SWITCHING SYSTEMS MANAGEMENT
NO. 1 ELECTRONIC SWITCHING SYSTEM (2-WIRE)
NETWORK MANAGEMENT OPERATIONAL FEATURES
CTX-6 AND LATER GENERIC PROGRAMS

CONTENTS PAGE

1. GENERAL

1.01 This section describes network management operational features in the 2-wire No. 1 Electronic Switching System (ESS). This section applies only to offices having CTX-6 and later generic programs. Network management features were developed for the ESS office to improve the utilization of facilities during overload conditions, to control congestion in the network, and to help prevent overload of tandem switching systems.

1.02 When this section is reissued this paragraph will contain the reason for reissue.

1.03 The features available for No. 1 ESS are ***code blocking*** and ***trunk group controls.*** Code blocking provides the capability to limit traffic to a congested area. Trunk group controls limit or change the routing of outgoing traffic to one-way outgoing or 2-way trunk groups. Code blocking controls are activated manually by teletypewriter (TTY) message input. Trunk group controls may be activated either manually by TTY messages or automatically in response to dynamic overload control (DOC) signals from a higher-class office in the routing hierarchy. Effective with CTX-7 generic programs, a No. 1 ESS office can be arranged to transmit as well as receive DOC signals.

1.04 The tandem switching system on which an ESS is homed and ESS machines which serve as class 4 or higher offices should be equipped to provide DOC. The purpose of DOC is to monitor and sense the state of overload or congestion within the tandem system. If congestion is not controlled in the early stages of buildup, it can spread rapidly throughout the network. Increased congestion in one part of the network will cause equipment time-outs, additional alternate routing, and congestion which can quickly spread to many other locations. When network congestion occurs, customers make repeated attempts which, in turn, create more congestion in the network. To control this condition, DOC equipment with load-sensing levels called machine congestion levels is used in ESS tandem offices. A similar function is performed in electromechanical offices. When triggered, this

circuitry sends signals to the traffic sources to cause specific items of traffic to be limited or not sent at all to the overloaded office.

1.05 When the traffic source is a No. 1 ESS office equipped with the appropriate control devices, selected calls which have little chance of completion in the network can be regulated at that office. Facilities to and through the tandem office can then be reserved for calls with a much higher chance of completion.

1.06 Some additional features offered to better manage a network are ***receiver attachment delay report*** (RADR) and ***network management indicators.*** The RADR feature provides No. 1 ESS offices with the capability of measuring the time delay experienced in receiver connections for incoming traffic. The network management indicators provide binary (on-off) indications of the No. 1 ESS status as closed-open contacts which could be used to drive operating company furnished displays.

1.07 The network management features offered with CTX-6 and later programs are not automatically available in offices with the appropriate generic program. The necessary call store, program store, and hardware must be present. Consequently, the use of these features must be planned for if network management is to be implemented.

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

2. CODE BLOCKING

2.01 ***Code blocking*** provides the capability to limit traffic to a congested area based on the destination code. The following code combinations can be blocked:

- 3-digit area code (numbering plan area [NPA])
- 3-digit office code (NXX)
- 6-digit code (NPA-NXX)
- 7-digit directory number (NXX-XXXX)
- 10-digit directory number (NPA-NXX-XXXX)

In addition, an access code of 0 or 1 may also be blocked.

2.02 Code block controls can be requested for 50, 75, 87-1/2, or 100 percent of attempts. Calls blocked will be routed via a fixed route index to access either a no-circuit announcement (NCA) or one of two emergency announcements (EA1 and EA2).

2.03 Code blocking cannot be activated from a remote DOC unit, but must be inputted manually via an ESS associated TTY.

2.04 The number of code blocking slots provided in a No. 1 ESS office will range from 4 to 31. Because of the design of the memory, code blocks share their code matching function with the ESS ***calling line identification*** (CLID) feature. This will limit the number of code blocks which may be used to a combination of from 4 to 31 CLIDs and code blocks. For example, if all 31 code block memory slots are equipped and 10 are used for CLID, only 21 can be used for code blocks. The CLID feature is used to trace calls and may be valuable when a customer is receiving nuisance calls.

2.05 Code blocking is only effective on lines that are not classified as essential service. Calls from essential lines will be excluded from code block control.

2.06 Form ESS 1507, Supplementary Rate Center Record, is used to identify the rate centers which will utilize the code blocking (and CLID) feature. Reproducible forms and instructions are available in the Translation Guide, TG-1A.

