4*ESS*™ Switch Network Management Operating Guidelines Network Administration

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1. Overview

1.01 The purpose of network management is to optimize the performance of the network. Network management involves maintaining service in the network during an overload condition brought on by heavy calling days such as Christmas or Mother's Day; by a natural disaster; or by a system failure. Network management also involves maintaining the network day in and day out. This practice describes network management as it pertains to the ***4ESS***™ switch. The following aspects of network management are discussed in this document:

(a) Network management support systems

(b) On-site network management equipment and facilities

(c) Network management controls

(d) Structure of the Network Management Display System (NMDS)

(e) Descriptions of directory, control, and display pages

(f) Function of the network management printer (NMPR)

1.02 This document is reissued to include information for the 4E24-R3 generic program.

1.03 This document does not contain safety labels.

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2. Network Management Support Systems

2.01 The network management function is performed at three different levels: national, regional, and on-site. The Network Operations Center (NOC) has network management responsibility at the national level. NetMinder (NTM) has no resonsibilities for LEC switches. The on-site network manager has network management responsibility for one 4ESS switch.

2.02 Support systems provide data regarding the performance of the 4ESS switch to network managers at the different levels. Data is provided to the NOC via the Network Management Operations System (NEMOS); to the LEC network centers via NetMinder (NTM). and to the on-site network manager via the Network Management Display System (NMDS).

Network Management Operations Systems (NEMOS)

2.03 NEMOS receives the following three types of data from the 4ESS switches in the AT&T switched network:

- Discrete data
- 5-minute data
- Data on demand.

The major type of data that NEMOS receives is node-to-node data from the Real Time Network Routing (RTNR); for example, node-to-node attempts and node-to-node overflows.

With the 4E24-R1 and later generic programs, the base for the NEMOS links to the 4ESS switch is the 56kbps AMA data links instead of the 9.6kbps links. This provides for the increased volume of data from the 4ESS switch to NEMOS for timely reporting of measurement data.

The following list contains examples of other types of data received by NEMOS:

(1) ***30-Second Discretes***:

- Simplex failures of 4ESS frames
- Service degrading equipment failures
- Excessive call irregularities
- Transmit buffer congestion discard levels.
- Area Cancel Control change data, Route Control Change data, and Call History Failure Rate Threshold Override Control Change data (available with 4E23-R2 and later generic programs)
- Carrier Identification Code (CIC) error data (available with 4E23-R4 and later generic programs)
- 911 Calls, when placed by non-configured Nodal Customers (available with 4E24-R3 and later generic programs)

(2) ***4ESS Application Measurements:*** (5-minute intervals)

- Time (in seconds) that the Common Network Interface (CNI) stream has not been active
- Number of Base-Level Cycles (BLCs) completed by the switch during the measurement interval
- Number of Base-Level Cycles in the measurement interval during which the "No-Hunt Ring" condition was present.
- Data that reflects signaling load measurements and problems encountered with processing signaling

messages in the CNI/Interprocess Message Switch (IMS) ring.

- With the 4E22-R3 generic program, the Service Identity (SI) Traffic Data Collection feature and the MR to SI Data Collection feature have been added. These features allow the 4ESS switch to collect hourly and 5-minute traffic data for 4ESS switch to 4ESS switch intertoll traffic and for 4ESS switch to End-to-End Class of Service (ECOS) area international traffic based on a SI or set of SIs to be sent to NEMOS. The 4ESS switch does not send SI set data that contain all zero information.
- With the 4E23-R2 generic Program, the Domestic End-to-End Class of Service (DECOS) feature has been added which is used for routing calls through the ingress/egress portion of the AT&T Network where AT&T switches connect to one of the following:
  - — Local Exchange Carrier (LEC) switches
  - — Certified Local Exchange Carrier (CLEC) switches
  - — Cellular Mobile Carrier (CMC) Mobile Telephone Service Office (MTSOs).

With this feature, the trunk capacity between one of the following can be allocated for different services specified on the basis of customer needs, including traffic for both incoming and outgoing directions, and to control the balance of inbound and outbound traffic:

- — 4ESS switch and the LEC switch (end office or tandem)
- — 4ESS switch and the CLEC switch
- — 4ESS switch and a CMC MTSO.

With the DECOS feature, NEMOS provides a more complete picture of how to manage ingress/egress traffic (using 4ESS switch to area data), the area based control capability (similar to the node based control capability in the RTNR network), and NEMOS provides the area controls with ECOS Routing Pattern Identity (ERPI) selectivity capability (similar to RPI capability in the RTNR network). For example, Call History failure rates for a particular destination, Route Data (including destination ID).

- With the 4E23-R4 generic program, a 5-minute Data Request Message 14 has been added for the peg counts for the Carrier Solutions Enhanced Carrier Identification Code (CIC) Based Maintenance feature. This feature provides the 4ESS switch the ability to block invalid calls to specific carriers and adds NPA screening of resell calls that access the AT&T Switched Network (ASN) via the Dedicated Trunk Subgroup Option (DTA) trunk subgroups.
- The 4E23-R4 generic program also includes the Digital Link Local Services Measurement Capability feature that counts and reports local service call volumes and patterns in the AT&T Switched Network (ASN) for Network Management purpose. The NOC and RNOC use these measurements to monitor local calling in the ASN. The following is a list of the measurements from the 4ESS switch reported in 5-minute intervals:
  - — Counts of local inter-4ESS switch terminating calls with bits set to indicate Local Term
  - — Counts of local call attempts (based on receipt of LTD parameter from the NCP as Route Local and upon access of the ASN on LSP_LOCAL trunks)
  - — Counts of blocked local call attempts (based on receipt of LTD parameter from the NCP as

Route Local and upon access of the ASN on LSP_LOCAL Trunks)

— Counts of Node-Node local call attempts (based on the Local Nodal Local Screening Index (LSI) set to Local_Orig and Local_Term)

— Counts of Node-Node local call attempts that are blocked in the RTNR network (based on the LSI set to Local_Orig and Local_Term).

- The 4E23-R4 generic program also includes the Service Identity (SI) Traffic Data Collection feature and the MR to SI Data Collection feature. These features allow 4ESS switches to collect hourly and 5-minute traffic data for 4ESS switch to 4ESS switch intertoll traffic and for 4ESS switch to End-of-End Class of Service (ECOS) area international traffic based on a SI or set of SIs. Five-minute data is collected on a demand basis from NEMOS, and 5-minute counts are sent to NEMOS at the end of each 5-minute interval. With this feature, NEMOS has added a control message (to allow SI sets to be manipulated), a demand data message (to allow SI sets to be audited) and two messages (to report intertoll and ECOS traffic counts).
- The Segmentation Directory Phase 2 feature has also been added with the 4E23-R4 generic program. This feature migrates additional Automatic Numbering Identification (ANI) based services and capabilities from the 4ESS switch. Specifically, the customer directory function for the following services is migrated:

  — Software Defined Network (SDN)

  — Positive Call Processing for Equal Access Cellular (PCP cellular)

  — Switched Digital Services (SDS)

  — Customer Long Distance (CLD) Custom Services using Universal Subscriber Data Structure (USDS) including Leave-A-Message service.

With this feature, the following mesurements are sent to NEMOS every 5 minutes and an hourly count on a per-service indicator basis:

— Manual Control

— Application Overload Control

— Calls Directed to a Service Provider

— Service Provider Query

— SP Response Timer Data

— Incoming calls cleared (while waiting for an SP response message)

— SP Query Timer Data

— Calls Defaulted Due to Abnormal Conditions

— Calls for which SD Query is blocked (because of 4ESS switch pre-SD Query Control) and receive final handling.

These measurements/controls protect the network by reducing the number of SD query messages generated by the 4ESS switch under circumstances where the calls associated with these queries are unlikely to complete (either determined to be hard to reach or have been specified by the network manager). The SD query manual control is used by network managers during events where signaling or SD resources may be stressed.

- With the 4E24-R1 generic program, the Carrier Completion Rate Feature (CCRF) has been added which enables

AT&T to route calls to different foreign carriers based on the performance these carriers have in completing calls. With this feature, network management has applied a new route code by extending the carrier skip control (CSC) scheme to each MCTT entry at the TAS. This feature can only be activated by setting the CCRF indicator to ON when the Route Advance (RA) indicator (which is a part of the Automatic Routing (AR) feature) is set to ON. Also, with this generic program, the AR feature is added. The AR feature provides NEMOS with the ability to activate Stop RA control to get RA control status and to remove any stopped RA controls.

- With the 4E24-R3 generic program, the A&T Digital Link (ADL) Phase 3-911 feature has been added. The ADL Phase 3-911 allows ADL Phase 2, also known as 4ESS Switch Local Nodal Phase 2, customers to complete emergency calls. In addition, this feature supports 911 services for non-digital link customers with PBX-direct connections to the 4ESS switch. With this feature, the 4ESS switch collects new 911 peg counts for call attempts and calls blocked and new 911 non-configured peg counts for call attempts and reports them to NEMOS in 5 minute intervals.

(3) ***3B Application Measurements***
(5-minute intervals)

(4) ***IMS Measurements:***
(5-minute intervals)

- Duration (in seconds) when a ring node is in overflow state 2
- Duration (in seconds) when a ring node is in overflow state 3.

(5) ***CNI Measurements:***
(5-minute intervals)

- Total bytes received
- Total bytes transmitted
- Total bytes retransmitted
- Number of A-link set failures.

(6) ***CNI Ring Configuration data:***
(5-minute intervals)

- List of nodes on CNI ring
- Number of in-service and functioning nodes on the CNI ring
- Common Language Location Identification (CLLI*) code of the signaling point at the far end of the signaling link
- A list of CLLI codes representing the customer locations with direct out-of-band signaling connections with the 4ESS switch.

(7) ***Demand Data***:

- Service circuit status demand data
- Final handling code demand data
- Service degrading demand data.
- Service changing CIC (adding, deleting or changed) data (available with 4E23-R4 and later generic programs)
- SI data (available with 4E23-R4 and later generic programs)
- Route Data including destination ID and threshold data for Call History (Available with 4E23-R2 and later generic programs)
- Pre-SD Query Control (available with 4E23-R4 and later generic programs)

(8) ***Televote Data***.

NetMinder (NTM)

2.04 NetMinder is a computerized, centralized, real-time surveillance and control system

that assists LEC network managers in monitoring the network. It is used to determine when and where congestion occurs and to relay control signals to the 4ESS switches.

2.05 Except for node-to-node data, the NTM receives all the data that NEMOS receives, plus the following additional data.

(1) ***More Discretes***. In addition to the 30-second discretes sent to NEMOS, the following discretes are also sent to NTM:

- D-Channel link failures
- D-Channel node suffers a near-end DS1 facility failure
- T1 Facility Access unit in a D-Channel node failure
- D-Channel link is manually placed in an out-of-service condition.

