CUTOVER

SOFTWARE DESCRIPTION

NO. 3 ELECTRONIC SWITCHING SYSTEM

1. GENERAL

1.01 This section provides a functional description of software required to perform precutover and cutover requirements in the No. 3 Electronic Switching System (ESS) offices.

1.02 This section is being reissued to include additional data and to update from Issue A to Issue 1. Due to extensive revisions, change arrows will not be used.

1.03 Cutover is defined as the time at which the No. 3 ESS office begins to process customer telephone service.

1.04 As part of the cutover function, office-to-office tests have been designed to test subscriber lines from the No. 3 ESS office to the connection

of those lines at the existing subscriber lines served by the old office. These tests check for continuity shorts, crosses, grounds, and reversals. A program automatically performs these tests, or this can be done manually, if desired, using the local test desk (14-type) or the local test cabinet (No. 3 type).

1.05 Before an office-to-office (OTO) test can be made, cable pair protectors must be installed at the low profile combined distributing frame (LPCDF). During OTO tests, the precutover mode is utilized. The line cutoff contacts are kept open to isolate the lines in the existing office from the No. 3 ESS office by the ESS program control. SET:PRECUT opens the cutoff contacts removing office battery and ground from the line. OTO test verifies:

- Continuity between offices

- Tip-to-tip and ring-to-ring (no reversals)

- No foreign battery, ground, or crossed pairs (lines).

However, trunk circuit isolation requires the use of mechanical cutover devices unless new trunk facilities are being provided (Fig. 1). Software listings containing detailed program functions and coded software instructions are:

TITLE	ACRONYM	LISTING
Cutover	CUT	PR3H023
Office-to-Office test	OTOTST	PR3H081

1.06 When a No. 3 ESS installation replaces an existing office, cross-connections for subscriber lines must be installed prior to cutover. Also, prior to cutover, the switching functions are performed by the existing office. The line cutover program ensures that customer service is not interrupted before cutover and that a quick transition of service from the old office to the new office takes place. The cutover program can also be used to transfer existing lines in another office to a No. 3 ESS office already in commercial service.

1.07 The cutover is performed in this order—precut, office-to-office test, and cut.

1.08 The following Bell System Practices may be helpful in understanding this section.

SECTION	TITLE
233-000-003	General Description, No. 3 Electronic Switching System
233-142-100	Task Oriented Practices, No. 3 Electronic Switching System
233-152-125	System Control Software Subsystem Description, No. 3 Electronic Switching System
233-153-106	Network Fabric Exercise Software Subsystem Description, No. 3 Electronic Switching System
233-153-115	Trunk and Service Circuits Diagnostics Software Subsystem Description, No. 3 Electronic Switching System
233-153-125	Alarm and Status Reporting Software Subsystem Description, No. 3 Electronic Switching System
233-153-130	Initialization and Fault Recovery Software Subsystem Description, No. 3 Electronic Switching System
233-153-135	Error Analysis and Fault Detection Software Subsystem Description, No. 3 Electronic Switching System
233-170-100	Precutover General Description, No. 3 Electronic Switching System
254-300-180	System Status Panel, System Status Panel Controller, and System Status Panel Relay Unit Description and Theory of Operation, No. 3 Electronic Switching System
254-300-190	Teletypewriter and Teletypewriter Controller Description and Theory of Operation, No. 3 Electronic Switching System

2. SOFTWARE DESCRIPTION (CUTOVER)

2.01 To go from the precut to the cutover state, the multiscan function (MSF) turnover/cutover

(TOCO) must be activated by the teletypewriter (TTY) input message ALW:TOCO!. The message causes the cutover and the office-to-office test programs to be loaded into the paging buffer. If the request is accepted, an in progress (IP) message is printed. When the programs are ready, the message TOCO READY is printed. An RL message means the request is denied because another MSF is active. Cutover is then performed by entering the TTY message SET:CUT!. The CUT program accepts the message if the TTYs and turnover/cutover MSFs are idle, and the cutover status (CUTSTAT) bit-per-line map has been properly allocated. The program then stops all other machine activities and cycles through all the line scan point numbers (SPNs) on the call processing equipped frames. Those that are lines are checked for cutover or precutover hundreds group membership. The program closes line cutoff contacts of precut hundreds group lines. After all lines have been processed simultaneously (using both network controllers, NWC0 for network frames 1 through 7 and NWC1 for network frames 8 through 15), the office PRECUT bit is made zero and a set cut complete (SET CUT COMPL) message is printed. Control frame 0 and 1 are referred to as NWC 0 and 1 in the document. Control is returned to the TTY control program and then to the normal base level loop. The No. 3 ESS system is then operating in its cutover (normal) mode and the formerly precut lines have been added to the set of working lines.