3. TRUNK GROUP CONTROLS

3.01 Two types of ***trunk group controls*** are provided for limiting or changing the routing of outgoing traffic. These control types are:

- ***Flexible:*** Can be activated on any trunk group in the office. This type is available with CTX-7 and later generic programs.
- ***Preprogrammed:*** Can be activated only on prespecified trunk groups in the office. This type is available with CTX-6 and later generic programs.

An office equipped with CTX-7 or later generic programs may be provided with both types of control.

3.02 Flexible controls are always activated manually with TTY input messages. Preprogrammed controls can be activated manually with TTY input messages or automatically under control of DOC signals.

3.03 Within each type of control, three control options are available. These control options are:

- ***CANCEL-TO:*** Controls the number of attempts offered to a trunk group by canceling the call.
- ***SKIP:*** Controls the number of attempts offered to a trunk group by skipping over this trunk group to the next trunk group in the routing pattern for this call.
- ***CANCEL-FROM:*** Controls the number of attempts overflowing a trunk group by canceling the call.

3.04 First-routed (direct) and/or alternate-routed traffic can be controlled in any of the following percentages for the CANCEL-TO and SKIP controls.

DIRECT: 0, 50, 75, or 100 percent

ALTERNATE: 50, 75, or 100 percent

For the CANCEL-FROM control 50, 75, or 100 percent of the overflow traffic can be controlled. An attempt affected by a CANCEL-TO or CANCEL-FROM control is routed via a fixed route index to the NCA.

3.05 In addition, the following control option is available as a flexible control:

- ***Trunk Reservation:*** Limits the number of attempts offered to a trunk group when fewer than the specified number of trunks remain available.

3.06 The trunk reservation control option includes two thresholds. They are:

- ***Protectional reservation of equipment (PRE)***
- ***Directional Reservation of Equipment (DRE)***

3.07 PRE is useful in reserving facilities for first-routed traffic. If the PRE threshold is crossed, all traffic alternate routed to this trunk group is inhibited from searching for an idle trunk in this trunk group and is routed to NCA.

3.08 DRE is useful in reserving facilities for incoming traffic. Thus, DRE has meaning only on 2-way trunk groups. If the DRE threshold is crossed, all outgoing traffic to this trunk group is inhibited from searching for an idle trunk in the trunk group and is routed to NCA.

3.09 The maximum number of controls that may be provided is 63 of each type. The actual number provided is an office parameter and may be less.

3.10 Preprogrammed controls are stored as translation data. See forms ESS 1506, 1508, and 1600 in the Translation Guide, TG-1A. Each trunk group control is called a preprogram (PP). The control information, stored as translation data, consists of one of the control options (CANCEL-TO, SKIP, or CANCEL-FROM), associated percentage(s) of attempts to be affected, and the trunk group to which this control is to be applied. Any number of the preprograms which can be activated by manual input only and as many as three preprograms which can be activated by DOC can refer to control of a given trunk group. However, a trunk group can be controlled by only one preprogram at any given time.

3.11 All preprograms can be activated manually and as many as 30 can also be activated automatically by DOC. Preprograms that can be activated automatically via a DOC signal must have a priority assigned to them and stored with the translation data. This priority is associated with the congestion level of the office which is sending the DOC signal. If the office sending the signal is a No. 1 ESS, priorities are assigned as one, two, or three correlating with machine congestion levels one, two, or three (MC1, MC2, or MC3). If

the office sending the DOC signals is an electromechanical office, priorities are assigned as one or two correlating with ***sender queue low*** or ***sender queue high*** (SQL or SQH). Thus, the automatic preprograms referring to control on the same trunk group must be assigned different priorities. A unique DOC signal is required for each priority.

3.12 A manually activated preprogram will assume immediate control of the associated trunk group replacing any manual control currently on that trunk group and overriding any activation requests received automatically via DOC signals. In the absence of a manual control on the trunk group, the highest priority preprogram for that trunk group for which a DOC signal is being received will control that trunk group.

3.13 Via a TTY input message a preprogram can manually be excluded from automatically taking control on a trunk group, causing the DOC signal to be ignored. This exclusion is done on a per-preprogram basis, allowing the trunk group to remain controlled by other automatic preprograms or manually by another preprogram.

4. DYNAMIC OVERLOAD CONTROL

4.01 DOC signals may be sent from tandem or toll offices to connected offices requesting that they limit the amount of traffic sent to the tandem or toll office. The signals are sent when there is a high probability that the traffic could not be processed in the DOC sending office and equipment would be tied up in the DOC receiving office. This would tend to deny service to calls in the DOC receiving office which are not directed to the DOC sending office.