(2) ***D-Channel Measurements:***

- Total number of incoming Q.931 messages that have been processed by the switch
- Total number of outgoing Q.931 messages that have been processed by the switch
- Number of messages dropped within the D-Channel node due to congestion of the node
- Number of messages dropped within the D-Channel node due to congestion of the CNI ring.

(3) ***Real-Time Network Routing (RTNR)***. When troubleshooting congestion/call failure problems within a switch, network managers must have a basic knowledge of the traffic flow in the RTNR side of the switch. To provide this information, the following RTNR total office counts are transmitted to the NTM every 5 minutes:

- Total incoming calls to Via Toll Switches (VTSs) from RTNR Trunk Subgroups (TSGs)
- Total incoming calls to Toll Terminating Switch (TTS) from RTNR TSGs.

NMDS

2.06 The NMDS is a tool the network manager uses for real-time surveillance and control of the 4ESS switch at the switch level. Network management at this level is carried out through a 3-step sequence: 1) alerting, 2) investigation, and 3) control. The first step, alerting, is provided through the activation of indicators or alarms on the exception panel, where provided, or by a printout at the NMPR. When an abnormality is reported, the network manager performs the second step, investigating the problem. If analysis of the problem warrants it, the third step, control, is taken.

2.07 The NMDS consists of Cathode Ray Tube (CRT) displayed information called "pages." There are two types of pages: display pages and control pages. Display pages contain preprocessed data and control pages support the investigation and control steps. For more information on display and control pages, refer to sections 6, 8, and 9.

2.08 To provide the preprocessed data needed for network management, the NMDS has access to the large data base of the 4ESS switch. The NMDS uses the traffic and plant measurements collected and stored by the system, as well as data collected specifically for network management.

2.09 Network management data includes traffic volume measurements, completions data, TSG performance measurements, and peg counts of calls affected by each automatic and manual control taken by the 4ESS switch. The display system also has access to control and equipment status data that is updated on a per-event basis, as

* Common Lanquage is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

well as to information that shows the outgoing TSG choices for each destination code. In general, the system performs calculations on raw data against preset thresholds to provide the following three basic types of information:

- ***Control Status:*** Active or nonactive, percentage of traffic controlled, and disposition of controlled traffic
- ***Control Counts:*** Number of calls affected by each control and the period (time interval) of data collection
- ***Reference Data:*** Routing patterns by code and by TSG and exception thresholds.

3. On-Site Network Management Equipment

3.01 This section describes the equipment and facilities available for an on-site network management center (NMC) arrangement.

Interface Devices

A. Network Management Display Terminal (NMDT)

3.02 Three network management display terminals (NMDTs 1, 2, 3) are provided for display of and interaction with network management management data. One of these terminals is located with personnel responsible for entry of office-dependent network data. Another is remoted to the support system responsible for the management of the 4ESS switch. The third NMDT is in the Machine Administration Center (MAC) and is used for scheduling reports generated by the On-Site Operations Report (OSOR) System.

NOTE:
OSOR is a 4ESS switch feature for displaying service quality, machine and system performance, and traffic load in a 4ESS switch office. The following reports are generated by OSOR:

- Machine Service Reports (MSR)
- Machine Performance Reports (MPR)
- Separations Summary Report (SSR)
- Network Switching Performance Measurements Plans (NSPMP)
- Load Distribution Reports (LDR)
- Load Service Reports (LSR)
- Machine Load and Service Summary (MLSS)
- Common Channel Signaling (CCS)
- CCS7 Load and Service Summary (CLSS)
- Far-End Network (FEN) Reports.

3.03 In some cases, the NMDT located in the MAC may be the terminal used to input the office-dependent network data. The configuration of the NMDT consists of a CRT display screen, keyboard, and printer.

B. Network Management Printer (NMPR)

3.04 An NMPR, independent of the NMDT, is provided for obtaining exception reports and audit-failure messages. A secondary use of the NMPR is to access the 4ESS switch data base to obtain information on specified events. Configuration of the NMPR consists of a receive-only printer (ROP) and an associated CRT terminal with the keyboard arrangement as an optional feature.

C. Exception Panel

3.05 Another network management interface device is the exception panel. (See Figure 1.) The exception panel provides a visual and an audible detection system for highlighting potential problem areas in the switching network. Configuration of the panel is available in two types: wall-mounted panel or desk-console panel. With the advent of support systems, the exception panel

no longer plays the big role it once did in 4ESS offices.

4. Automatic Network Management Controls

4.01 The 4ESS switch has been designed with highly sophisticated controls, both automatic and manual, for administering its tremendous call-handling capacity. Complementing the network management controls is the hard-to-reach (HTR) feature, which allows implementation of the controls against trunk subgroups on a selective basis.

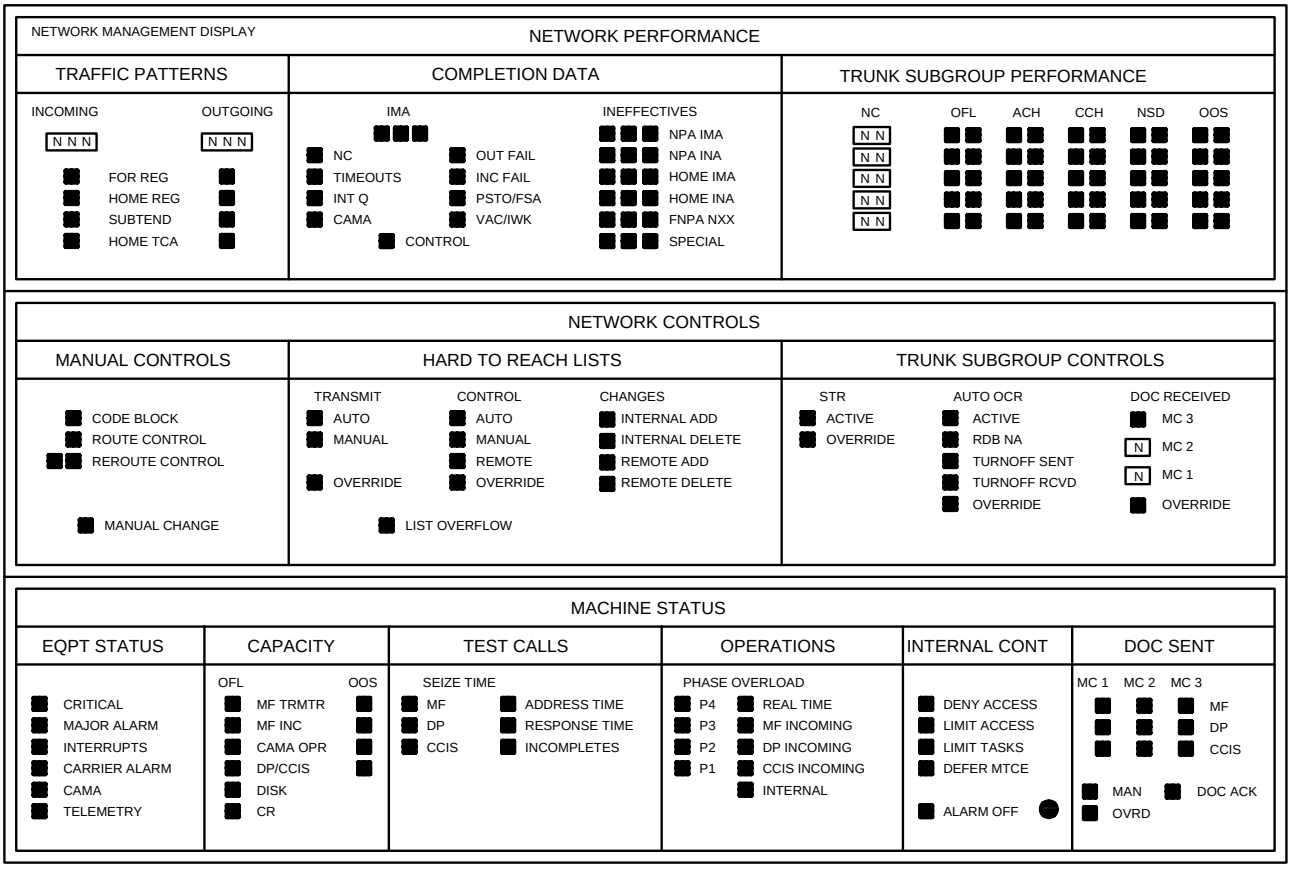

Figure 1. 4ESS Switch Exception Display Panel

4.02 While the HTR feature identifies codes that have a high probability of completion failure, no action is taken to discriminate against this traffic until a control is begun. Traffic is processed in a normal way until congestion signals trigger an automatic control action or a manual control is implemented. It is only after thresholds are exceeded or events occur that mandate action that certain classes of traffic are affected. The automatic controls available in the 4ESS switch for

managing traffic flow through the network are explained in this section.

4.03 The following network management controls operate automatically when there is congestion in the network:

(a) Selective Dynamic Overload Control (SDOC)

(b) Selective Trunk Reservation (STR)

(c) Dynamic Overload Control for Time-Out Relief (DOCTOR)

(d) Selective Incoming Load Control (SILC).

Selective Dynamic Overload Control (SDOC)

4.04 SDOC is a protective control used to relieve switch congestion. When a 4ESS switch becomes congested, it sends a signal through the Common Channel Interoffice Signaling (CCIS) or Common Channel Signaling, System 7 (CCS7) network to other switches that are connected to it. These switches then reduce the amount of traffic they send to the congested switch. SDOC not only helps reduce traffic to the congested switch, but it also keeps the congestion from spreading.

4.05 The 4ESS switch can transmit and receive signals for selected levels of congestion and also transmit and receive acknowledgments of these signals. The capability of the switch to process traffic is based on its engineered capacity. Congestion signals are automatically triggered when preset threshold levels for this capacity are exceeded.

4.06 The SDOC used in the hierarchical network was not completely automatic. The network manager had to manually specify in advance which trunk groups a switch should skip or cancel calls controlled by SDOC.

A. Machine Congestion Levels

4.07 In the 4ESS switch, machine congestion (MC) for network management purposes is defined in the following four levels:

- ***NONE:*** Implied by the absence of other signals and no traffic is controlled.
- ***MC1:*** Indicates the engineered machine capacity has been surpassed, and delays are being experienced in processing attempts.
- ***MC2:*** Indicates increased congestion over the MC1 level as evidenced by further delays in service to incoming calls, loss in switching effectiveness, or both.
- ***MC3:*** Indicates machine is unable to process traffic and is triggered only when the machine is in a major recovery phase.

B. Monitoring Machine Congestion

4.08 Congestion, which results in service degradation, can be caused by a heavy traffic load or a real-time delay in the central processor.