2.02 A request to SET:PRECUT! is similar to the SET:CUT! since all the actions are the same except that line cutoff contacts are opened instead of closed. Also, SET:PRECUT! constructs a bit-per-line map (CUTSTAT) in memory containing a one for each precut-nontest line. The map is actually constructed following both SET CUT and SET PRECUT instructions, but is used only when the office is operating in the precut mode. Finally, the office PRECUT bit that is in memory in the office option word is set to one.

2.03 After SET CUT or SET PRECUT TTY messages have been accepted, any error occurrence in writing program store, translations, or network orders will cause the function to abort, the proper TTY message containing error data to be printed, and control to return to the base level loop. If such errors occur, system faults should be corrected before attempting to repeat this program.

2.04 The SET:CUT and PRECUT orders halt normal call processing for several seconds (45 seconds maximum). The resultant effect is similar to that of a transient clear. To ensure against mutilated digits or long ringing (45 seconds), all transient call records (TCRs) are failed (idled), and all of the ringers, junctors, and test vertical test circuits (TVTCs) are idled during the execution of either order.

2.05 The No. 3 ESS uses reallocatable memory; therefore, the space for the bit-per-line map is available before cut in the spare translations program store. After the cut has been performed, this space can be reclaimed for normal translations since the map and list are only needed during the precut mode of operation. After an office is cut into service, the cutover status bit map should be removed via reallocation to prevent accidental use of the SET:CUT or SET:PRECUT messages.

3. SOFTWARE FUNCTIONAL DESCRIPTION (CUTOVER)

INTRODUCTION

3.01 The cutover program is divided into two sections:

(a) Main controller

(b) Find and service the next precutover line.

A. Main Controller

3.02 The main controller provides basic program control. Generally, it provides for the following:

(a) Acceptance of the TTY Message for Precutover or Cutover—The cut program will abort under the following conditions:

- Nonresident program OTOTST is active

- TOCO MSF is not active

- Cutover status (CUTSTAT) map is not accessible

- Number of map entries does not match the maximum-equipped scanner size

- TTY is active.

Interrupts are blocked by external program INITA, and the program timer and system status panel (SSP) display are updated. For SET:CUT input, the machine must be in a precutover state. If any of these checks fail, an error indication is sent to the error handling subsection of the main controller. External program INITA idles all test vertical test circuits (TVTCs), ringer circuits, nonstable junctors, and active transient call records (TCRs), and initializes the registers and data areas for operation by each of the network controllers (NWCs).

    (b) Basic Loop—This subroutine alternates between NWC 0 (network frames 1 through 7) and NWC 1 (network frames 8 through 15) until all lines in the network frames have been set into the precutover or cutover state and the CUTSTAT bit is set.

    (c) Cleanup—Recycles both NWCs for a final time and restores interrupts; also, sets the necessary office state bit (PRECUT) and returns to the TTY program which invoked CUT.

Initialization

3.03 The ALW:TOCO! message must precede the SET:PRECUT! and SET:CUT! message. The SET:CUT! message sets the office into the cutover mode while the SET:PRECUT message sets the office into the precutover mode. The initialization section prepares the system for the requested cutover (CUT) or precutover (PRECUT) task. The difference in the operation is that the network cutoffs will be opened for precutover or closed for cutover, and the office PRECUT bit (option) will be set accordingly. These are differentiated by zeroing the first message word for cutover and leaving it unchanged for precutover.

3.04 If any peripheral pulse distributor (PPD) order fails, the program aborts. If an error occurs in the writing program store, four-line translation, or network orders, the TTY prints SET CUT/PRECUT ABORT and control returns to the base level loop. All line cutoffs are set properly by the basic loop section. The cleanup and return routine indicates final disposition. Control is then returned to the TTY program CUT.

3.05 Nonresident program INITA calls subroutine PPD_INIT to idle the TVTCs. The TVTCs are idled to prevent an interrupted restore verify

(RSV) test from receiving current with the first stage opened. This current is generated during precutover. If not idled, it is possible for this condition to cause an error analysis entry when interrupts are restored.

3.06 The ringing circuits are also idled to prevent a long ring on any line during cutover or precutover. This must be accomplished before the idling of the junctors to avoid the breaking of junctor ringing contacts with ringing current applied. Regular ringers are idled by subroutine GR PX in external program, EQPSEL. In-service ringers are idled by subroutine PPD—INIT in program INITA. Special ringers (full service) are not fully idled but are silenced.

3.07 Idling the junctors (nonstable) which are not part of a stable call prevents breaking current flow when opening the network crosspoints. Transient junctors are ignored before being idled to prevent monitor reports which may occur before the corresponding TCR is failed (idled). Precut lines which are part of a stable call during a change to the precutover mode can be left in the talking connection. These will be left high and dry when disconnected. If the TMR is idle or transient, the corresponding junctor is idled. Before the transient junctor is idled, both junctor scan points are ignored. The nonstable junctors are idled by subroutine PPD_INIT.