4.02 The capability to receive automatic DOC signals by a No. 1 ESS from a toll or tandem office is available in CTX-6 or later generic programs. Up to three levels of DOC signaling can be received by the No. 1 ESS machine. These DOC signals are associated with the preprogrammed controls for a given trunk group as was discussed in previous paragraphs.

4.03 The hardware required to receive DOC signals by No. 1 ESS is the common systems dynamic overload control circuit, SD-27980-01.

4.04 With CTX-7 and later generic programs, No. 1 ESS offices have the capability, if the feature is installed, to transmit DOC signals. These signals are sent because of a shortage of real time; a shortage of multifrequency, trunk dial pulse, or revertive pulse receivers; or a lack of capability to switch any calls.

4.05 Two levels of signaling exist for the shortage of real time and the shortage of receivers. These levels are ***MC1*** and ***MC2***. MC1 indicates that the machine is sufficiently congested to cause substantial delays in receiver attachment. Delays in the range of from 20 to 40 percent above normal receiver holding time are considered substantial. MC2 indicates that the machine is considerably more congested than the MC1 level. At MC2, delays in the range of 40 to 80 percent above normal receiver holding time would be expected.

4.06 A shortage of real time is determined from the length of the incoming overload control queue. This is a queue of call attempts waiting to be served which have not yet been allowed to attempt to seize a receiver. As the E-E visitation rate decreases and call processing is retarded, a call attempt remains in the queue longer causing the length of the queue to increase. It is this length which, when crossing certain threshold lengths, is used to activate DOC signals, MC1 or MC2, for shortages of real time. The threshold lengths are constant generic values based upon the call-processing speed of the generic program installed. For example, with a generic program of greater call-processing speed, a call attempt would remain in the queue a shorter time. Therefore, more call attempts must be in the queue before the call processing is retarded and DOC signals are required. This higher speed generic program would have longer threshold lengths for shortages of real time defined as constant generic values.

4.07 Once a call attempt is allowed to seize a receiver, an idle receiver of the correct type (multifrequency, trunk dial pulse, or revertive pulse) is chosen for that call attempt. If there are no idle receivers a queue is formed for that receiver type. The length of the queue depends upon the average holding time of the receivers and the number of receivers in the office. As the receiver holding time increases or the demand for receivers exceeds the number of receivers (or both), a call attempt remains in the queue longer causing the length of the queue to increase. It is this length

which, when crossing certain threshold lengths, is used to activate DOC signals, MC1 or MC2, for shortages of each receiver type. These threshold lengths are determined by the generic program based upon the number of receivers equipped in the office. With a machine having a greater supply of receivers than other machines, a call attempt would remain in the queue a shorter time. Therefore, more call attempts must be in the queue before a shortage of receivers for that type exists and DOC signals are required. This machine would have longer threshold lengths for shortages of receivers.

4.08 The thresholds for real-time and receiver shortages are checked every two seconds. When a threshold is crossed at two consecutive 2-second checks, the sending of the associated DOC signals is initiated. DOC signals will cease to be sent at the first 2-second check at which the threshold is no longer crossed.

4.09 A third level of signaling, MC3, must be sent when the switching machine is incapable of processing calls. The command source for this type of signal is derived from either of two lamp signals on the master control center. These lamp signals are:

- Emergency action (EA) phase in progress which is on when a software problem exists and call processing has ceased in an attempt to correct the problem

- Repeated time-out (RTO) which is on when a hardware problem exists and, in most cases, a manual action is required.

4.10 The hardware required to send DOC signals is the DOC transmit circuit, SD-1A334-01 (Fig. 1). A maximum of 64 MC1/MC2 signals and a maximum of 32 MC3 signals may be sent to connected offices. This circuit accepts inputs for each MC1/MC2 signal from a corresponding signal distributor (SD) point and transmits a signal only when the signal distribution point is operated. Additionally, this circuit accepts inputs for the MC3 signals from the master control center (EA or RTO lamp signals).

4.11 Since the DOC signals are restrictive in nature, all offices to which any DOC signal is sent must acknowledge the signal. These acknowledgments are detected at the transmitting office by supervisory scan points of the master scanner. For MC1 and MC2, the signal is removed and marked out of service either when an acknowledgment is not received within 2 seconds or when an acknowledgment is received without a signal having been sent. The signals may be returned to service via TTY input messages at the maintenance TTY. For MC3, acknowledgments are checked by software after the machine has recovered. The network maintenance personnel is notified via TTY output message at the maintenance TTY of any DOC signal that is marked out of service.