4.09 To detect and correct congestion situations, the 4ESS switch has been provided with various software integrity programs. The major program for monitoring machine capacity is the 2-pronged overload (OVLD) program. One prong of the program monitors the traffic load through incoming seizures offered to the switching system, and the other monitors real-time delay of the central processor. The traffic load in the 4ESS switch is measured for each signaling type; that is, multifrequency (MF), dial pulse (DP), and CCIS/CCS7. The OVLD program determines if the origination queues exceed the preset threshold levels for each of these signaling types. The real-time delay is determined by measuring the base level cycle (BLC) of the central processor.

4.10 To determine the machine congestion level, the offered load (incoming seizures) is compared against the accepted load. The comparison is made by signaling type; that is, MF, DP, or CCIS/CCS7. If the difference is excessive or if the thresholds for a normal operating load have been exceeded, the OVLD program activates signals for the appropriate MC level for the call type experiencing the excess load.

4.11 To gain real-time availability in the central processor, the OVLD program progresses through successive levels for deferring work on a BLC basis. Deferred work consists of such items as routine maintenance tasks, routine audits, and certain recent change activities. For example, real time could be gained by canceling CCIS/CCS7 voice path assurance testing to a certain percentage of calls. If congestion in the central processor is not relieved after all nonload affecting measures have been taken, the congestion signal is then transmitted for all call types.

4.12 The real-time OVLD program operates in five states or threshold levels. These levels, the controls invoked, and the leverage gained are provided in Table A. The program state is determined by the length of the BLC compared with predetermined (generic set) thresholds. As the time required to complete the BLC increases or decreases, the state of the program changes accordingly. In each state, certain actions are taken to alleviate congestion, such as transmission of the overload signal at the MC1 or MC2 level. When controls are invoked, there is a 4.16-second delay for MF/DP calls and a 0.32-second delay for CCIS/CCS7 calls between MC level changes. This delay applies even when the program state changes in less time.

4.13 The number of TSGs on which SDOC can be applied is dependent on the number of Adjunct Trunk Subgroup Head Cells (ASGHCs) available in the system. If 2047 ASGHCs are available to the office, then SDOC can be applied to 2047 TSGs simultaneously. Since CCIS/CCS7 trunks require no hardware provisioning, SDOC (transmission and receipt) is restricted only by the availability of ASGHCs.

C. Transmission

4.14 The office originating the SDOC signal is referred to as the ‘‘source’’ office, and the office implementing the control is the ‘‘execute’’ office. Both offices exchanging signals need to identify the TSGs controls to be applied. However, response to the SDOC signal at the execute office still depends on assignment of an ASGHC.

D. Control Options

4.15 The control options that may be selected for SDOC are "cancel" or "skip." If no option is specified, the default action to be implemented is "cancel."

4.16 A TSG may be assigned to one of 14 categories (A through N) for SDOC. Table B shows the percentage of traffic to be controlled by each category for the various types of traffic.

4.17 If the OVLD program doesn’t detect any new congestion levels (MC1 or MC2) for a TSG within the predefined time intervals, the system automatically restores that TSG to the normal state. On CCIS/CCS7 trunks, the MC1 or MC2 messages repeat every 1 to 2 minutes until the congestion status changes.

4.18 A manual override capability is also provided. The manual override allows the network administrator to ignore certain congestion signals from specified switching machines. It also allows the network administrator to prevent certain signals from being transmitted to specified switching machines.

E. Deployment

4.19 Plans for SDOC signaling at the 4ESS switch should be coordinated through the appropriate regional network management organization. The plans should be reviewed and agreed to by the Network Operations Center (NOC). End offices interfacing with the 4ESS switch should follow procedures as prescribed locally for Dynamic Overload Control (DOC) signaling arrangements.

Table A. Real-Time Controls

Stimulus	Controls Invoked	Control Leverage (Estimated Maximums)
1. Cumulative BLC Length (CBLCL) — threshold 1 (T1)	MAC*—restricted to 2 segments per BLC	3-measurements/BLC
2. CBLCL-T2	(a) MAC — restricted to 1 segment per BLC (b) I/O and recent changes restricted to 1 segment per 3 BLCs, and traffic measurements restricted to 1 segment per 2 BLCs (c) Total DOC — MC1†	(a) 3-measurements/BLC (b) 5.5-measurements/BLC (c) Offered load reduced ‡
3. CBLCL-T3	(a) MAC — restricted 1/N segments per BLC (b) Reduce operations testing (c) Restrict load — level 1	(a) 2-measurements/BLC (b) 1300 cycles/CCS7 call (c) Accepted load reduced 33 percent
4. CBLCL-T4	(a) Total DOC — MC2 (b) Restrict load — level 2	(a) Offered load further reduced† (b) Accepted load reduced additional 33 percent
5. CBLCL-T5	Reschedule MF origination program and set number of CCS7 and DP call registers available to 0.	Accepted load reduced to zero

* MAC — Maintenance Control Program.
† Total DOC MC1 is considered a nonload affecting control.
‡ Amount of reduction is office dependent.

Table B. Response Table for MC1/SRL1

	Type of Traffic			
	First Choice Routed Traffic		Alternate Routed Traffic	
Category	NHR (%)	HTR (%)	NHR (%)	HTR (%)
A	0	0	0	100
B	0	0	0	100
C	0	75	0	100
D	0	0	100	100
E	0	75	0	100
F	0	0	0	0
G	0	0	0	0
H	0	0	0	100
I	0	100	0	100
J	0	100	0	100
K	0	100	100	100
L	0	0	0	0
M	0	0	0	0
N	0	0	0	0

Transmitting SDOC Signals

4.20 The points made in the following paragraphs should be considered for the transmission of SDOC signals.

4.21 The MC1 signals are transmitted to control intraregional trunk groups to reduce the total originating attempts experienced at the 4ESS switch. Usually, alternate routing of traffic at subtending and lateral offices provides enough relief. Offices with trunk groups handling only first-routed traffic would not be controlled until conditions at the 4ESS switch become severe enough to warrant transmission of the MC2 signal. Requirements for deployment of MC2 signals should be closely examined since separate signaling channels are required for MF and DP trunks.

4.22 If the 4ESS switch machine is having trouble that is not traffic related, proper leverage at the MC1 level should minimize the need for the MC2 signal. The MC2 signal is an extensive control that affects both alternate and first-routed traffic and should be used sparingly.

4.23 Inter-regional transmission of SDOC signals should only be considered when the TSG is large and the traffic volume is heavy. Intraregional signals are normally CCIS/CCS7, which does not require individual signaling channel considerations.

Receiving SDOC Signals

4.24 4ESS switches should be equipped to respond to all three congestion signals.

Selective Trunk Reservation (STR)

4.25 Selective Trunk Reservation (STR) is an automatically activated control used to relieve trunk congestion. It selectively limits access to trunks in an outgoing TSG when the TSG is nearly full. The number of TSGs upon which the

STR control can be simultaneously activated is dependent only on the Adjunct Trunk Subgroup Head Cell (ASGHC) availability.

4.26 When the number of idle trunks within a TSG designated for STR control reaches a predetermined level, that TSG becomes a candidate for the STR control. Deployment of the STR control depends on the establishment of thresholds for two reservation levels: selective reservation levels 1 and 2 (SRL1 and SRL2).

4.27 When STR was first introduced, reservation level thresholds were manually set. A capability called Automatic Reservation Adjustment (ARA) now adjusts the SRL1 and SRL2 thresholds on a per-call basis. The thresholds are based on the current TSG occupancy and other factors. If you want to enable STR but not ARA, a mechanism does exist to override ARA.

A. STR Thresholds

4.28 The value for the STR thresholds, which are set by network management personnel, may vary between 0 and 15 idle trunks within a TSG. The only restriction in setting these thresholds is that the SRL1 value must be equal to or greater than SRL2. Normal threshold values for SRL1 are three or four idle trunks and for SRL2, one or two idle trunks within a TSG. The setting of two varying STR threshold levels permits the following options for traffic control:

- When SRL2 = SRL1, the system only executes SRL2.
- When SRL2 = 0 and SRL1 > 0, the system executes only SRL1.
- When different values are set for both thresholds and SRL1> SRL2, the system executes full operation of the STR control.

B. STR Control Options

4.29 The control options implemented on TSGs for STR are "skip" or "cancel"; the default action is "cancel" control.

4.30 A TSG may be assigned to one of 14 response categories (A through N) for STR control. Tables B and C show the STR response categories and percentage of control.

4.31 An override capability is provided to exclude selective TSGs from STR control. When an override is in effect, the system is inhibited from performing threshold checks against the TSG.

Dynamic Overload Control for Time-Out Relief (DOCTOR)

4.32 DOCTOR is used to automatically detect machine congestion in switches that do not have CCIS/CCS7. It is intended for multifrequency TSGs between AT&T switches and Regional Bell Operating Companies (RBOC) and independent company switches. This control minimizes wasted usage of MF transmitters and reduces access charges for calls which cannot complete to switches that are in a congested or failed state.

4.33 Any non-CCIS/CCS7 TSG assigned to a DOC category for pattern response is a candidate for DOCTOR. A DOC category for pattern response can be assigned to a TSG via NTM, NEMOS, or NMDS. Control page CN02 is used to assign TSGs to a DOC category for pattern response. DOCTOR thresholds are set using control page CN04.

4.34 Excessive no-start dial (NSD) time-out counts on an outgoing TSG can indicate congestion or failure in the distant switch. DOCTOR detects excessive NSD time outs on a per TSG basis. If a threshold is exceeded, the 4ESS switch automatically activates a control as if a DOC congestion signal had been received for the TSG. It then responds as if the distant switch had transmitted DOC failure or congestion signals to the 4ESS switch.

4.35 The percent of traffic controlled by DOCTOR for MC3 (switch failure) is 87.5%. Analysis interval is 10 seconds.

Table C. Response Table for MC2/SRL2

	Type of Traffic			
	First Choice Routed Traffic		Alternate Routed Traffic	
Category	NHR (%)	HTR (%)	NHR (%)	HTR (%)
A	0	75	0	100
B	0	0	100	100
C	0	75	100	100
D	100	100	100	100
E	0	87.5	0	100
F	0	0	0	100
G	0	100	0	100
H	0	100	0	100
I	0	100	100	100
J	75	100	100	100
K	75	100	100	100
L	0	0	0	0
M	0	0	0	0
N	0	0	0	0

4.36 Once DOCTOR is activated, it stays in effect as long as the overload or failure condition exists.

Selective Incoming Load Control (SILC)

4.37 SILC is an automatic control that allows a switch to reject traffic from specific trunk subgroups whenever the switch reaches a predefined machine congestion level. There are two congestion levels for each switch. When the first congestion level is reached, a predetermined percentage of traffic on specified trunk subgroups is blocked. If the overload condition continues and the second level is reached, a greater percentage of traffic is blocked.

4.38 Based on their knowledge of the network, network managers can determine in advance which trunk subgroups in an office should receive SILC treatment. As traffic patterns change, the trunk subgroups under SILC control can be changed.