3.08 To prevent misdirected calls, the active TCRs are failed. By clearing the TCRs, the preceding hardware-idling is made agreeable. Transient TCRs are cleared by subroutine FAILSUB in program FALTCR.

3.09 The registers are initialized with data to be passed to the NET_ORDER subroutine in program QTMON which constructs the network orders. This is used to open the first stage, make the second stage nonoperative, as well as the test vertical. The cutoff is opened or closed depending on the TTY input (SET:CUT or SET:PRECUT); another part of this operation initializes the timing.

3.10 Error handling provides a means to indicate the error. A junctor translation error or a junctor PPD failure causes an abort message to be printed. The network number is printed as a concentrator group number while the junctor number is printed separately. For any failure of the program to complete its task an abort message

is printed and the cleanup and return routine assumes control.

Basic Loop

3.11 This subsection initiates loops until the office has been put into the requested state, precut or cut (one line cut off at a time). For offices with more than one NWC, the basic loop alternates between each network controller. Frequently NWC 1 will finish before NWC 0 because all the frames are not equipped. The NET 1 done bit in the state register is set when NWC 1 is finished. The NET 1 done bit will also be set if NWC 1 does not exist. The program will loop on NWC 0 until the task on its assigned lines is complete. After every network order, it sets aside the registers for the current network controller and retrieves the registers needed for the other network controller. In determining which SPN is called next, NEXT_POINT is called by the basic loop in order to find and service the next precutover line. When the network controller(s) complete(s) assigned line operations, control is given to the cleanup and return subsection.

B. Find and Service Next Precutover Line

3.12 This subsection is comprised of three parts:

- Search the line scan point numbers (SPNs) for a precutover, nontest line

- Process the precut line

- Process the precut line-error handling.

Search Line SPNs for Precutover, Nontest Line

3.13 The next SPN is determined by subroutine NEXT_POINT. For the specific network controller, CUT searches for the next precutover, nontest line and opens or closes its line cutoff (providing it is not part of a stable call). The SPN is incremented. If a new scanner row is detected, the cutover status (CUT STAT) map word for the old row is stored; checks are then made for a new scanner, the end of the scanners, or unequipped scanners. A valid scanner check is performed to find out if the maximum SPN has been exceeded. If so, the NET 0 or NET 1 done bit for the frame is set and the program returns to the basic loop. For new equipped SPNs, the CUT program branches to entry OK_POINT for a valid SPN. If the new SPN is not equipped, the

program goes to the next frame. The REPORT_ERROR subroutine is called when a translation error occurs. The error is reported, and the program continues with the next SPN. After each equipped precutover line is processed, the internal binary clock is updated.

3.14 The subroutine UPDATE_CLOCK provides a consistent 11.25-ms interval between network orders. The TERMXL translation subroutine checks for a precutover hundreds group. For non-precut lines, the program loops to NEXT_POINT. If a new scanner row is detected, the cutover status bit map is accessed. Using subroutine WRITE_STORE, the word is stored here. Two recent change subroutines are called by WRITE_STORE to write unconditionally into main store. The subroutine also stores the bit-per-line map (one word at a time) and the PRECUT bit. An error in WRITE STORE or a failure to access the MAP causes the cut program to go to entry point CUTMAP_ERROR which calls subroutine REPORT_ERROR. Errors from find-and-service the-next-precutover-line routine are reported by a TTY message with an error code. However, if the number of errors exceeds four, it aborts the rest of the requested action by marking both networks finished (sets NET 1 and 0 in the STATE register). Then it returns to the basic loop (main controller). This routine is used as a subroutine so that errors do not interrupt normal processing until the number of errors exceeds four.

3.15 After every scan row is completed the display, timer, and clock are updated. The UPDATE_ SYC subroutine is used to reset the system timer and to display the current SPN on the system status panel. The subroutine is used after a network order or a word is stored in CUTSTAT (a table in translations storage). The RESETPT subroutine in program CBLM resets the program timer. If all the scanners in the network controller have been completed, the NET 0 AND 1 done bit is set in the STATE register. Also, a return is made to the basic loop. If another valid SPN does remain, a translation is performed on it. When the SPN is not a line, part of a precutover hundreds group, or a test line, control goes to process the precut line.

Process the Precut Lines

3.16 When a precutover, nontest line is found, the register holding the bit map word for this scanner now has the appropriate bit set to

one. Subroutine TMRSCAN in program TKPROC checks to determine if the line is in a stable connection. If it is, the connection will be left alone and then handled at disconnect. Return is made to search the line SPNs for a precutover, nontest line routine for the next precut line because a network action delay is not needed.

