may be received. The DN will be translated to an OE before scanning the terminal memory records (TMRs), Fig. 3, for a match. If a match is found, the OE of the other party is translated to a DN (if possible) and printed out. When no match is found, the call is not in a stable state, and a message to that effect is printed out. If the party being traced is a call waiting customer, a second TMR is hunted on behalf of the customer.

2.05 When the TMR is found, the other party's OE is tested for a line or trunk. If the other party is an individual line, the scan point number (SPN) is saved and translated into an office code (OC) and DN. Subroutine JCT_NUM determines the junctor and group number in each network

frame. The junctor, concentrator group, OC, and DN are stored in registers. The successful trace message is then printed. The MULTIPAR subroutine will trace calls from multiparty lines. The TEN is translated for printing by the TEN_EXP subroutine in program TRSUBS. The junctor and group number are determined by subroutine JCT_NUM. The TEN, junctor and group number are stored in registers, and the trace message is printed. When the other party is a trunk, the OE is translated by translation subroutines in the scan point number translation program (XSLSPN) to the supervisory scan point of the trunk and then to the trunk group number and member number. The information is then converted to binary coded decimal (BCD) characters for printing. The successful TTY trace message printed is:

tt REPT CCT AA aaaa bbbb
where tt is time
AA indicates the type of party
TN normal line
aaaa office code
bbbb directory number

TRK trunk
aaaa group member
bbbb member number

OE terminal equipment number (multiparty)
aaaa concentrator group
bbbb concentrator, switch group, switch, level.

2.06 Any errors encountered in the current call trace result in an error message being printed. Error messages are as follows:

tt REPT CCT FAIL—a TMR was not found for the call

tt REPT ERROR TRL OC—translation error on an office code

tt REPT ERR TRL DN—translation error for a directory number

tt REPT ERR TRL PBX—translation error on a line in a PBX

tt REPT ERR TRL TRK—translation error on a trunk

where tt = time.

INCOMING CALLS

2.07 When a customer in the No. 3 ESS office has received nuisance calls, the source of these calls may be discovered by tracing calls to that number. The trace with alarm level indication is activated by a TTY recent change message (RC:LINE) which modifies the translation data for the line. The terminating program (TERM) invokes subroutine ICT in CTRACR for the trace of an intraoffice or incoming call when the trace bit is set in the line translation data. Whenever a call to the line is attempted, a TTY output message identifies the calling and called parties and the junctor numbers associated with the parties. If the calling party is a trunk, it is identified by a group and member number. A 1- or 2-party line or PBX is identified by a telephone number. A 4- or 8-party line is identified by an OE.

2.08 A trace is accomplished by obtaining the calling party from the transient call record (TCR) and formatting the information for printing on the TTY. When the calling party is a trunk, the TEN is translated first into the supervisory scan point number and then to the trunk group and member number. A translation error results in a return code of 0 being returned to TERM. Otherwise, the group and member number are converted to BCD, and the message is formatted.

2.09 When the calling party is a line, the TEN is translated to the DN if possible (that is, the line is a 1- or 2-party line or a PBX/multiline hunt group). The correct DN cannot be distinguished for 4- or 8-party lines; therefore, the TEN is printed instead.

2.10 The TEN for the called party is translated into the DN unless a 2-party line, in which case the TEN is printed. The TTY trace output message format is:

TT REPT ICT FROM AA aaaa bbbb TO BB aaaa bbbb

where tt is time
AA = calling party type

TRK trunk
aaaa group number
bbbb member number

OE terminal equipment number (4- or 8-party line)
aa concentrator group
bbbb concentrator, switch group, switch, level

TN normal line
aaaa office code
bbbb directory number

MP PBX
aaaa office code
bbbb directory number

BB = called party type

OE terminal equipment number (2-party line)
aa concentrator group
bbbb concentrator, switch group, switch, level

TN normal line
aaaa office code
bbbb directory number.

After printing of the trace information, control of the call is returned to the program TERM with a return code of 1 (indicating success) for further call processing.

OUTGOING CALLS

2.11 When an operating company is notified that a No. 3 ESS office is the source of nuisance calls to particular lines in other offices, all outgoing calls to those lines can be traced. The trace is initiated by a TTY input message which causes a 7- or 10-digit telephone number (not prefixed by 0 or 1) to be placed in the CLID table, and the alarm level to be indicated. Whenever a call is made to a number in the table, a TTY message results, indicating the time of the call and identifying the parties and the associated junctors. The alarm is also activated. The called party is always identified by a telephone number. If the calling party is a 1- or 2-party line or a member of a PBX, it is identified by a telephone number. Otherwise it is identified by an OE. The craft person can achieve the five following traces by entering the TTY messages:

TRC:ENTER, DNP ccc [;xx]!