4.39 SILC is normally used only in local exchange company switches.

5. Manual Network Management Controls

5.01 The following are the manual network management controls:

- Call Gapping Control (CGC)
- Cancel To (CANT)
- Cancel From (CANF)
- Spray Reroute (SPRR)
  - — Immediate Reroute (IRR)

— Overflow Reroute (ORR)

- Time Activated Reroute (TARR)
- Cancel Reroute Overflow (CRO)

Control Parameters

5.02 A CRT page from the NMDS control package, which is identified by the alpha designation "CN," is used to execute a manual control or override existing automatic controls. For most of the controls, you can specify one or more of the following parameters on the control page:

- ***Percentage of Control:*** The amount of TSG control can be specified either as a percentage or it can be based on rate. Percentages range from 12.5 percent to 100 percent in 12.5 percent increments. Since there is no default value generically defined for the amount of traffic to be controlled by manual control action, a value must be specified.
- ***Selective Service Protection (SSP):*** SSP is a network management feature that provides service protection for preferred customers. It does this by separating traffic for revenue purposes into two classifications: preferred (P) and standard (S).

  During periods of congestion, it may be necessary to control parcels of traffic selectively. Calls classified as preferred (P) are normally exempted from automatic controls and from some of the manual controls. However, network managers can override that exemption if necessary during unusual circumstances. Preferred calls are then treated as standard calls.
- ***Routing:*** Select the type of routing on which traffic is to be controlled; that is, direct routed (DIR), alternate routed (ALT), or a combination of direct and alternate routed (ALL).
- ***Traffic Type:*** There are three possible options: hard-to-reach (HTR) traffic only; non-hard-to-reach (NHR) traffic only; or both hard-to-reach and non-hard-to-reach traffic (ALL). Select the type of traffic to be controlled. If an option is not specified, the system defaults to ALL, that is, HTR and NHR.
- ***Rate Based Reroute (RBRR):*** The difference between a RBRR and the traditional percentage reroute is that rather than reroute a fixed percent of calls, one call per unit of time is rerouted. Table D shows possible rates for rerouted calls.

  If you want to implement a rate based reroute, RTE must be entered in the **PERCENT** window on CN16, CN17, or CN18. An RR rate index must be entered in the **RATE** window for every via route. If you want to implement a percentage reroute, the percent of traffic to be rerouted should be entered in the **PERCENT** window and all **RATE** windows should be left blank.
- ***Final Handling Treatment:*** Select the final treatment to be given to a call that cannot be processed. Any valid 4ESS switch announcement can be used.

Call-Gapping Control (CGC)

5.03 The call-gapping control is used to effect a smooth flow of traffic through the network during periods of a focused overload that is caused by expected or unexpected mass-calling events. The control provides a selective way to effectively control code-related traffic by attempts rather than a percentage of total attempts.

5.04 The call-gapping control restricts the number of calls for a specific code by limiting the rate of outgoing attempts. The call-gapping control can be active on up to 64 codes, 1 to 15 digits, at one of 32 possible gap intervals (the number of seconds between calls). Each gap interval is assigned an index number. The call-gapping index assignments are shown in Table E.

Table D. Rates for Rerouted Calls

Reroute Rate Index	Seconds Between Calls	Maximum Calls Per Hour
0	0	UNLIMITED
1	1	3600
2	2	1800
3	4	900
4	8	450
5	10	360
6	15	240
7	30	120
8	45	90
9	60	60
10	120	30
11	180	20
12	240	15
13	360	10
14	720	5
15	1200	3

5.05 The prespecified call rates, together with a timer to meter calls, determine the calls to be outpulsed. Implementation of the control involves setting the timer to the present time plus a time-interval gap. The first call that arrives after expiration of the selected gap interval is forwarded (attempted) and the timer is restarted for the next gap interval. All calls that arrive before time-out of the gap interval are routed to the appropriate recorded announcement as specified in the data base.

5.06 A per-call offset interval is used to prevent bunching of calls from several offices at any one time, and it also prevents favoring calls from one office over another. Application of this control improves the flow of traffic during heavy calling periods or if facility failure occurs. Changes to the specified call-gap interval may be made to alleviate an overload situation, as required.

5.07 Control page (CN08) provides the means for implementing the call- gapping control. PA08 provides an inventory of all active call-gapping controls in the office.

5.08 One of the inputs on CN08 is the call-gap type (TYPE). For each manual CGC, a call type must be selected from one of the following eleven call types:

(1) *Type 0* — all domestic calls except test calls in the verification network (domain 87)

(2) *Type 1* — all calls switched in the Plain Old Telephone Service (POTS) subdomains 1 through 19 except international terminating calls at an International Switching Center (ISC)

(3) *Type 2* — all domestic calls in non-POTS domains except test calls in the verification network (domain 87)

(4) *Type 3* — calls in the Software Defined Networks (SDN) dedicated egress domains

(5) *Type 4* — calls in ACCUNET® data domains

(6) *Type 5* — international originating calls. This includes international originating calls at non-ISCs that are switched using Fully Coded Addressing (FCA).

(7) *Type 6* — international transit calls at an ISC

(8) *Type 7* — international terminating calls at an ISC

(9) *Type 8* — affects all domestic calls arriving at the switch on intertoll trunks

(10) *Type 9* — domestic calls at a BOC Service Switching Point (SSP) switch

(11) *Type 10* — international originating calls at a BOC Service Switching Point (SSP) switch.

Table E. Call-Gapping Index Assignments

Gap Interval (Seconds)	Maximum Calls (Per Hour)	Gap Number (Index)
OFF	—	0
0	NO CALLS BLOCKED	1
0.1	36000	2
0.12	30000	16
0.14	25704	17
0.16	22500	18
0.18	19992	19
0.2	18000	20
0.25	14400	3
0.36	9996	21
0.5	7200	4
0.6	6000	22
0.75	4800	23
1.0	3600	5
1.6	2244	24
3	1200	6
6	600	7
9	396	8
12	300	25
15	240	9
20	180	26
30	120	10
45	72	27
60	60	11
75	48	28
100	36	29
120	30	12
150	24	30
300	12	13
450	7.2	31
600	6.0	14
∞	ALL CALLS BLOCKED	15

Cancel To (CANT)

5.09 The CANT control can inhibit any TSG from being searched for idle trunks. A call is routed to the no circuit announcement (NCA) or an equivalent announcement that the network manager specifies. The ASGHC assignments determine the number of TSGs that can simultaneously activate the control.

Cancel From (CANF)

5.10 The CANF control provides a means to inhibit a call from searching for an idle trunk in another TSG when sensing an overflow condition. The number of TSGs on which the control can be activated simultaneously depends on the ASGHC assignments.

SKIP

5.11 The SKIP control provides the means to inhibit a TSG from being searched for an idle trunk by passing the call to the next TSG in the routing pattern. The number of TSGs on which the SKIP control can be activated simultaneously depends on the ASGHC assignments.

NOTE:
The controls CANT, CANF, and SKIP are referred to as protective TSG controls. These protective TSG controls are placed on a TSG to reduce the number of paths normally available to some portion of traffic that requires access to that TSG.

As network manager, you can specify the traffic that is affected by a protective TSG control. You can specify that the control affect HTR traffic, non-HTR traffic, or all traffic (both HTR and NHR). You can also specify that a control affect direct-routed (DIR) traffic only, alternate-routed (ALT) traffic only, or direct and alternate routed (ALL) traffic.

Spray Reroute (SPRR)

5.12 SPRR is a manual trunk subgroup (TSG) control that may be active on up to 192 TSGs simultaneously. SPRR allows a maximum of seven via routes (TSGs) and uses a circular hunt where the starting point of the hunt is determined by the last TSG accessed by the last rerouted call.

5.13 The reroute percentages available are 12.5, 25, 37.5, 50, 62.5, 75, 87.5, and 100.

5.14 SPRR is implemented with control pages CN16, CN17, and CN18.

A. Reroute Capabilities

5.15 SPRR provides three distinct reroute capabilities: destination code specific reroute, routing data block specific reroute, and regular reroute.

- ***Destination Code Specific Reroute***: This reroute capability allows you to select up to sixteen 3-digit or 6-digit destination codes. These destination codes can be selected in any combination. When you select this reroute, only calls destined for the selected codes are rerouted.
- ***Routing Data Block Specific Reroute***: The routing data block specific reroute allows you to select up to 16 routing data blocks (RDBs). When the RDB specific reroute is selected, only calls accessing the selected RDBs are rerouted.
- ***Regular Reroute*** : Regular reroute is a manual reroute that is neither destination code specific nor routing data block specific.

B. SPRR Options

5.16 The following options are available for all three reroute capabilities:

- ***Reroute Type Option:*** Any of the SPRR capabilities may be used as a TO (prior to trunk hunt) or FROM (after overflow) control. When SPRR is used as a TO control, it is

called an Immediate Reroute (IRR). When SPRR is used as a FROM control, it is called an Overflow Reroute (ORR).

- ***Routing Option:*** When an IRR or an ORR is selected, you can specify the type of calls the control affects, that is, direct-routed (DIR) calls only, alternate-routed (ALT) calls only, or both direct and alternate routed (DAR) calls.
- ***Traffic Option:*** An SPRR may be activated to affect Hard-To-Reach (HTR) traffic only, non-HTR (NHR) traffic only, or all traffic.
- ***Allow-In-Chain Return Option:*** This option allows a call that cannot get on one of the via TSGs to return to the in-chain RDB. The choices are ‘‘no’’ or ‘‘yes.’’
- ***Allow International Inbound Option:*** This option allows international calls terminating in this country to be rerouted. The choices are ‘‘no’’ or ‘‘yes.’’
- ***Allow Previously Rerouted Option:*** This option allows calls that have been previously rerouted to be rerouted again.
- ***Allow TSG Turnoff Option:*** Part of the SPRR capability is to allow a via TSG turnoff. Under certain conditions, an SPRR via TSG is turned off for either 30 seconds or 5 minutes. The choices are ‘‘no’’ or ‘‘yes.’’
- ***Preference Option:*** This option allows reroutes to be classified as preferred, standard, or both.

Time Activated Reroute (TARR)

5.17 TARRs are automatically activated preplanned reroutes in the ISCs. The time activated reroute (TARR) allows a network manager to define a spray reroute (SPRR) once and to have that SPRR turned on and off as needed. The TARR capability is intended to be used primarily by international network managers, but it can be implemented by any network manager who has access to an NMDS Terminal (NMDT).

5.18 A TARR can only be installed or removed via the local NMDS. It is added and deleted using CN19, *Spray Reroute Scheduling Page*. To add or modify a TARR, you need to specify the Circuit Identification Name (CIN) of the AB TSG (the controlled TSG), the start time, the stop time, and at least one day of the week on CN19.