4.12 The signal transmitted by the DOC transmit circuit is an on signal interrupted by an off signal every 30 seconds. The duration of the off signal is approximately 1 second. This interruption is inserted to validate the DOC transmit signal. Without the interruption, no distinction can be made between a steady on DOC signal and a shorted pair in the transmission facility between the two switching offices. The interruption is provided by a duplicated hardware interrupter.

4.13 Since the acknowledgment that is returned from the DOC receiving office is identical to the transmitted signal, the interruption exists in the acknowledgment signal also. To avoid unnecessary processing during change of states of the scan point, the interruptions are nullified and are continuous "on" signals at the scan point.

4.14 The MC3 signal is a broadcast-type signal which is sent to only 32 offices or less. However, the signaling arrangement for MC1/MC2 is more flexible. DOC signals for MC1 and MC2 levels may be sent to a maximum of 64 offices if a radial signaling arrangement is used or to a maximum of 64 loops if a tandem signaling arrangement is used. With radial signaling, the office receiving the DOC signals must return an acknowledgment to the sending office. With tandem signaling, however, the acknowledgment may be transmitted to another office which will accept it as a DOC signal. This ofice must either return the acknowledgment or transmit it to another office. The only limit on the number of offices in the tandem loop is that the acknowledgment must be returned to the signaling office within 2 seconds of the initial transmittal. The sum of the number of MC1 and MC2 signals must not exceed 64. Thus, if MC1 signals are sent to 48 offices, MC2 signals can be sent to only 16. In most cases,

when MC1 signals are sent to an office, MC2 signals will probably also be sent, thereby using two of the 64 signals.

4.15 Crossing any of the thresholds for MC1/MC2 signaling causes DOC signals to be sent on some subset of the 64 signals. These subsets are identified in translations using the equipment questionnaire, E-8056, and data provided on form ESS 1509A (available in the Translation Guide, TG-1A). Using a TTY input message, the network manager may send any of the 64 individual signals at any time, regardless of congestion level. In addition, the network manager may at any time use a TTY input message to exclude any of the 64 individual signals from being sent, even if the threshold for that signal is crossed.

4.16 The set of offices connected to receive MC3 signals is defined in translations using form ESS 1509B.

5. RECEIVER ATTACHMENT DELAY REPORT

5.01 The receiver attachment delay report (RADR) is a feature available with CTX-7 and later generic programs. This feature measures the delay experienced by incoming traffic to reach the proper type receiver. Electromechanical systems have a similar device to measure incoming traffic congestion known as the sender attachment delay recorder (SADR).

5.02 RADR tests are software-generated test calls, originating from incoming trunks and the incoming portion of 2-way trunks, for the purpose of measuring the delay experienced by incoming traffic. Every 4 seconds an attempt is made to initiate a test call from a randomly chosen incoming trunk. This simulated seizure goes through call-processing programs to the point of receiver connection. The attempt is then abandoned. Attempts which fail to establish a path between the incoming trunk and the proper receiver in 3 seconds are reported as delays.

5.03 A relatively even distribution of RADR tests is accomplished providing approximately 900 tests per hour. The RADR feature is very similar to the method used in No. 1 ESS to make dial tone speed tests.

5.04 The test and delay measurements relative to the RADR feature are available normally on a scheduled basis. A visual display of RADR delay counts or percentage is also available for each receiver type. The RADR feature is described in more detail in Dial Facilities Management Practices, Division H, Section 6k(1).

6. NETWORK MANAGEMENT INDICATORS

6.01 In order to better manage the network associated with a No. 1 ESS, it is sometimes desirable to produce visual displays or other recording devices of current machine and network status. These displays are usually located in a remote network management center where a network manager can administer a number of switching machines or in a large toll or tandem No. 1 ESS machine. The CTX-7 and later generic programs make available interconnection between the network management center and the No. 1 ESS machine to provide ***network management indicators.***

6.02 The hardware required at the No. 1 ESS office is the circuit SD-1A335-01. This circuit accepts inputs from a maximum of 167 signal distributor points to control the various indicators. The circuit includes machine status, trunk group no-circuit, and RADR which may be provided in the following maximum quantities at these update times:

QUANTITIES	UPDATE TIME
Machine status—22	Every 40 seconds
Trunk group—112	Every 40 seconds
RADR—33	Every 30 seconds

These indicators may provide a useful display of the state of the machine in large tandem or toll offices.