TRC:ENTER (aaa), DNP ccc [;xx]!

TRC:ENTER (aaa,bbbb), DNP ccc [;xx]!

TRC:ENTER (aaa) [;xx]!

TRC:ENTER (aaa,bbbb) [;xx]!

where aaa = office code

bbbb = telephone number

ccc = area code

xx = 10 (major alarm), 01 (minor alarm), 00 (no alarm), 11 (not assigned)

When a trace is successful, the office alarm is activated. The type of alarm is indicated by the data entered in the input message (xx).

2.12 Subroutine MESREC in CTRACN examines the TTY input message and passes control to subroutine CLIENT (also in CTRACN). CLIENT formats the number and enters it into the CLID table if an empty slot exists. The table consists of three 3-word entries (Fig. 4); therefore, calls to three numbers can be traced at a time. The following error message is printed when the CLID table is full and an entry cannot be made:

tt REPT ERR CLID TF

In addition, an attempt to place an entry already in existence into the CLID table results in this error message:

tt REPT ERR CLID IE

2.13 The CLIENT subroutine first determines if an area code (AC) is included in the entry, and calls the DIGFIX subroutine to align the digits in the scratch storage area. The subroutine first picks up the digits in registers to be worked on, and tests sequentially for the following:

1. AC only
2. AC + OC
3. AC + OC + DN
4. OC only
5. OC + DN

If the AC is included in the input message, DIGFIX is entered at point ACOD. Registers that are not filled (AC + OC + DN is full) are filled with 1s which will match any number. The digits are then shifted into the CLID table format. If the area code is not included in the input message, DIGFIX is entered at point OCOD. Unfilled registers are filled with 1s and shifted into the CLID table format. The CLID table is then searched to see if the number is already in existence. An empty slot is found in the CLID table, and the digits are placed in the table. The CLID table is searched via subroutine CLISR. The CLIENT, CLIDEL, or OCT can invoke CLISR to linearly search for a match to a 3-word block of BCD digits.

2.14 The outgoing call handling program (OUTCAL) calls the subroutine OCT in CTRACR for each outgoing call to determine whether calls to the called number are to be traced. The address of the TCR for the call is passed to OCT. OCT determines whether the call should be traced. The digits in the TCR are compared to the entries in CLID. If no match is found, control is returned to the calling program. If a match is found, OCT (outgoing call trace) subroutine proceeds to trace the call. Calls from manual lines (there are no digits in the TCR) and 0 minus calls (there are no real digits in the TCR), which are sent to a Traffic Service Position System (TSPS), are not traced and control is returned to OUTCAL.

2.15 Subroutine OCT calls subroutine CLISR in CTRACR to search for a match of the called number to a number stored in the CLID table. No match means a trace is not to be made, and a 1 return code is returned to OUTCAL. When the dialed number matches a CLID table entry, subroutine PDFE in program CTRACR is called to set up the CLID entry (called number) for printing in the trace TTY message.

2.16 Subroutine OCT must determine the calling party information to be printed. The calling party information is obtained from the TCR for the call. When the calling party is a line, the line TEN is translated by GET_TN in program XSLSPN to the correct directory number when possible. The TEN is printed for 4- or 8-party lines. When the calling party is a trunk, the TEN is translated to its supervisory scan point number and then to the group number and member number by subroutines in program XSLSPN. The trace message is then printed containing the following information:

tt REPT OCT FROM AA aaaa bbbb TO cccc dddd eeee JC ffff gggg

where tt is time
AA = calling party type

TRK trunk
aaaa group number
bbbb member number

MP PBX
aaaa office code
bbbb directory number

OE terminal equipment number
aaaa concentrator group
bbbb concentrator, switch group, switch, level

TN normal line
aaaa office code
bbbb directory number

TO = called party type

cccc area code
dddd office code
eeee directory number

JC = junctor

ffff concentrator group of junctor circuit
gggg junctor switch number of junctor circuit

Control is then returned to OUTCAL after the trace for futher processing of the call. When a translation error is encountered in the trace, control is returned to OUTCAL with a return code of 0.

2.17 A directory number is removed from the CLID table when outgoing calls to that number no longer need to be traced. The number is deleted in response to the following TTY input message:

TRC:ERASE (aaa, bbbb) [,DNP ccc]!

aaa = office code

bbbb = telephone number

ccc = area code (optional).

2.18 Subroutine MESREC in CTRACN processes the message and passes control to CLIDEL also in CTRACN. CLIDEL reformats the number for comparison with entries in the CLID table. Subroutine CLISR in CTRACR is called to search the table for a match. When a matching entry is not found in the CLID table, the following error message is printed:

tt REPT ERR CLID ENF

Otherwise, the entry is deleted, thus ending traces to that number.