5.19 A TARR may only be defined for a SPRR that is already active.

5.20 To delete a TARR, you only need to specify the CIN of the AB TSG. When a TARR is deleted for an active SPRR, the SPRR remains active. When a TARR is deleted for an inactive SPRR, all of the data for both the SPRR and the TARR is purged from the NM data base.

5.21 NEMOS and RNMS provide display page indicators that identify active reroutes that are under TARR control.

5.22 A time activated reroute does not apply to DNHR reroutes (D-RR).

Cancel Rerouted Overflow (CRO)

5.23 CRO is a TSG control used at a via office to prevent "round robin" routing situations. When this control is active on a TSG, rerouted calls that cannot find an idle trunk in that TSG are canceled. CRO is turned on or off from control page CN02.

Sequence of Control Application

5.24 Controls should be applied in the following sequence:

Code Controls:

(1) Call Gapping (Calling Code Control)
(2) Automatic Code Control (Applied for 800 service traffic, SDN, Megacom®, etc.)

To Controls:

(3) Cancel To Immediate Rerouted (CANT)
(4) Skip
(5) STR

(6) SDOC (MC3, MC2, MC1)

From Controls:
(7) Overflow Reroute (ORR)
(8) Cancel Reroute Overflow (CRO)
(9) Cancel From (CANF)

6. Structure of Network Management Display System

6.01 Entering a command at the Network Management Display Terminal (NMDT) allows the retrieval, display, and manipulation of a set of items from the data base. Each set of items retrieved from the data base is called a ''display.'' The portion of the display shown on the CRT screen at one time is called a ''page.''

6.02 The displays are grouped into categories called ''packages.'' Six distinct packages are provided with the NMDS. Each package is identified by a 2-character alpha designation and title; for example, PA (alpha designator) - Traffic Patterns (package title). The packages in the NMDS are as follows:

CN—Control input/threshold input
PA—Traffic patterns
MA—Ineffective Machine Attempt (IMA) data/machine status
CC—Code completions
TG—Trunk subgroups
EF—Entry form.

6.03 The displays can be categorized into three general types of pages as follows:

- ***Directory Pages:*** Each package contains a directory page. The directory page presents a menu of pages contained within that package.
- ***Display Pages:*** Display pages present processed data for investigation of potential network problems. The display pages are contained in the packages labeled PA, MA, CC, and TG. These pages were initially designed to correspond, but not necessarily directly, with the 4ESS switch exception panel. To better understand the packaging concept of the display pages, see the exception panel shown in Figure 1.
- ***Control Pages:*** Control pages provide the means for selecting controls to relieve problems. They are used to execute manual controls and also to establish and change thresholds upon which network performance is measured. These pages are labeled CN.

Format of Display Pages

6.04 Certain specifications are common to all displays. For example, all displays are rectangular in shape with an area 24 lines deep and 80 columns wide. Within the display area, there are regions that contain fixed information and regions that either convey or accept information from the user.

6.05 The regions dedicated to variable information, such as the common name for a TSG or the number for a routing data block, are always rectangular and are called ''windows.'' The remainder of the display area is called ''background.'' It consists of contextual information such as labels that make the window content significant.

6.06 Each display has its own unique arrangement of background and windows, but common to all pages are these major areas: identification, data, transfer, and identification of the source office. These major areas are defined as follows:

- ***Identification:*** Each display consists of its own identification code (two alpha characters plus two digits) and title as it appears on the directory page.
- ***Data:*** The main portion of the display page provides data that consists of both fixed and variable information with presentation of the information dependent on the format design.

- ***Transfer:*** The last line of the display provides for mobility functions such as transfer to a directory page, or transfer to another display page. Whenever a page is presented to the system, the transfer section is interrogated for requested action before processing begins on the page displayed.
- ***Source:*** At the bottom of the display, the source office is identified through its CLLI code.

Using Display System

6.07 The pages of the display system are accessed via keyboard operation and displayed on the CRT screen for real-time surveillance and control purposes.

6.08 You can steer the paths of execution for the programs that implement most of the displays. You indicate the one item out of several that should be investigated; the type of analysis to be conducted; the interval of time to be encompassed; and other factors.

6.09 The program execution path is selected by using the keyboard to enter data in one or more input windows. Program execution is implemented by pressing the BLOCK SEND key or the ENTER key. (The labeling of the key depends on the type of terminal you are using.) After the BLOCK SEND (or ENTER) key is pressed, the system responds by supplying data in the output window areas. At this point, the display is ready for additional input or for making changes to the original input.

6.10 Since the system is activated by entries into input windows, these areas are clearly marked on the display by either parentheses or brackets. The windows indicated by parentheses are programmed to recognize the plus sign (+) as the designation symbol. Windows indicated by brackets accept variable information such as integers or common language entries.

6.11 Completion of the display formats are both facilitated and limited by the CRT capabilities. The CRT features that enhance display formatting include cursor tabbing for locating input windows, character flashing for error identification, and two levels of character brightness to highlight between fixed and variable information. Conversely, display formats are constrained by the CRT screen capacity of 24 lines and 80 columns. Therefore, some of the displays have been designed with windows that permit the user to scroll the data either forward or backward to obtain additional information. Also limitations on space have mandated extensive use of abbreviations for window labeling. Refer to section 13 of this practice for a list of abbreviations and acronyms used on the CRT pages of the NMDS.

6.12 The display system is programmed for default operations when no specific instructions are received. For example, if no instructions are received regarding the time interval desired, the system usually defaults to the present data from the most recent 5-minute period.

6.13 Since the display system is subject to change from one generic to the next, it is not practical to discuss and illustrate each individual display. Therefore, the display system is discussed under the package concept. The directory pages and at least one representative display page from each package are used to illustrate the format and content provided by displays in each package.

7. Directory Pages

7.01 Each package has a directory page. Generally speaking, a directory page shows the content and organization of the package. The displays are organized so that the first pages of a package present an overview or summary of a particular situation. The succeeding pages expand a certain category and provide more detailed information.

7.02 Examples of each type of directory page are found in Figures 2 through 7:

CN—Figure 2
PA—Figure 3
MA—Figure 4
CC—Figure 5
TG—Figure 6
EF—Figure 7.

Description of Directory Pages

7.03 The directory page is divided into two halves, a left and a right. The left half of the directory page is an inventory listing of the displays contained in that package. Each display is identified by a 2-character directory designation plus a number and the page title. A set of parentheses separate the directory designator and the page title. A page is accessed by entering the designation symbol (+) in the parentheses or the 4-character page designator.

7.04 The right half of the directory page provides a list of all the directories available in the system. This list of directories appears on each directory page.

Accessing Directory Pages

7.05 When the display system is activated from the ***off*** position, the control package (CN) directory is automatically displayed. To view another directory page, enter the 2-character designation for the desired directory in the directory select brackets. These brackets are in the upper right-hand corner of the page. To view a specific page from a directory, enter the designation symbol in the parentheses next to the page and press the BLOCK SEND (or ENTER) key.

7.06 It is not always necessary to go through a directory page to access a display. A display can be accessed directly if you know the page number. To directly access a display page, enter the full identification symbols (directory code and number) in the page-select brackets and press the BLOCK SEND (or ENTER) key. (The page-select brackets are in the upper left portion of the directory page.)

8. Control Pages

8.01 The control package (CN), as depicted by the directory page (Figure 2), provides pages for implementation of manual controls to maximize traffic flow through the network (control input pages). The control package also provides pages for establishing or changing threshold values for triggering automatic controls (threshold input pages).

CN—Control Input Pages

8.02 Control input pages permit the network manager to enter and remove manual controls on TSGs and provide thresholds for internal HTR calculations.

8.03 The CN input pages encompass three categories of controls: 1) controls for domestic traffic, 2) controls for international traffic, and 3) controls common to both domestic and international traffic. The applicable term in the display title identifies displays dedicated strictly to one class of traffic; for example, domestic or international. In the displays common to either class of traffic, the window label on the display format provides a means of distinguishing between international and domestic data.

8.04 The control input pages contain a message section that displays error messages, instructions, and explanatory material. Another element common to these pages is the display of the time of day for current control status.

8.05 Control pages can operate in three modes: initial display, pending, and execution. When a control action is entered, the system feeds back data pertinent to the control selected and for controls already in effect. The control entered remains in a pending mode until the data is

reviewed. The pending mode allows changes to be made to the initial display before execution of the page. While in the pending mode, you can change any of the data, specify the removal of a control, or delete the performance of a test by entering new data or the designation symbol for the appropriate item. When satisfied with the changes entered, press the BLOCK SEND (or ENTER) key and then execute the page by placing the designation symbol in the **EXECUTE** window.

8.06 Having a pending mode before execution is unique to the control pages and has been programmed into the system to inhibit hasty input of manual control actions.

8.07 The control pages are described in the following paragraphs.

A. CN01 - Domestic Manual HTR Control

8.08 This control page, Figure 8, allows you to add (or delete) a single code to (or from) the domestic HTR control list via the NMDS. A Numbering Plan Area (NPA) or an NPA-NXX may be added to the control list. CN01 is used when you need to add only one code at a time. (CN05 is used for adding blocks of codes.)

B. CN02 - Outgoing Trunk Control Page

8.09 This control page, Figure 9, allows you to activate, change, or remove the following manual TSG controls: Cancel To (CANT), Cancel From (CANF), and SKIP. This page is also used to do the following:

- Override the exemption of preferred calls from automatic controls, that is, treat preferred calls as standard.
- Assign TSGs to DOC and/or STR categories for pattern response.

You can transfer the CIN from this control page to control pages CN16, CN17, CN18, and display page TG9.

C. CNO3 - Domestic Incoming Trunk Control

8.10 This control page, (Figure 10), allows you to inhibit or transmit DOC levels MC1 and MC2 and assign SILC at the TSG level.