6.03 The 22 binary (on/off) machine status indicators available for display are:

- ***Transmitters:*** An indicator is provided for each of the following transmitter types: multifrequency, trunk dial pulse, and revertive pulse. When sampled, if the requests for a transmitter type exceeds the number of transmitters, an overflow condition exists and the indicator is turned on. When the overflow condition does not exist, the indicator is off (three indicators).

- ***Receivers:*** An indicator is turned on if there is an overflow for any of the following receiver types: customer TOUCH-TONE®, customer dial pulse, trunk dial pulse, trunk revertive pulse, and trunk multifrequency (five indicators).

- ***Line Load Control:*** An indicator is placed in the on state if at the time of sampling the line load control program is denying service to any lines. Otherwise, the indicator is turned off (one indicator).

- ***Incoming Load Control:*** If the No. 1 ESS is transmitting any DOC signals to a connected office, the indicator is turned on (one indicator).

- ***Incoming Overload Queue:*** The indicator is placed in the on state if the length of the incoming overload queue exceeds a generic parameter value. Otherwise, the indicator is placed in the off state (one indicator).

- ***Matching Loss:*** If, during a period of a maximum of 3 minutes prior to the sampling, there was matching loss greater than 10 percent in the trunk link network, an indicator is turned on (one indicator).

- ***Machine Congestion:*** A corresponding indicator is turned on if the machine experiences levels MC1 or MC2 for shortages of real time or receivers (eight indicators).

- ***Internal Queues:*** If any internal queues are active at the time of sampling, an indicator is turned on. Currently only the peripheral order buffer queue is sampled (one indicator).

- ***Outgoing Load Control:*** An indicator is turned on if toll network protection, code block control, or trunk group control is in effect (one indicator).

6.04 Additionally, binary indicators are available for a maximum of 112 trunk groups. If all circuits in a specified trunk group are busy (traffic or maintenance), a no-circuit condition exists and an indicator will be activated. If desired, auxiliary equipment can be provided to visually display a maximum of 33 RADR delay counts or percentages.

6.05 Translation data for the network management indicators are recorded on form ESS 1506. Although no entries are recorded for machine status and RADR indicators, entries are made for a maximum of 112 trunk group no-circuit indicators.

7. TRAFFIC MEASUREMENTS

7.01 With CTX-6 generic programs traffic measurements are available for code block controls, preprogrammed trunk group controls, and other network management traffic data. The following is a list of obtainable data.

- Peg counts of code blocked calls for each of the last two clock quarter-hours are available upon TTY request.

- Peg counts of calls affected by preprogrammed trunk group controls for each of the last two clock quarter-hours are available upon TTY request or an hourly count may be requested on the H or C schedules (see form ESS 1400).

- Peg counts of total calls not completed because of a no-circuit condition (ie, no trunk or no service circuit) are available for each of the last two clock quarter-hours.

- Peg counts of calls not completed because of transmitter time-out by transmitter type are available for each of the last two clock quarter-hours.

- Peg counts of incoming and outgoing calls for the last clock quarter-hour are available upon TTY request.

7.02 The traffic measurement data available with CTX-7 and later generic programs include all of the above with the following exceptions. Only the last clock quarter-hour measurements are provided and peg counts of panel call indicator transmitter time-outs are excluded.

7.03 Some additional traffic measurements are provided with CTX-7 and later generic programs. These are as follows.

- Peg counts of tandem calls along with tandem no-circuit conditions are available for the last clock quarter-hour upon TTY request.

- A flexible trunk group peg and overflow counter may be activated on any trunk group in the office for the last clock quarter-hour.

7.04 CTX-7 and later generic programs also provide an optional quarter-hour report. This report consolidates the traffic measurement data into one output message. This message is allowed or inhibited via TTY input message (LS-NMQU).

7.05 With CTX-7 and later generic programs three other traffic-associated messages are provided to the network management TTY. These are traffic overload control messages, TØC 01 and TØC 02, and the TC15. The TC15 message includes counts of calls affected by code block controls and trunk group controls (flexible and preprogrammed).

7.06 Machine congestion measurements are printed on the TTY after any clock 5-minute period during which the No. 1 ESS machine crossed or remained across any of the DOC congestion thresholds. The message gives a peg count of the number of times each threshold was crossed and a usage count (based on a 10-second scan) for the 5-minute period.