3.17 When the line is not part of a stable connection, a delay is inserted to verify that the last order to the network controller was at least 11.25 ms old. Subroutine TIMER checks the internal binary clock to ensure 11.25 ms between network orders to a particular network controller. When the last order is given, a register (OLD-TIMER) is set to current time. Then it calculates the difference between the current order and the last order. After a 11.25-ms delay has been verified, it returns to the calling routine.

3.18 Then the network order for the selected line is formatted and issued. Subroutine MAKE_ NETWORK_ ORDER is called to create the two words of network order to open (precutover) or to close (cutover) the cutoff contact of the selected line. The program timer is reset to prevent undue time-outs and the current SPN is displayed on the SSP. Control then returns to the basic loop of the main controller.

Process the Precut Line-Error Handling

3.19 Upon detection of an error in the performance of find-and-service-the-next-precutover-line routine, control is given to entry point REPORT_ NETWORK ERROR. The error is reported and the next SPN in the controller is tried. Three messages used by the CUT program are complete, abort, and error. The TTY output data buffers contain the data that is required to output these messages. After reporting the problem using error reporting, control will return to search the line SPNs for a precutover, nontest line (3.13) routine, unless the error caused an abort.

Cleanup and Return

3.20 This routine performs the final cleanup after all line cutoffs have been properly set. If the requested operation was not aborted due to errors/failures, it sets or resets the PRECUT bit according to the operation requested. It also prints the complete or abort message to indicate final disposition. Then it waits for 11.25 ms since the

last network order and recycles both network controllers. Finally, interrupts are turned on and control is returned to the TTY program which requested the program.

4. OFFICE-TO-OFFICE TEST

INTRODUCTION

4.01 The office-to-office test is used to test cross-connections between the No. 3 ESS office and a step-by-step office (SXS) it is replacing (Fig. 1). This test is initiated via TTY messages specifying a range of directory numbers to be tested. (These are tested sequentially.) Translation data is checked for the assigned telephone numbers (TNs). The TN is outpulsed to the SXS via a special outgoing trunk (universal trunk circuit FB429). The incoming trunk in the SXS office is a test distributor control circuit. This trunk must be equipped with a no-test access. The line under test is checked to verify that it is idled; if busy, the line is tested after it becomes idle. Once the line is verified to be idle, a continuity polarity (CP) test circuit is connected to the No. 3 ESS side of the cross-connect (via a normal network connection). A positive check using battery from the CP circuit is performed to verify that the cross-connect is present and correctly wired. As an option, the SXS office can be tested to determine if the wiring (ground start or loop start) of its line sensor is consistent with the No. 3 ESS translations.

4.02 This program will only test lines whose telephone number (TN) has not changed when connected to the No. 3 ESS office. Also, multiline hunt group (MLHG), private branch exchange (PBX) lines, lines with special routing, and lines not in the precut state (cutoff contacts open) are not tested. The TN and the office equipment number (OE) of these lines will be printed on the TTY, indicating these are to be manually tested. An option of having a printout made of each line passing all tests (all tests passed-ATP) is available. Normally, only failing TNs will be printed with the counts of TNs passing, TNs found busy, TNs corresponding to MLHGs and PBXs, and TNs unassigned totaled by the program. These counts are printed when the entire range of TNs requested has been tested or the program is aborted.

A. Entry Into Office-to-Office Test

4.03 Entry into the TOCO programs via the MSF controller (TOCOENT) is made by a call from the MSF controller. An entry code is provided by the MSF controller which is used to branch to one of three points:

- Initial entry from the MSF controller (TOCOIE)

- Normal entry into office-to-office test program (OTONENT)

- Abort entry into the office-to-office test program (OTOAENT).

Initial Entry From MSF Controller (TOCOIE)

4.04 This is entered only on the initial entry from the MSF controller. The message TOCO READY is printed and control is returned to the MSF controller. When the TOCO READY message has been received, the craftsperson can enter the messages to start either the CUT program or to test lines using the office-to-office test program. The overall TOCO timer is set to 10 minutes. If the TOCO programs are idle for 10 minutes, the program is stopped.

Normal Entry Into the Office-to-Office Test Program (OTONENT)

4.05 This is the normal entry into the office-to-office test program (OTOTST). A check is performed to determine if office-to-office testing is being performed. If testing is not being performed, subroutine TIMECHK in program CSYSUB is called to verify whether TOCO program has timed out. If a timeout has occurred, TOCOST is called for a STOP:TOCO message. If there is no timeout, active control is immediately returned to the MSF controller. However, if office-to-office testing is being performed, various checks are made to verify if the office-to-office progress mark should be invoked.