D. CN04 - Domestic General Control Change

8.11 The Domestic General Control Change page, (Figure 11), provides the capability to do the following:

- Remove all manual controls
- Set HTR thresholds
- Set DOCTOR thresholds
- Inhibit SDOC
- Select up to six NPAs for 6-digit HTR resolution
- Do an SDOC transmit test at MC3 level
- Test the lamps on the exception display panel, if one is provided

8.12 Controls may be removed or inhibited by inserting the designation symbol (+) beside the appropriate control. The HTR threshold windows accept only numerical values. When the page is called up, it displays the following data:

- Active manual controls
- HTR thresholds
- Status of SDOC
- NPA codes on 6-digit HTR resolution

E. CN05 - Domestic/International Manual HTR Control

8.13 This control page, (Figure 12), is intended to be used to quickly add a large number of codes to the domestic HTR list; for example, on Christmas or Mother's Day. CN05 is designed to handle 6-digit codes (NPA+NXX). It may be used for 3-digit codes, but 3-digit codes cannot be mixed with 6-digit codes.

```
   [    ] PAGE
                                                [  ] DIRECTORY
CN1   ( ) DOM MANUAL HTR CONTROL
CN2   ( ) OUTGOING TRUNK CONTROL PAGE            CN  CONTROL INPUT
CN3   ( ) DOMESTIC INCOMING TRUNK CONTROL        CN  THRESHOLD INPUT
CN4   ( ) DOMESTIC GENERAL CONTROL CHANGE
CN5   ( ) DOM/INT'L MANUAL HTR CONTROL           PA  TRAFFIC PATTERNS
CN6   ( ) INT'L MANUAL HTR CONTROL               MA  IMA DATA
CN7   ( ) INT'L GENERAL CONTROL CHANGE           CC  CODE COMPLETIONS
CN8   ( ) CALL GAPPING CONTROL                   TG  TRUNK SUBGROUPS
CN9   ( )                                        MA  MACHINE STATUS
CN10  ( )
CN11  ( ) EXCEPTION PANEL THRESHOLDS             EF  ENTRY FORMS
CN12  ( )
CN13  ( )
CN14  ( )
CN15  ( )
CN16  ( ) REGULAR REROUTE CONTROL
CN17  ( ) CODE SPECIFIC REROUTE CONTROL
CN18  ( ) RDB SPECIFIC REROUTE CONTROL
CN19  ( ) TIME ACTIVATED REROUTE SCHEDULING PAGE
CN20  ( ) MODIFY INITIALIZATION FOR TRANSACTION
```

Figure 2. CN—Control Input/Threshold Input Directory

```
   [    ] PAGE
                                                [  ] DIRECTORY
PA1   ( )
PA2   ( )                                        CN  CONTROL INPUT
PA3   ( ) HTR SOURCE/CONTROL INVENTORY           CN  THRESHOLD INPUT
PA4   ( ) RR VIA INVENTORY
PA5   ( )                                        PA  TRAFFIC PATTERNS
PA6   ( )                                        MA  IMA DATA
PA7   ( ) PAS WITH CUT THROUGH                   CC  CODE COMPLETIONS
PA8   ( ) CALL GAPPING CONTROL INVENTORY         TG  TRUNK SUBGROUPS
PA9   ( ) PAS WITH TELEVOTE INVENTORY            EF  CONTROL EFFECTS
PA10  ( )                                        MA  MACHINE STATUS
PA11  ( ) SEL INC LOAD CTRL INVENTORY
PA12  ( ) SCHEDULED REROUTE INVENTORY
PA13  ( )
PA14  ( ) STR INVENTORY
PA15  ( ) DOC RECEIVED INVENTORY
PA16  ( ) TOTAL OFFICE REROUTE INVENTORY
PA17  ( ) ROUTE CONTROL INVENTORY
PA18  ( ) INTL HTR CONTROL LIST INVENTORY
PA19  ( ) INTL MANUAL HTR LIST INVENTORY
PA20  ( ) PAS ANNOUNCEMENT INVENTORY
```

Figure 3. PA—Traffic Patterns Directory

```
   [    ] PAGE

                                                [  ] DIRECTORY

MA1   ( ) IMA OVERVIEW
MA2   ( ) SUMMARY: NC. TIMEOUTS & OUT FAIL          CN  CONTROL INPUT
MA3   ( ) SUMMARY: CONTROL & CAMA QUEUE             CN  THRESHOLD INPUT
MA4   ( ) SUMMARY: INTERNAL QUEUE
MA5   ( ) SUMMARY: VAC/IWK & CAMA INC FAIL          PA  TRAFFIC PATTERNS
MA6   ( ) SUMMARY: NON-CAMA INC FAIL                MA  IMA DATA
MA7   ( ) SUMMARY: PSTO/FSA                         CC  CODE COMPLETIONS
MA8   ( ) SUMMARY: ABANDONED CALL                   TG  TRUNK SUBGROUPS
MA9   ( ) TRUNK SUBGROUP IMA                        EF  CONTROL EFFECTS
MA10  ( )                                           MA  MACHINE STATUS
MA11  ( ) MSR PART I
MA12  ( )
MA13  ( )
MA14  ( )
MA15  ( )
MA16  ( )
MA17  ( )
MA18  ( )
MA19  ( )
MA20  ( )
```

Figure 4. MA—IMA Data/Machine Status Directory

```
   [    ] PAGE

                                                [  ] DIRECTORY

CC1   ( )
CC2   ( ) NPA COMPLETIONS OVERVIEW                  CN  CONTROL INPUT
CC3   ( )                                           CN  THRESHOLD INPUT
CC4   ( )
CC5   ( ) 3-DIGIT CODE TREND                        PA  TRAFFIC PATTERNS
CC6   ( ) 6-DIGIT CODE INVENTORY                    MA  IMA DATA
CC7   ( ) 6-DIGIT CODE TREND                        CC  CODE COMPLETIONS
CC8   ( ) ROUTING ANALYSIS                          TG  TRUNK SUBGROUPS
CC9   ( ) 100% FAILURE CODE INVENTORY               MA  MACHINE STATUS
CC10  ( ) CODE NETWORK INVENTORY
CC11  ( ) COMPLETION CODE MONITOR                   EF  ENTRY FORMS
CC12  ( )
CC13  ( ) INTERNATIONAL CODE NETWORKS
CC14  ( ) COUNTRY CODE INVENTORY
CC15  ( ) COUNTRY CODE TREND
CC16  ( )
CC17  ( )
CC18  ( )
CC19  ( )
CC20  ( )
```

Figure 5. CC—Code Completions Directory

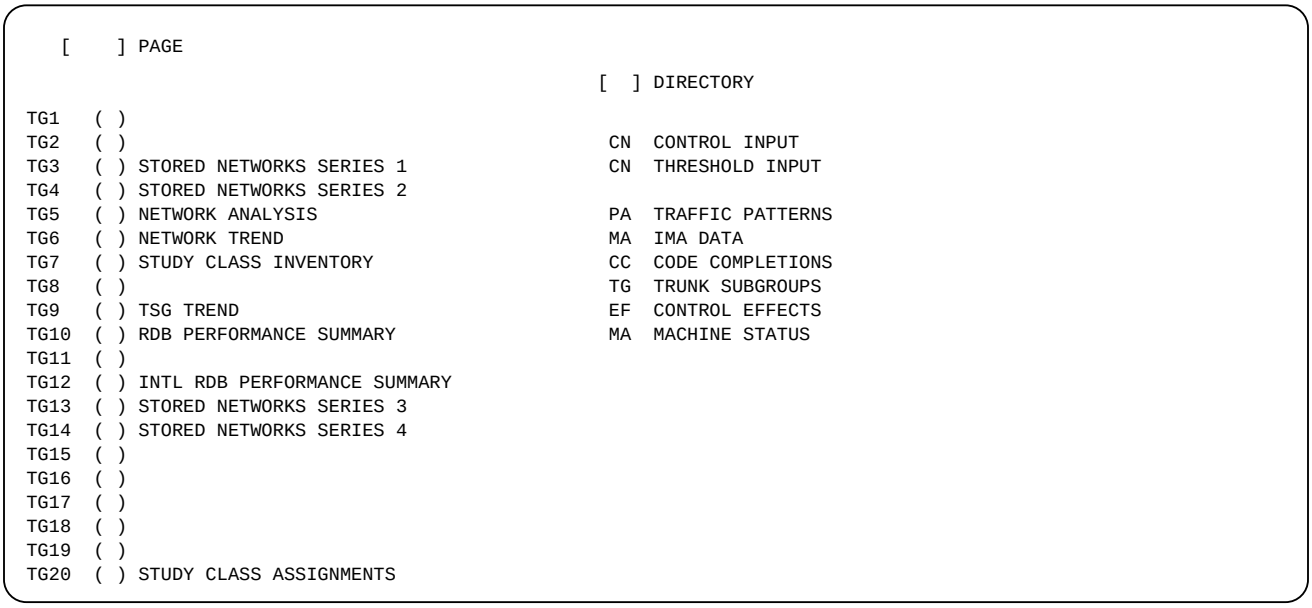

Figure 6. TG—Trunk Subgroup Directory

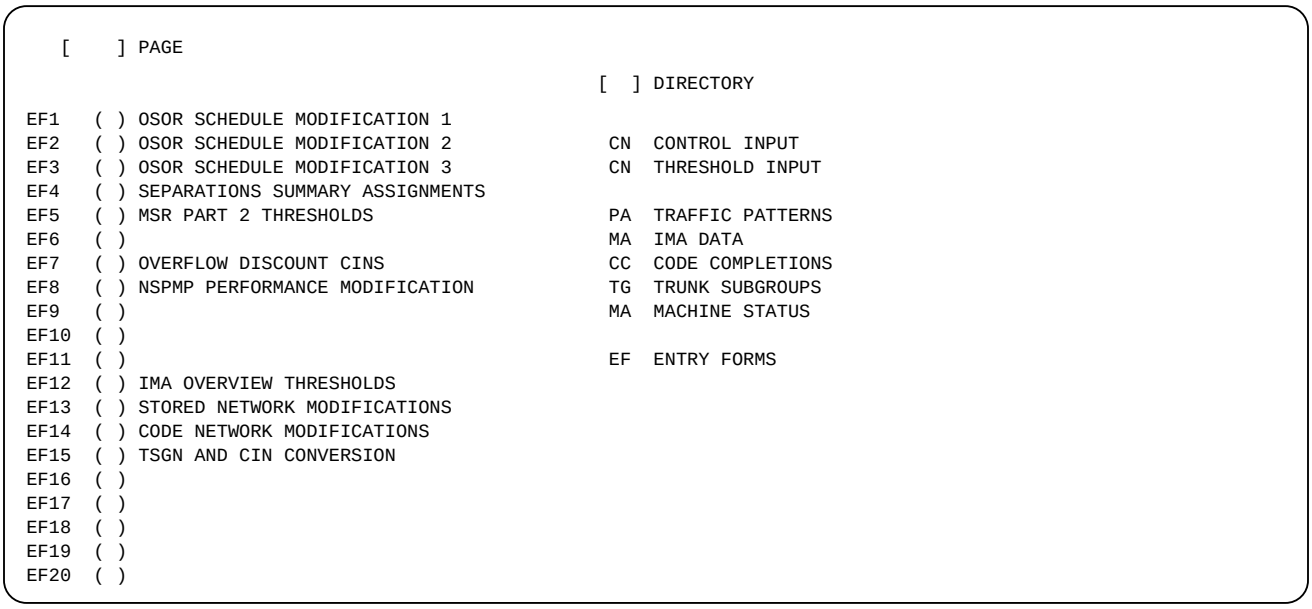

Figure 7. EF—OSOR Scheduling Directory

```
CN01 DOM MANUAL HTR CONTROL            DATA TIME              SENT AT
--------------------------------------------------------------------------------

                          NPA   NXX
  ...CODE                <   > <   >

  ...MANUAL HTR          <   >
     (OFF/MAN/INH)

  ...ACTIVE DOM HTR CODES
     (MANUAL HTR AND INH)









--------------------------------------------------------------------------------
```