8. INPUT/OUTPUT TTY MESSAGES

8.01 It is possible to equip the ESS office with a dedicated network management TTY. If a network management TTY is not provided, the network administration TTY serves as the network management TTY.

8.02 All network management requests to activate, deactivate, or override controls are echoed as output messages to the TTY which made the request and to the TTY dedicated (or serving) as the network management TTY.

8.03 The following TTY input messages are associated with the network management features. Complete information on these messages is provided in the Input Message Manual for No. 1 ESS, IM-1A001-A1. The Output Message Manual, OM-1A001-A1, describes the output messages referenced in this section. Refer to these manuals, checking for proper format and generic program number, prior to using any messages.

- **CB-ACT** is used to activate a code block control. The system responds with an NM05 output message.

- **CB-CLEAR** removes (clears away) all code block controls that are active in the machine. The system response is NM08.

- **CB-REM** removes a particular code block control. The NM06 is the response message.

- **CB-STATUS** requests printout of codes and control information for all active code blocks. The output message is NM03.

- **CB-TRAFFIC** is used to request traffic peg counts on code block controls. The output message is NM11.

- **CF-ACT** activates a flexible cancel-from trunk group control. The system responds with an NM14 output message.

- **CT-ACT** activates a flexible cancel-to control on a trunk group. NM14 is the output message.

- **DØC-CLEAR** removes all manually activated controls which activate or exclude DOC signal transmission. The output message is NM08.

- **DØC-EXC** manually excludes DOC signals from being sent to an office or loop of offices specified by this input message. The output message, NM20, follows.

- **DØC-REM** is used to remove a particular manual control (send or exclude from send) of DOC signals to an office or loop. The system responds with a NM20 output message.

- **DØC-SND** manually sends a DOC signal to a specified loop or office. The NM20 output message follows.

- **DØC-STATUS** is used to list the active DOC signal loops. The output message which follows is NM23.

- **DØCX-EX** requests a maintenance exercise of the DOC transmit circuit. The system responds wih an NM26 output message.

- **DØCX-REST** restores a specified DOC signal loop to service. The system responds with an OK and performs the task.

- **DPD-MCØNE** is used to request a printout of translation data which identify the offices or loops to which MC1 signals for trunk dial-pulse receiver congestion are sent. The output message is NM22.

- **DPD-MCTWØ** prints the translation data identifying the offices or loops which would receive MC2 signals for trunk dial-pulse receiver. The output message is NM22.

- **FLEX-CLEAR** deactivates all flexible trunk group controls and flexible trunk group counters that are presently active. The system responds with NM08.

- **FLEX-DEACT** deactivates a particular flexible control or counter. The output message is NM18.

- **FX-STATUS** requests a list of active flexible controls and counters and NM19 is the system response.

- **FX-TRAFFIC** is used to request traffic peg counts for flexible trunk group controls and flexible peg and overflow counters. The system response is an NN24 output messsage.

- **LS-NMQU** is used to turn on or off the 15-minute network managment traffic data report. When turned on, the output messages NM10, NM11, NM12, and NM24 are printed every quarter-hour.

- **LST-MCTHREE** requests translation data defining those offices which receive MC3 signals. The output message is NM22.

- **MFD-MCØNE** prints the translation data which identify those offices or loops which receive MC1 signals for multifrequency receiver congestion. The system response is NM22.

- **MFD-MCTWØ** prints the translation data which identify those offices or loops which receive MC2 signals for multifrequency receiver congestion. The response is an NM22 message.

- **NMG-TRAFFIC** requests a limited set of traffic data. The output is the NM10 message.

- **PP-ACT** is used to manually activate a preprogrammed trunk group control. The response is NM07.

- **PP-CLEAR** removes all preprogrammed trunk group controls that were manually activated. See NM08 for the output message response.

- **PP-DATA** requests that the translation data associated with each preprogram be printed. The output message is NM04.

- **PP-EXC** is used to exclude a preprogram from being activated by DOC signals. The preprogram will be removed from control if it was already activated. The preprogram cannot be activated until this manual control is removed. The system response is NM07.

- **PP-REM** is used to remove the manual override of a preprogram. The preprogram will again be controlled by DOC signals. The control is followed by an NM07 output message.

- **PP-STATUS** is used to request a list of the active preprogrammed trunk group controls and their active state. The system response is NM02.

- **PP-TRAFFIC** is used to print traffic peg counts for preprogrammed controls. The output is NM12.