B. Select Equipment for Office-to-Office Test

4.06 If the OTO program is active, the program branches to NORMENT where the TOCO timer is reset to 10 minutes. The select equipment bit (SELEQP) is then checked and, if set, the program branches to SELECT_EQUIPMENT. If

Bit (SELEQP) is not set, the equipment has previously been selected. The address of the TCR is then isolated in the assigned register.

4.07 When the EX:OTO message has been received, equipment required for the office-to-office test is selected. All hardware selected is idled, If a failure occurs in selecting any equipment, the abort section of OTOTST is entered and an error message is printed. The equipment selected for office-to-office tests includes:

- Transient call record (TCR)

- Office-to-office trunk

- Multifrequency transmitter (MFT)

- Continuity and polarity test circuit.

After the required equipment is selected, the transmitter is connected to the trunk (via CONNECT subroutine). This connection is maintained throughout the entire test.

4.08 If the office is in the precut state, subroutine NXX_ NOC in external program XSLSUB is called to find the normalized office code. After a TCR is selected by subroutine TCRSEL in program EQPSEL, the TCR timer is set to 10 seconds. The OTOTST route index is accessed to determine the trunk group, and the trunk is selected by subroutine TRKSEL in external program EQPSEL. The trunk data is saved and the trunk is checked to see if it is an immediate start trunk. The multifrequency transmitter is also selected by TRKSEL. The MFT data is stored, and the MFT scan point number (SPN) is accessed and stored. Then the MFT is idled, and a continuity polarity (CP) test circuit is selected by subroutine MBRSEL in program EQPSEL. The CP data is stored and the CP is idled. Then a path from trunk to transmitter is selected. Next, the program goes to entry point TNSRCH to find a TN to test.

C. Telephone Number Search

4.09 This part of OTOTST does a TN search to find a TN which can be tested (sequentially). The search is driven from the initial and final TNs inputted via the EX:OTO message. The search is continued if the test buffer is empty and the busy TN table is not active. If the busy TN table is active, the next TN for test is taken from the

busy TN table. Subroutine UNT_PRINT is called to print the untested TNs data.

4.10 The general registers are loaded with pertinent data such as current TN and final TN. A terminating translation is performed to determine if the line is assigned or unassigned. If the line is assigned, its precut bit is checked; if the precut bit is not set, the line cannot be tested (because it is already in service in the No. 3 ESS office). When a line cannot be tested, the current TN is incremented and the next TN is tested. When a testable line is found, its TN is loaded into the test buffer, the test buffer flag is set, the current TN is saved, and control is returned to the MSF controller with a return code of two.

4.11 A test of the peripheral message waiting bit indicates whether or not the OTOTST is waiting for peripheral work to complete. If the program is waiting, the message bit is checked to verify if the work is finished. When the message bit is set, a check is performed to determine if MAINT 2 or MAINT 3 is the base progress mark (BASEPM). Either BASEPM (MAINT 2 or MAINT 3) signals a return from peripheral work. A MAINT 2 signal indicates an error during peripheral work which resulted in the TCR timing out. This case aborts the OTOTST. If the OTOTST is not waiting for peripheral work or all three checks pass, the office-to-office progress mark is invoked.

D. Get Set to Outpulse the TN

4.12 This is the OTOTST progress mark used to set up the TCR for outpulsing a TN. The TN is in the test buffer. The TCR is loaded with the office code, the TN to be tested, the transmitter DTA, and the MAINT base progress mark.

4.13 For an immediate start dial pulse trunk, a seizure is sent and the OTOTST progress mark is set to outpulse the TN.

4.14 The OTOTST progress mark is invoked after the TN is outpulsed. If the DISCRTN bit is set, equipment in the SXS was detected as busy. If it is not set, the state of the transmitter is verified and a busy check is performed from the transmitter.

4.15 The supervisory scan point of the transmitter is checked. If it is set, a busy condition occurred in the SXS office. If it is not set, the

test is continued. When a busy line is found, a check is performed to determine whether this is the first time a test of this TN was attempted. If it is the first attempt, the TN is placed into a busy table and the test is repeated later. However, if it is the second attempt, the busy result is printed by calling subroutine OTOPRINT. The subroutine prints the per line all tests pass, busy, or error data when desired.

E. Prepare for Continuity Polarity Checks

4.16 The office-to-office trunk is set to complete connection through to the line in the SXS office. Next, the TCR is set to connect the line in the No. 3 ESS office to the CP circuit.

4.17 The program prepares for the CP test and the appropriate distribute subroutine is called (a failure returns control). The junctor is opened and the test counter is zeroed. Then the CP test circuit is connected to the line.