Figure 8. CN01—Domestic Manual HTR Control

```
CN02 OUTGOING TRUNK CONTROL PAGE       DATA TIME              SENT AT
--------------------------------------------------------------------------------
 ...SELECT     BTFN TOWN ST BL FBS NBS  IO  RDOC   ...SET TO INHIBIT INH/ALW
      ROUTE   <                      >               STR          <   >
                                                     RDOC         <   >
                                RATE    PREFERENCE
 ...MANUAL CONTROLS  OFF/%/RTE  INDEX  (ALL/P/S/PS)  HTR/NHR/ALL  ALT/DIR/ALL
      CANCEL FROM      <   >    <   >      <   >        <   >        <   >
      CANCEL TO        <   >    <   >      <   >        <   >        <   >
      SKIP             <   >    <   >      <   >        <   >        <   >

 ...CANCEL REROUTED OVERFLOW (ON/OFF) <   >        ...SELECT PATTERN/OPTION
 ...CANCELLED CALL DISPOSITION        <   >             STR      (OFF,A-N)<   >
 ...ASSIGN STUDY GROUP      (OFF,1-5) <   >               OPTION   (SK/CA) <  >
 ...SET SRL1             (AUT / 0-15) <   >     SDOC/SILC/DOCTOR (OFF,A-N)<   >
    SET SRL2             (AUT / 0-15) <   >               OPTION   (SK/CA) <  >
 ...INH PREFERRED CALLS     (INH/ALW) <   >
 ...ACTIVE IN SYSTEM     ADJUNCTS                              TRANSFER TSG TO
                       STUDY GROUPS                              REG RR CNTL( )
                                                               CODE RR CNTL ( )
                                                                RDB RR CNTL ( )
                                                                  TSG TREND ( )
--------------------------------------------------------------------------------
```

Figure 9. CN02—Outgoing Trunk Control

```
CN03 DOMESTIC INCOMING TRUNK CONTROL  DATA TIME              SENT AT
------------------------------------------------------------------------------
            BTFN TOWN ST BL FBS NBS   IO
  ...ROUTE  <                      > <  >

                      INHIBIT AUTO MC1 & MC2 ( ) RESTORE ( )
  ...DOC TRANSMIT
     MANUAL CONTROL             TRANSMIT MC1 ( ) RESTORE ( )
                                         MC2 ( )


  ...DOC LEVEL SENT

  ...DOC LEVEL RECEIVED

  ...SILC            ASSIGN( )   REMOVE( )

------------------------------------------------------------------------------
```

Figure 10. CN03—Domestic Incoming Trunk Control

```
CN04  DOMESTIC GENERAL CONTROL CHANGE  DATA TIME              SENT AT
------------------------------------------------------------------------------
                             ACTIVE      ...SET DOMESTIC HTR THRESHOLDS
              REROUTE     ( )                                AT         FTO
  ...REMOVE   SKIP        ( )                             (1-9999)   (1-100)
     MANUAL   CANCEL TO   ( )              FOREIGN NPA    <    >     <   >
     CONTROLS: CANCEL FROM ( )             HOME NPA-NXX   <    >     <   >
                                           FOREIGN NPA-NXX<    >     <   >

                                                            (0.1-1.0)
                         INHIBIT AUTO                      DELTA AT <   >
  ...OUTGOING AUTO DOC/SILC ( )   ( )                      DELTA FT <   >
                                      ...SET DOCTOR THRESHOLDS (1-100)
  ...SET RR TURNOFF INTERVAL 5 MIN/30SEC   MC1 <   >
     FOR DOMESTIC TSGS        <     >      MC2 <   >
                                           MC3 <   >
  ...DOC MC3 TRANSMIT TEST   ON ( )   ...ASSIGN FOREIGN AREA CODES  <   >
  ...LAMP TEST       ON ( ) OFF ( )      FOR OFFICE CODE HTR        <   >
                                         RESOLUTION                 <   >
                                                                    <   >
------------------------------------------------------------------------------
```

Figure 11. CN04—Domestic General Control Change

```
CN05  DOM/INT'L MANUAL HTR CONTROL      DATA TIME             SENT AT
-------------------------------------------------------------------------------

SELECT CODE TYPE DOM( ) INT'L( )   ...CODES    ...MANUAL HTR (OFF/MAN/INH)

 CC/   NN/   MANUAL   CC/   NN/  MANUAL   CC/   NN/  MANUAL   CC/   NN/  MANUAL
 NPA   NXX    HTR     NPA   NXX   HTR     NPA   NXX   HTR     NPA   NXX   HTR
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
<   > <   >  <   >   <   > <   > <   >   <   > <   > <   >   <   > <   > <   >
```

Figure 12. CN05—Domestic/International Manual HTR Control

8.14 With this control page, up to 60 manual international HTR codes can be added or deleted at one time. Display page PA19 displays the codes on the manual international HTR list.

8.15 Since CN05 is designed for speed, it only operates in two modes: initial display and execution. Execution of this control page is different than other control pages. After selecting the execute option, all the codes that were entered are erased. Therefore, take extra care when entering data on this page.

F. CN06 - International Manual HTR Control

8.16 This control page, (Figure 13), is used to set HTR.
It is the international equivalent of CN01.

G. CN07 - International General Control Change

8.17 This control page, (Figure 14), is used to set international HTR thresholds and to remove international TSG controls.

H. CN08 - Call-Gapping Control

8.18 This control page, (Figure 15), provides the capability to insert call-gap controls by selecting a unique combination of the following five items:

- CODE (1 - 15 digits)
- CARRIER IDENTITY
- FAR-END COUNTRY CODE
- TYPE
- INCOMING TSG NUMBER

```
CN06 INT'L MANUAL HTR CONTROL            DATA TIME              SENT AT
-------------------------------------------------------------------------------

                           CC    NN
  ...CODE                <   > <   >

  ...MANUAL CONTROL       <   >
     (OFF/MAN/INH)

  ...ACTIVE INT'L HTR CODES
     (MANUAL HTR AND INH)


-------------------------------------------------------------------------------
```

Figure 13. CN06—International Manual HTR Control

```
CN07 INT'L GENERAL CONTROL CHANGE     DATA TIME             SENT AT
 -------------------------------------------------------------------------------
  ...SET RR TURNOFF INTERVAL  5MIN/30SEC
     FOR INTERNATIONAL TSGS    <     >   ...SET INT'L HTR THRESHOLDS
                                                        DELTA  DELTA
  ...REMOVE ALL INT'L                          AC     %FC    AC      FC
     CONTROlS                                 (1-     (1-   (0.1-   (0.1-
       REROUTE         ( )                     9999)   100)   1.0)    1.0)
       SKIP            ( )         SET 1    <    >  <   >  <   >  <   >
       CANCEL TO       ( )         SET 2    <    >  <   >  <   >  <   >
       CANCEL FROM     ( )         SET 3    <    >  <   >  <   >  <   >
                                   SET 4    <    >  <   >  <   >  <   >
                                   SET 5    <    >  <   >  <   >  <   >
                                   SET 6    <    >  <   >  <   >  <   >
  ...INHIBIT INT'L AUTO            SET 7    <    >  <   >  <   >  <   >
     HTR (OFF/INH)        <   >
                                  ...ASSIGN COUNTRY CODE
                                    TO HTR THRESHOLD SET
                                        COUNTRY CODE            <   >
                                        HTR THRESHOLD SET       < >

-------------------------------------------------------------------------------
```

Figure 14. CN07—International General Control Change

```
CN08 CALL GAPPING CONTROL            DATA TIME              SENT AT
--------------------------------------------------------------------------------
  CODE         [            ]   GAP   GAP.INT     GAP   GAP.INT   GAP   GAP.INT
  CARRIER IDENTITY      [   ]  INDEX  SECONDS    INDEX  SECONDS  INDEX  SECONDS
  FAR END COUNTRY CODE  [   ]    2      0.1       13     300.0    25     12.0
  GAP INTERVAL INDEX    [   ]    3      0.25      14     600.0    26     20.0
  TYPE                   [  ]    4      0.5       16       0.12   27     45.0
  INCOMING TSG NUMBER  [    ]    5      1.0       17       0.14   28     75.0
  DISPOSITION           [   ]    6      3.0       18       0.16   29    100.0
  SECURITY TRAP         [   ]    7      6.0       19       0.18   30    150.0
                                 8      9.0       20       0.2    31    450.0
  TOTAL NUMBER OF                9     15.0       21       0.36   0=OFF
  CONTROLS                      10     30.0       22       0.6    1=NO CALLS
                                11     60.0       23       0.75  15=ALL CALLS
                                12    120.0       24       1.6      BLOCKED
XFER TO CALL GAP INV ( ) +------------ GAP TYPE DESCRIPTIONS ----------------
XFER TO CUT-THRU INV ( )  0=ALL DOM CALLS           6=INT'L TRANSIT ONLY
                          1=ALL DOM POTS CALLS      7=INT'L TERMINATING ONLY
                          2=ALL DOM NON-POTS CALLS  8=INCOMING INTERTOLL ONLY
                          3=SDN EGRESS DOMAINS      9=BOC-SSP DOMESTIC
                          4=DIGITAL DATA CALLS     10=BOC-SSP INT'L ONLY
                          5=INT'L ORIGINATING ONLY
--------------------------------------------------------------------------------
```

Figure 15. CN08—Call Gapping Control and Inventory

These items work together to determine how the control is applied. Once these five items have been selected, the **GAP INTERVAL INDEX**, **DISPOSITION** and **SECURITY TRAP** options may be selected, pending execution. If any change is made to the original five items, the page is returned to the initial display (status) mode.

I. CN11 - Exception Panel Thresholds

8.19 This control page, (Figure 16), allows you to set 30-second, 5-minute, and 15-minute thresholds.

J. CN16 - Regular Reroute Control

8.20 This control page, (Figure 17), implements the regular reroute capability of the SPRR control. From this control page you can select a reroute percentage, IRR, or ORR. It allows the selection of multiple via routes. After executing CN16, the total number of active reroutes in the office is displayed. (The range of reroutes is from 0 to 256.)