- **RPD-MCØNE** prints the translation data which identify the offices or loops which receive MC1 signals for revertive pulse receiver congestion. The response is NM22.

- **RPD-MCTWØ** prints the translation data which identify the offices or loops which receive MC2 signals for revertive pulse receiver congestion. The system responds with NM22.

- **RTD-MCONE** is used to print the translation data to identify the offices or loops which receive MC1 signals for real-time shortages. NM22 is the system response.

- **RTD-MCTWO** is used to print the translation data to identify the offices or loops which receive MC2 signals for real-time shortages. The system responds with NM22.

- **SA-AUDIT** is used to request the network management audit of call store. The system responds with SA01, SA02, and SA03 messages.

- **SK-ACT** activates a flexible skip control on a trunk group. An NM14 output message follows.

- **TG-ACT** is used to activate a flexible trunk group peg and overflow counter. The system responds with an NM14 output message.

- **TGN-DATA** is used to request a list of the trunk group numbers for which no-circuit indicators are available. The response is an NM16 message.

- **TR-ACT** activates the flexible trunk reservation function (PRE or DRE) on a trunk group. The system response is NM14.

8.04 During a system initialization of emergency action phase three or higher all network management controls will be automatically removed. Upon clearing the trouble condition, the DOC-initiated signals will be reinstated immediately. Controls which were operated manually (via TTY) must be reinputted using the appropriate input TTY message.

8.05 The network management TTY, or the network administration TTY where the network management TTY is not provided, is used as a network management data gathering terminal. This TTY will record all requests for network management controls, record data, and act as a permanent network management activity log.

8.06 The ESS 1405 form, Teletypewriter Activity Log, is used to record the latest input and output messages, including the network management controls that were implemented. A TTY activity log should be prepared monthly for the network management channel. The previous log sheets should be filed and retained as determined by local practice. If the network administration TTY furnishes network management information as well as traffic data, a separate log sheet should be maintained for each general type. A line has been provided on the form heading for entering the name of the channel represented. See the Translation Guide, TG-1A, for further instructions and reproducible forms.

9. NETWORK MANAGEMENT PLANNING

9.01 Advanced planning is required to best utilize the network management features available in the No. 1 ESS office. Each local configuration will depend greatly upon existing network management policy and availability of support hardware items such as DOC circuit and network management indicators.

9.02 Interdepartmental planning meetings should be held early and should include the network manager, network administrator, maintenance and engineering personnel and, if involved, the Traffic Service Position System (TSPS) personnel.

9.03 It must first be determined if network management features are required at all. The proper utilization of a particular No. 1 ESS office may not require any of these features. In such cases the hardware and software space taken by network management features would best be used for other features. If network management features are determined useful, a signaling network configuration must be developed and applied to fit each unique network management traffic control problem.

9.04 With CTX-6 and later generic programs, network management features may be provided which require the following items to be resolved to implement the features.

- Choose the number of code blocking (and CLID) slots to be provided. Parameter set card ***NMCODE*** is required to provide from 4 to 31 slots (see Office Parameter Specification, PA 591001). Identify those rate centers from which calls should be affected by code blocking (and CLID) on form ESS 1507.

- Determine if DOC receive circuits, SD-27970-01 Issue 5D or later, are to be provided.

- Choose the number and identification of trunk groups for which network management controls will be provided. Choose the number, function, and priority of preprograms which will control these trunk groups. The parameter set cards required are ***NMTGC*** and ***NMTGPP.*** The translation forms required are ESS 1506, 1508, and 1600.

- Decide whether a new TTY channel will be required for network management. The parameter set cards required are ***NMGTT*** and ***NMGTD.*** Consideration should be given to the amount of traffic data which are collected at the network administration TTY. If the quantity is large, a new dedicated channel may be chosen for network management.

- Determine which network management control counts should be collected on a scheduled basis and assign these to the H or C schedules (ESS 1400 form).

- Determine which 1400, 1500, and 1600 series ESS forms are required.

9.05 With CTX-7 and later generic programs additional network management features require the following additional items to be resolved to implement the features.

- Determine the number of flexible trunk group control slots to be provided. Parameter set card ***NMFLXC*** is used to provide from 0 to 63 slots.

- Determine if it is necessary to transmit DOC signals. The hardware which must be provided is the DOC transmit circuit, SD-1A334-01. Parameter set card ***NMDOC*** is required. Identify those offices to which it is desirable to send DOC signals. Determine the type of traffic received from those offices (eg, multifrequency) so that the proper DOC signal may be associated with the office. Complete ESS 1509A/B forms and the No. 1 ESS equipment questionnaire, E-8056, to identify the offices receiving DOC signals.