3. REFERENCES

3.01 The following sections may be helpful in understanding call tracing software:

SECTION	TITLE
233-151-105	Call Processing Software Subsystem Description SSD No. 3 ESS
233-151-130	Basic Call Processing SSD No. 3 ESS

4. GLOSSARY

4.01 The following terms and definitions are used in this section.

Clear—To restore a storage device to the "zero" state.

Intraoffice call—A call from one subscriber assigned to a central office to another subscriber in the same office.

Nonresident program—A program which does not reside in memory but resides on tape and is brought into memory for execution when needed.

Subroutine—A sequence of instructions which performs a well-defined function and is called by another section of instructions.

TCR (transient call record)—A 16-word block of writable main storage assigned to a call in the transient state containing control information, terminal and path information, and receiving and sending data applicable to the call. Information in the TCR and the format of the TCR constantly changes as different call processing functions are performed for a call. Therefore, a format is not provided in this document but formats of the TCR as it appears for different functions are available in the program listings.

TMR (terminal memory record)—A 4-word block of writable main storage assigned to each junctor.

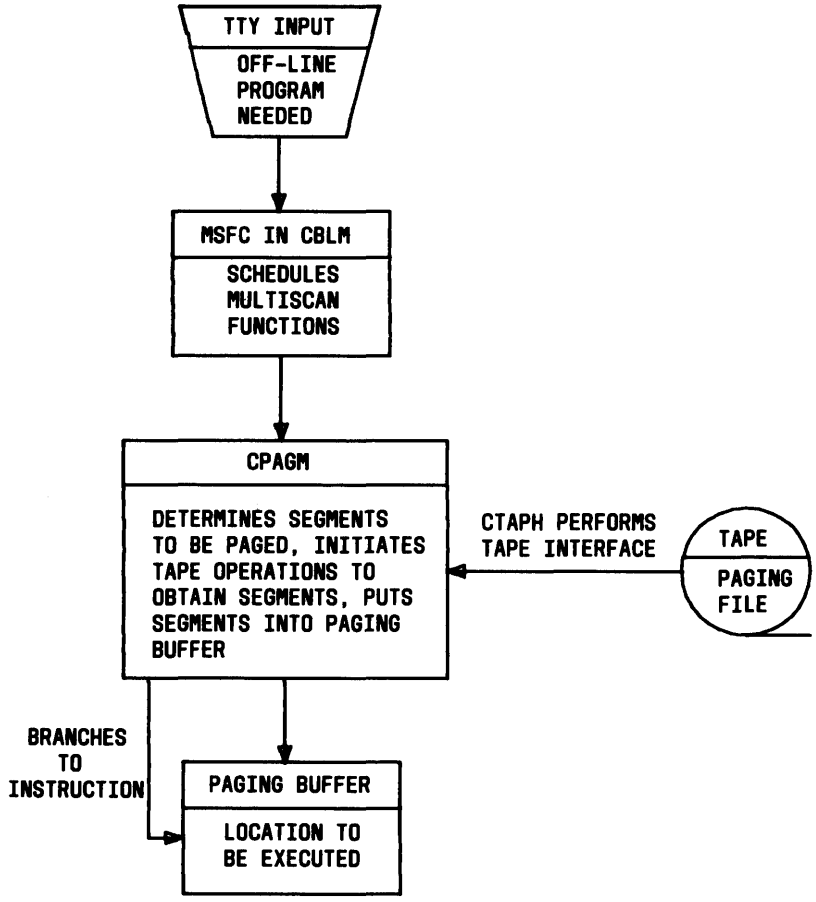

Fig. 1—Loading of Nonresident Function Into On-Line Memory

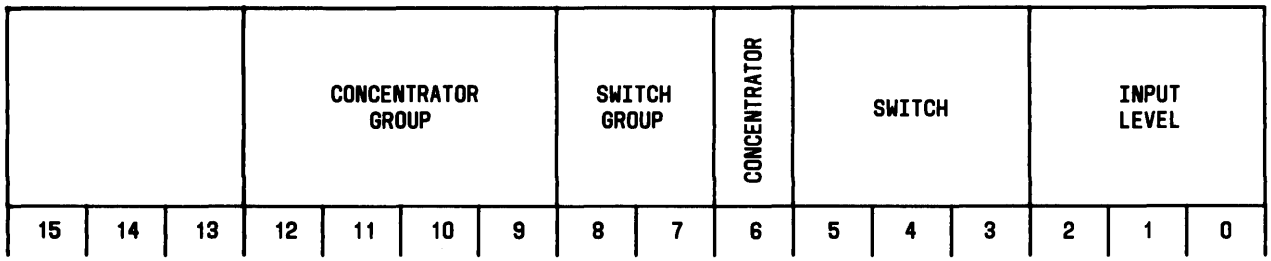

Fig. 2—Terminal Equipment Number Format

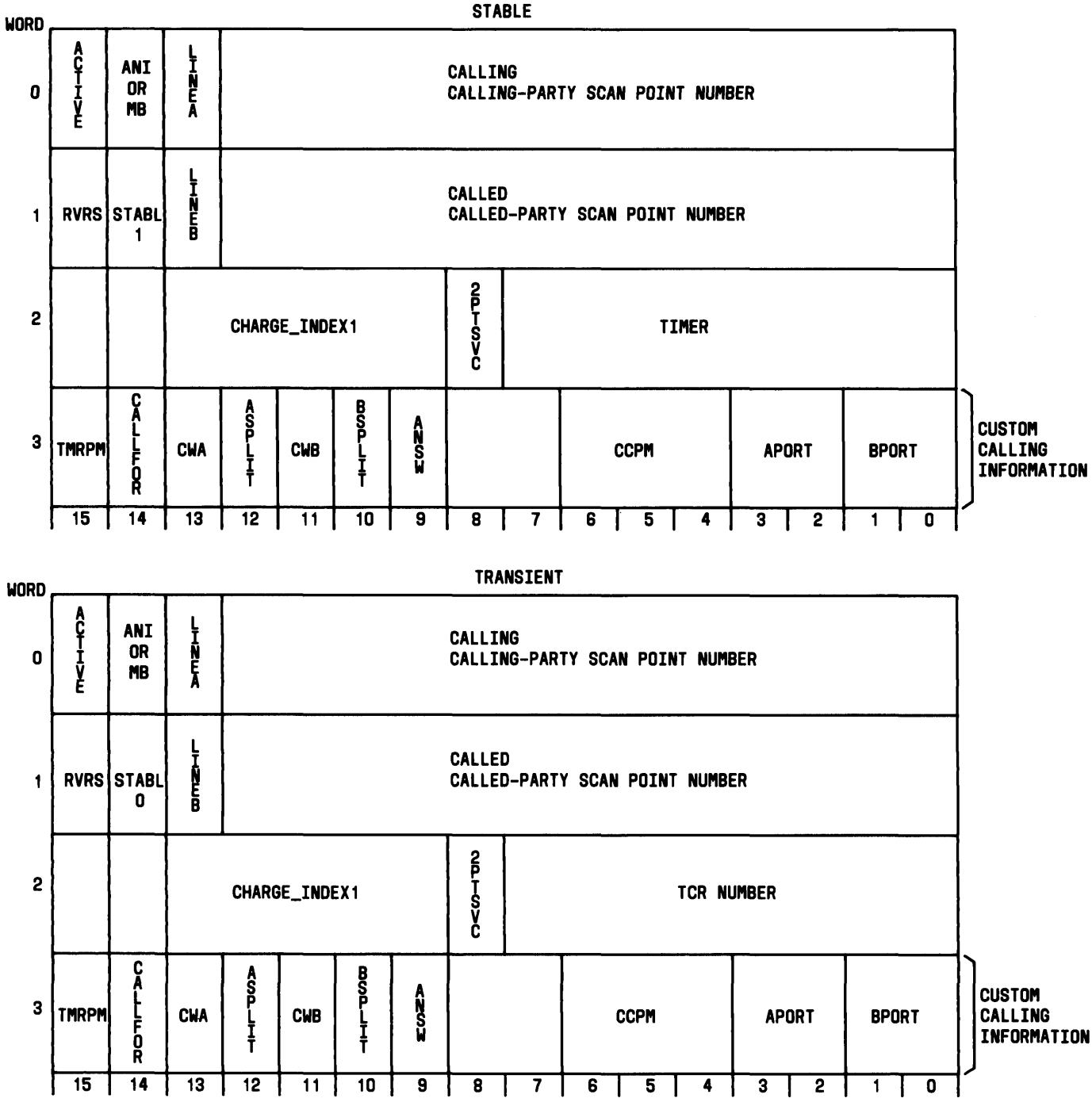

Fig. 3—Stable and Transient TMRs

DIGIT				DIGIT				DIGIT				DIGIT			
DIGIT				DIGIT				DIGIT				DIGIT			
DIGIT				DIGIT				DIGIT						ALARM	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Fig. 4—CLID Table Format

TABLE A

TABLE OF ACRONYMS

AC	Area Code
BCD	Binary Coded Decimal
CLID	Calling Line Identification
DN	Directory Number
ESS	Electronic Switching System
OC	Office Code
OE	Originating Equipment
PBX	Private Branch Exchange
SPN	Scan Point Number
TCR	Transient Call Record
TEN	Terminal Equipment Number
TMR	Terminal Memory Record
TSPS	Traffic Service Position System
TTY	Teletypewriter