F. Continuity Polarity Tests

4.18 The CP circuit is used to verify that the line connected to the No. 3 ESS office is the same one as in the SXS office. The program cycles through the continuity polarity test table. This table is a list of the states to which the CP circuit will be set. The CP circuit is scanned each base level loop until the entire test table is used or a scan fails. If a scan fails while the test is being performed, there is a voltage on the line. This could result because the line is cross-connected incorrectly or a foreign potential is across the line. The error is printed as well as the TN under test and its terminal equipment number (TEN). If all tests in the table pass, the CP circuit is set to apply ground to the tip and battery to the ring. Control is then transferred on the next base level loop to the POSITIVE_CHECK office-to-office progress mark.

G. Check That the SXS Line Cutoff is Operated

4.19 The transmitter continuity scan point is scanned; if it is set, the line cutoff in the SXS office has probably not operated. A large number of these errors means that there is trouble with the test distributor circuit or its control circuit in the SXS office. If the scan point is not set, the A junctor (the A junctor is in the test path to the old office) is again set to bypass state and

a positive check is made to ensure that the cross-connect is good.

H. Positive Verification of the Cross-Connect

4.20 A positive check is performed to verify that a connection exists between the CP circuit and the transmitter through the SXS office over the cross-connect. This is accomplished by checking the transmitter continuity scan point. If the scan point is not set, a connection does not exist. If the scan point is set, a connection does exist and the transmitter supervisory scan point is checked to verify a tip-to-tip and ring-to-ring connection. If the preceding tests pass, then either the CP circuit is disconnected from the line and the next TN is tested or an optional ground start-loop start check is invoked.

I. Ground Start—Loop Start Test

4.21 The timer is checked to ensure that the trunk has disconnected from the line in the SXS office. Once the line is disconnected, the CP circuit is scanned. (It is looking for ground on the tip and battery on the ring.) If the line is a loop start, the scan point should be set. For a ground start line, the scan point will not be set. On an error occurrence, an error code is entered into the error register and printed by the OTOPRINT subroutine.

J. All Tests Passed Telephone Numbers

4.22 This section is entered when all tests of a TN and its associated line have passed. The results of the test are printed if that option was specified by input message or if only one TN is being tested. Subroutine OTOPRINT prints the all tests pass results. The CP circuit is idled and the TCR is set to disconnect the CP circuit from the line by using subroutine DISCNCT in program MCSUB. If the ground start-loop start test was not performed, the trunk is set to the disconnect state causing the SXS office to disconnect.

K. Cleanup for Next Telephone Number

4.23 The timer is checked to insure that the trunk has been disconnected from the line in the SXS office. When the timer has timed out, a check is performed to determine if there are any more TNs to be tested. If there are, the office-to-office progress mark is set to test the next TN. If there are no more TNs to test, the TCR is set to disconnect the transmitter from the trunk. Next, the totals of all tests passed and busy, untested, and unassigned TNs are printed. The CP circuit is then idled and the office-to-office status area is cleared along with the TCR. ZERO_OTO subroutine clears the office-to-office status area of the paging buffer. It effectively stops the OTOTST by changing the progress mark to zero. Only the first sixteen words of this area are cleared because all the control information is located here. TOCO MSF is not aborted to enable the craftsperson to test any individual TN without reloading the TOCO MSF from the tape.

L. Abort Entry Into the Office-to-Office Test Program (OTOAENT)

4.24 This is the abort entry into OTOTST from the MSF controller. The proper error code is set; then the abort is handled as an internal abort.

4.25 A check of the error code is made in the error register. If the abort is from the MSF controller or the result of a TTY message, the MSF return code is set to three for a final return. If not, the return code is two for an in-progress return. Thus, the craftsperson can recover from most aborts without reloading the TOCO MSF from the tape. The office-to-office status area is cleared. The OTO ABT xx message is printed where xx is the following error code.

XX	Failure.
00	The office precut bit is not set.
10	A TCR could not be selected.
11	An OTO trunk could not be selected.
12	A transmitter could not be selected.
13	The continuity polarity test circuit could not be selected.
14	A route index expansion failed.
15	A problem in circuit translations was found.
16	A line translation failed.

30	A distribute order failed.
31	A failure occurred during sending.
32	A failure occurred in a peripheral sequence.
64	A TTY abort occurred.
65	An abort from the MSF controller occurred.

4.26 Control is returned if a failure occurs which causes an abort. The appropriate action is then taken, depending on the type of failure. One or all of the following actions can be performed.

- Office-to-office counters are printed.

- TCR is failed.

- OTO ABT xx message is printed.

M. Input Messages

4.27 *EX:OTO:* The OTOINP subroutine handles the input message EX:OTO to start the OTOTST. The office-to-office status area is initialized with the data from the input buffer. Various options are available; these include: testing only one directory number or a group of several numbers, performing a ground start/loop start test, and printing all tests passed results. At the end of this routine, the OTOACT and SELEQP bits are set and an okay (OK) is printed.