- Determine if a display of network management indicators is necessary. This display may be of use in large toll or tandem offices to provide indicators to a network management center. Parameter set card ***NMSTAT*** is required along with the translation data on form ESS 1506. The hardware required is the indicator circuit SD-1A335-01. It must be determined which machine status indicators are to be displayed. Additionally, the number and identity of trunk groups having no-circuit indicators must be determined. Decide if RADR percentages are to be displayed via the network management indicator circuit. Designate on the E-8056 questionnaire either 11, 22, or 33 leads of the indicator circuit to be used for RADR.

10. REFERENCES

10.01 The following is a list of documents which are relevant to this section.

- Section 231-123-101—Network Management Description, 2-Wire No. 1 Electronic Switching System (CTX-6 and later Generic Programs), Issue 2

- Section 231-123-301—Network Management Procedures (CTX-6 and Later Generic Programs), 2-Wire No. 1 Electronic Switching System, Issue 2

- No. 1 ESS 2-Wire—Announces the Initial Phase of Network Management Controls In the CTX-6 Generic Program, GL 73-03-031; Other: EL 2435, Topical Index Code 1B26.2, 3C3.3L, March 9, 1973

- No. 1 ESS Network Management Feature—CTX-7 Generic Program GL 74-03-062; Other: EL 3131, Topical Index Code 1B26.2, 3C3.3L, March 11, 1974

- No. 1 ESS Network Management Recommendations, GL 75-06-077, 3C3.3L

- Translation Guide, No. 1 ESS, 2-Wire, TG-1A

- Office Parameter Specification, No. 1 ESS, 2-Wire, PA 591001

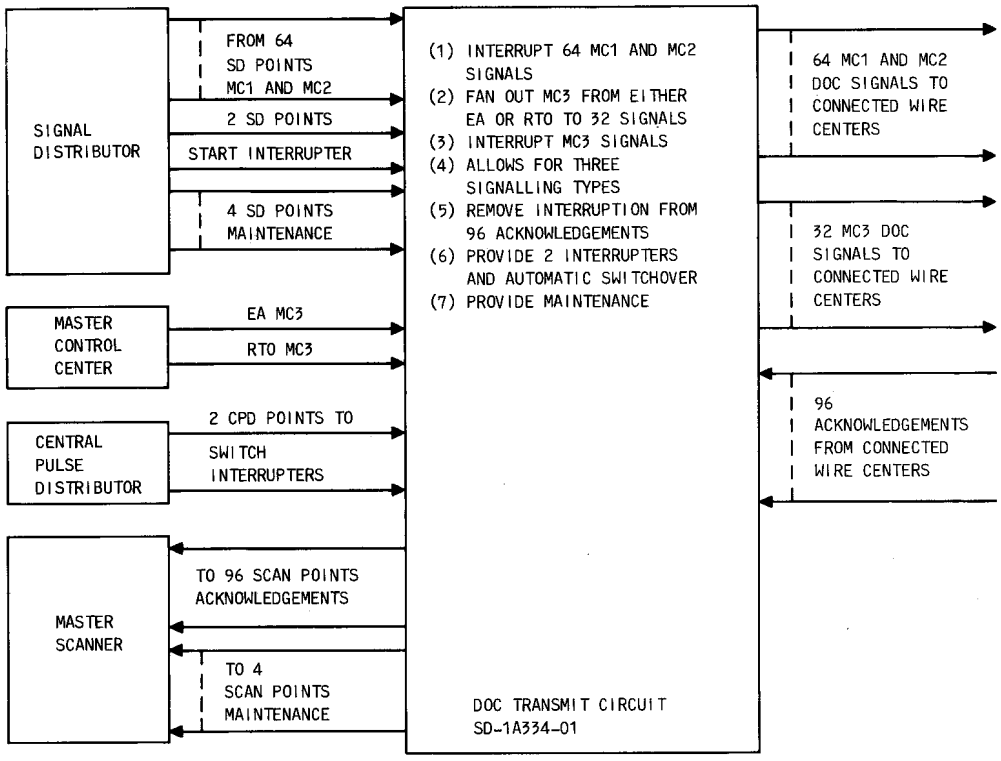

Fig. 1—DOC Transmit Circuit Functional Schematic (4.10)