4.28 *ABT:OTO:* An office-to-office program abort is handled by the ABTOTO subroutine. The OTOACT bit is checked. If the program is active, it is aborted and an IP is printed. If the office-to-office program is not active, NG is printed.

4.29 *ALW:TOCO:* The TOCOREQ subroutine loads the TOCO programs into the paging buffer.

4.30 *STOP:TOCO:* A TOCO program stop is handled here. First, a check is made to verify that TOCO MSF is active or inactive; if inactive, a NG is printed. If active, IP is printed and a request is made to the MSF controller to abort the TOCO MSF. The TOCOST subroutine handles the STOP:TOCO input message.

N. Output Messages

4.31 *TOCO STOPPED:* In response to the input message STOP:TOCO, the turnover/cutover MSF has been stopped. Other non-resident programs can now be accessed.

4.32 *OTO bbb TN nnx-xxxx OE gg-cwsl:* In response to the input message EX:OTO, the subroutine OTOPRINT prints a message. The TN NXX-XXXX is reported for reason BBB.

Reason BBB is:

ATP	This message is printed if the ATP option was specified on the EX:OTO input message.
BSY	The TN NXX-XXXX was busy both times it was tested. Manually check the line associated with the TN. Once problem is cleared, rerun OTOTST.
UNA	The TN NXX-XXXX is not assigned to a line. The message is printed only if one TN is under test.
UNT	The TN NXX-XXXX was not tested because it is a member of a PBX. Check the TN manually.
MLHG	The TN has special routing or has not been precut.

The office equipment number (OE) GG-CWSL is:

GG—Concentrator Group

C—Concentrator

W—Switch Group

S—Switch

L—Switch Level

4.33 OTO COMPL aaaa bbbb cccc dddd eeee ffff: All TNs requested by the EX:OTO message have been processed. The office-to-office test program is finished.

AAAA	The total number of TNs which were tested.

BBBB	The total number of TNs which have ATP.
CCCC	The total number of TNs which were busy on two attempts.
DDDD	The total number of TNs untested. TNs assigned to PBXs, MLHGs, having special routing, or not being precut are not tested. Manually test these TNs.
EEEE	The total number of TNs unassigned.
FFFF	The total number of TNs that have errors.

4.34 *OTO ERR yy TN nxx-xxxx OE gg-cwsl:* The line assigned to the TN nxx-xxxx failed because of trouble reason yy.

yy is:

01	The CP circuit detected ground on the ring and battery on the tip instead of an open circuit.
02	The CP circuit detected ground on the tip and battery on the ring instead of an open circuit.
03	The CP circuit detected battery on the tip instead of an open circuit.
04	The CP circuit detected battery on the ring instead of an open circuit.
05	The CP circuit detected ground on the tip instead of an open circuit.
06	The CP circuit detected ground on the ring instead of an open circuit.
09	The cross-connect between the old office and the No. 3 ESS is open.
10	The tip and ring are reversed somewhere in the cross-connect.
11	The wiring of the line-attending element in the old office does not agree with the No. 3 ESS translation.
12	The line cutoff in the old office did not operate as expected. Numerous errors of this type indicate a problem in the test distributor or test distributor control circuit.

5. GLOSSARY

5.01 The following terms, definitions, and abbreviations are applicable to this section.

ATP—All tests passed.

Base Level—Major software loop including all functions not done at interrupt level.

Bit—The binary unit of information that is represented by one of two possible conditions, such as the digits 0 and 1, on or off.

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

CP—Continuity polarity.

Cutover—Time or point at which the No. 3 ESS office begins to handle or process customer telephone service.

ESS—Electronic Switching System.

IP—In progress.

LPCDF—Low profile combined distributing frame.

MF—Multifrequency.

MFT—Multifrequency transmitter.

MLHG—Multiline hunt group.

MSF—Multiscan function.

NWCs—Network controllers.

OE—Office equipment number.

OTO—Office-to-office.

PBX—Private branch exchange.

PPD—Peripheral pulse distributor.

Initialization—A program restart at a fixed location to provide an orderly return to a stable state in the data processing routines. A count of the number of restarts incurred during a given time is used to progressively clear areas until the system recovers its sanity.

Read—To retrieve the information stored in a memory device.

Register—A functionally associated set of memory elements such as flip-flops; a word repository.

RSV—Restore verify.

Scan Point—Ferrod sensor used in scanners for supervisory purposes.

Sequential—A manner of action or operation of equipment in which instructions are set up in a sequence (following a specific space or time pattern) and are fed consecutively to equipment.

Set—To place a storage device in the "one" state.

SPNs—Scan point numbers.

SSP—System status panel.

Subroutines—A sequence of instructions that perform a well-defined function and are called by another section of instructions.

SXS—Step-by-step.

TCR—Transient call record.

TNs—Telephone numbers.

TOCO—Turnover/cutover.

TTY—Teletypewriter.

Turnover—Time or point at which TELCO accepts the office from WECO.

TVTCs—Test vertical test circuits.

Word—A set of characters which occupies one location in storage and is treated by the system as a unit.
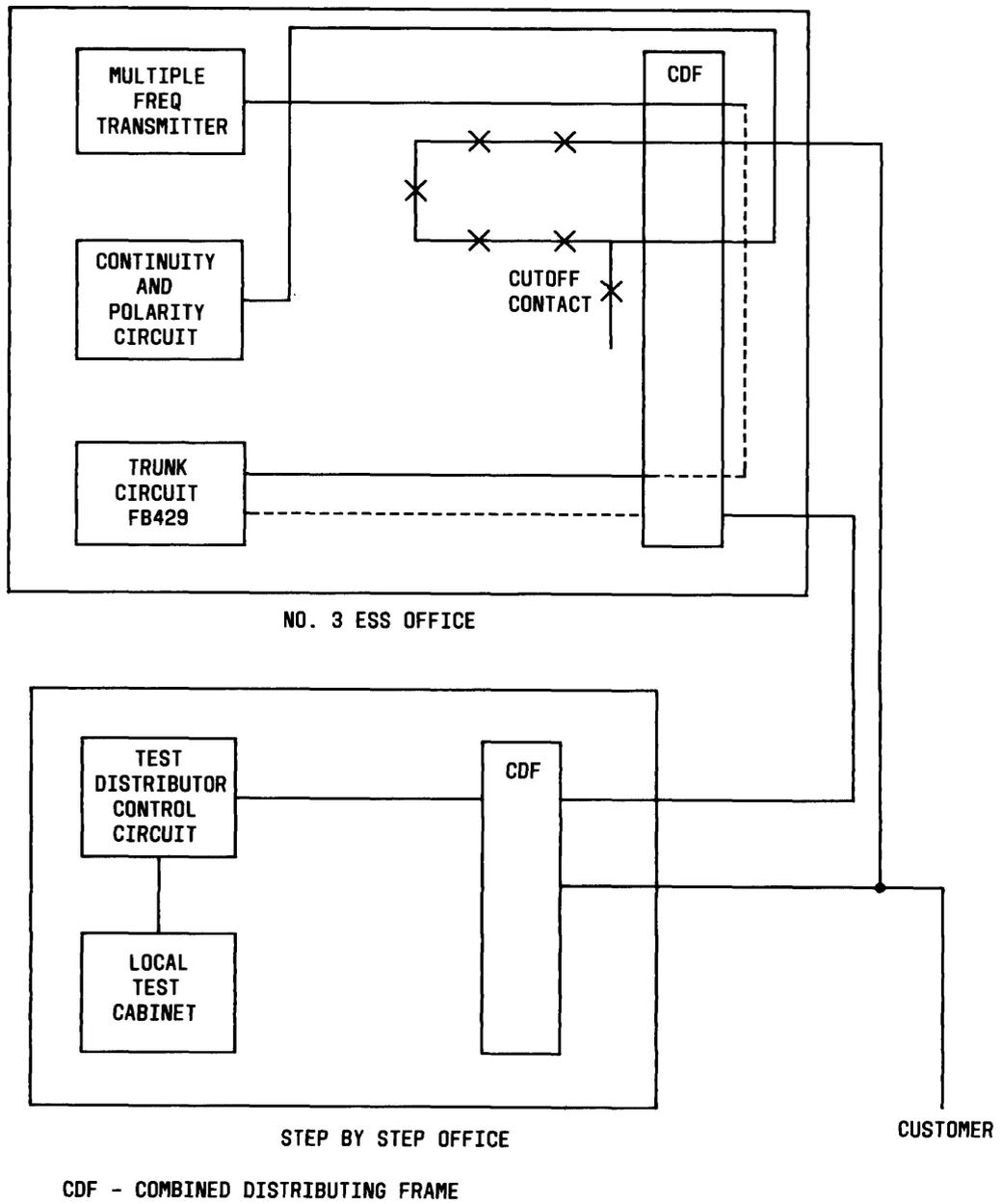
Write—To insert information into a memory device.

MULTIPLE
FREQ
TRANSMITTER

CDF

CUTOFF
CONTACT

CONTINUITY
AND
POLARITY
CIRCUIT

TRUNK
CIRCUIT
FB429

NO. 3 ESS OFFICE

TEST
DISTRIBUTOR
CONTROL
CIRCUIT

CDF

LOCAL
TEST
CABINET

STEP BY STEP OFFICE

CUSTOMER

CDF - COMBINED DISTRIBUTING FRAME

Fig. 1—Cutover Setup