K. CN17 - Code Specific Reroute Control

8.21 This control page, (Figure 18), implements the destination code specific reroute capability of the SPRR control. From this control page you can select up to sixteen 3-digit or 6-digit destination codes in any combination. When the destination code specific reroute is selected, only calls destined for the selected codes are rerouted.

```
CN11 EXCEPTION PANEL THRESHOLDS        DATA TIME            SENT AT
--------------------------------------------------------------------------------
                                    5-MINUTE THRESHOLDS

                                OFL      ACH      CCH      NSD      OOS
                               LO  HI   LO  HI   LO  HI   LO  HI   LO  HI
               STUDY GROUP 1  <  ><  > <  ><  > <  ><  > <  ><  > <  ><  >
 ..TRUNK       STUDY GROUP 2  <  ><  > <  ><  > <  ><  > <  ><  > <  ><  >
   SUBGROUP    STUDY GROUP 3  <  ><  > <  ><  > <  ><  > <  ><  > <  ><  >
   PERFORMANCE STUDY GROUP 4  <  ><  > <  ><  > <  ><  > <  ><  > <  ><  >
               STUDY GROUP 5  <  ><  > <  ><  > <  ><  > <  ><  > <  ><  >

                                                 15-MINUTE THRESHOLDS
       30-SECOND THRESHOLD                                LOW   HIGH
                                          ..IMA           <    > <    >
..CAPACITY <  >  MF INCOMING
                    (OFL)                 ..CAPACITY      MF TRMTR <  >
                                                       MF INC (OOS) <  >
                                                           CAMA OPR <  >
                                                            DP/CCIS <  >
--------------------------------------------------------------------------------
```

Figure 16. CN11—Exception Panel Thresholds

```
CN16 REGULAR REROUTE CONTROL PAGE      DATA TIME              SENT AT
--------------------------------------------------------------------------------
 ...SELECT    BTFN TOWN ST BL FBS NBS  IO RDOC           RTE  SECS   RTE   SECS
    AB ROUTE <                 >                        INDX  BTN   INDX   BTN
 ...SELECT REROUTE PARAMETERS                                CALLS       CALLS
     PERCENT       (12.5-100/RTE/OFF) <   > DOMAINS<   >   0   OFF    8     5
     TYPE OF REROUTE        (IRR/ORR) <   >        <   >   1    0     9     6
     ROUTING            (ALT/DIR/ALL) <   >        <   >   2    1    10     8
     TRAFFIC            (HTR/NHR/ALL) <   >        <   >   3  1.5    11    10
     ALLOW IN-CHAIN RETURN  (NO/YES)  <   >        <   >   4    2    12    15
     ALLOW INTL INBOUND     (NO/YES)  <   >     ALL ( )    5  2.5    13    30
     ALLOW PREV REROUTED    (YES/NO)  <   > ALW            6    3    14    45
     PREFERENCE         (ALL/P/S/PS)  <   > TURN           7    4    15    60
                                         OFF AT  RATE
 ...SELECT           BTFN TOWN ST BL FBS NBS N/Y N/Y 0-15   TRANSFER TSG TO
     AV  ROUTES AV1<                      >< > < > < >  >
                AV2<                      >< > < > < >  >   OUT TSG CNTL ( )
                AV3<                      >< > < > < >  >      TSG TREND ( )
                AV4<                      >< > < > < >  >
                AV5<                      >< > < > < >  >
                AV6<                      >< > < > < >  >   ...TOTAL NUMBER OF
                AV7<                      >< > < > < >  >      ACTIVE REROUTES
--------------------------------------------------------------------------------
```

Figure 17. CN16—Regular Reroute Control Page

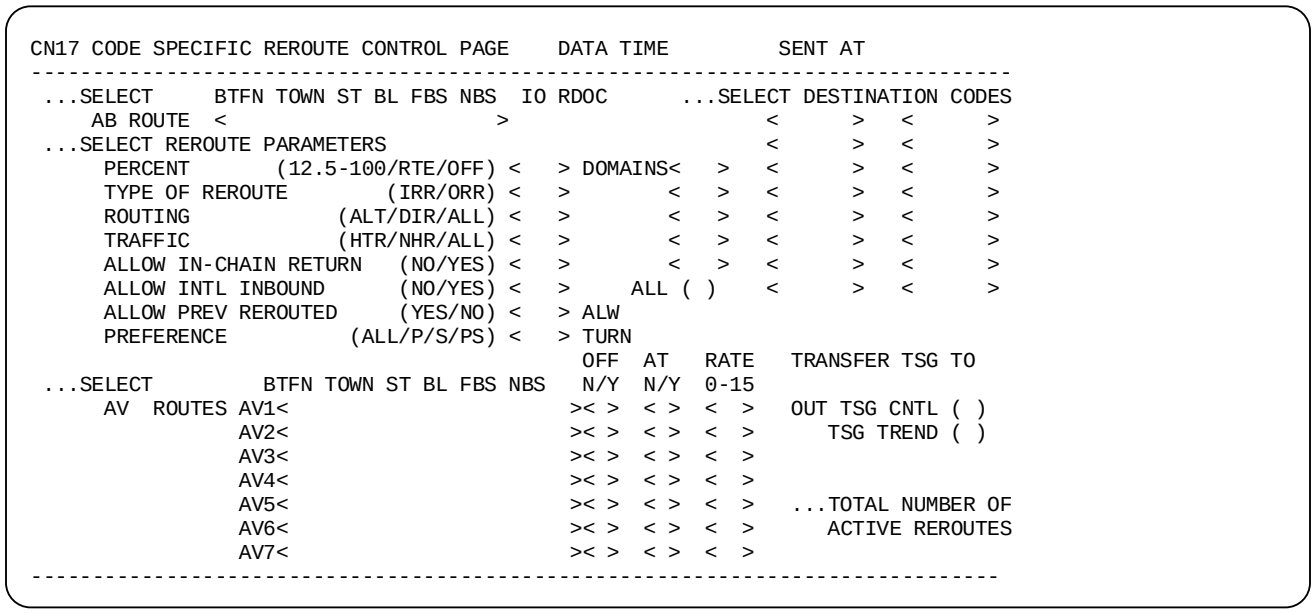

Figure 18. CN17—Code Specific Reroute Control Page

L. CN18 - RDB Specific Reroute Control

8.22 This control page, (Figure 19), allows you to select up to 16 routing data blocks (RDB). When the RDB specific reroute is selected, only calls accessing the selected RDBs are rerouted.

M. CN19 - Spray Reroute Scheduling Page

8.23 This control page, (Figure 20), is used to schedule a start and stop time for SPRRs and the day of the week that they are to be active.

N. CN20 - Modify Initialization For Transaction

8.24 This control page, (Figure 21), is used primarily by program developers for debugging purposes.

CN—Threshold Input Pages

8.25 The CN package also provides pages for entering thresholds associated with the system operating parameters for the following time intervals: 30 seconds, 5 minutes, and 15 minutes. For the 30-second interval, the thresholds are associated with test calls; for the 5-minute interval, the thresholds are entered for TSG performance and HTR calculations; and for the 15-minute interval, the thresholds are associated with traffic patterns, IMAs, and system load capacity.

8.26 As previously stated, the pages of the NMDS that provide for investigation and resolution of network problems are nongeneric in nature. These nongeneric pages access the 4ESS switch data base, which is subject to change as the office environment changes. The data retrieved from the data base consists of counts for various facilities. Usually the facilities are lists of CINs or codes (NPA-NXX) that are entered into the system as office dependent lists. The lists are updated on site and stored in the Long-Term Storage (LTS) portion of memory. This data is mapped to its correct location during a retrofit and does not require an Office Data Assembler (ODA) decompile/recompile. The following display pages provide the updating and data retrieval functions:

- EF12 (MA11) - IMA Overview Thresholds
- EF13 (TG03/TG04/TG13/TG14) - Stored Networks Modification
- EF14 (CC10/CC13) - Code Network Modification
- TG20 - Study Class Assignments.

9. Data Display Pages

9.01 Data display pages are used to interrogate the system for real- time solutions to network failure and congestion problems. Display pages from the PA, MA, CC, and TG packages are discussed in this section.

PA—Traffic Patterns Display Pages

A. General

9.02 The display pages listed on the PA directory page (Figure 3) provide three major types of control-related information: control status, control counts, and reference data. From the information displayed on these pages, the network manager can determine the cause of an alarm or an exception printout.

B. Data Presented

9.03 The PA display pages provide two basic types of information: 1) controls currently active and 2) affect of active controls on traffic flow. The displays show the type of traffic and the quantity of traffic affected by controls. They also show the routes used by the controlled traffic. By analyzing the data presented, the network manager can address and answer the following questions:

- Which controls are severely restricting traffic?
- Which controls are not being utilized?
- How are controls affecting traffic to a particular geographic area?
- Which controls of a particular type are now active?
- How many controls of each type are now active?
- Are there redundant or conflicting controls?

9.04 Both domestic and international traffic control data are contained in the PA display pages. The displays provide information about traffic controls available for network management purposes as well as dynamic overload control signals received from served locations. The data presented ranges from listings of all TSGs under control to all codes declared HTR to TSGs and codes that have controls but no calls affected. Data presented by the displays are total count attempts, percentage of traffic control specified, and reroute information.

C. Direct Transfer

9.05 Many of the displays offer direct transfer selection to other pages for expanded details on the data currently viewed. To select a display, enter the designation symbol (+) beside the desired page. This activates the system to transfer the requested page to the screen without reference to package identification or page number.

D. Sample Display Page

9.06 Display page PA17, *Route Control Inventory* (Figure 22), is an example of the format and data presented by the pages of the PA package. This display page presents the route controls currently in effect along with counts of the calls being affected by these controls.

9.07 The initial PA display shows all controlled TSGs by control type: Cancel To (CANT), Cancel From (CANF), SKIP, etc. An asterisk appears when more than one control is in effect at the same time. When this is the case, the TSG appears twice on the list, once for each control in effect. The counts of calls affected for each TSG are ordered by quantity under the **NEW** counts column within each control section.

```
CN18 RDB SPECIFIC REROUTE CONTROL PAGE    DATA TIME        SENT AT
------------------------------------------------------------------------------
 ...SELECT      BTFN TOWN ST BL FBS NBS  IO RDOC     ...SELECT    RDBI   RDBI
    AB ROUTE  <                      >                          <    > <    >
 ...SELECT REROUTE PARAMETERS                                    <    > <    >
     PERCENT       (12.5-100/RTE/OFF) <   > DOMAINS<   >        <    > <    >
     TYPE OF REROUTE       (IRR/ORR) <   >        <   >        <    > <    >
     ROUTING           (ALT/DIR/ALL) <   >        <   >        <    > <    >
     TRAFFIC           (HTR/NHR/ALL) <   >        <   >        <    > <    >
     ALLOW IN-CHAIN RETURN   (NO/YES) <   >        <   >        <    > <    >
     ALLOW INTL INBOUND      (NO/YES) <   >     ALL ( )         <    > <    >
     ALLOW PREV REROUTED     (YES/NO) <   > ALW
     PREFERENCE          (ALL/P/S/PS) <   > TURN
                                        OFF  AT   RATE   TRANSFER TSG TO
 ...SELECT         BTFN TOWN ST BL FBS NBS   N/Y  N/Y  0-15
     AV  ROUTES AV1<                        >< >  < >  <  >   OUT TSG CNTL ( )
                AV2<                        >< >  < >  <  >      TSG TREND ( )
                AV3<                        >< >  < >  <  >
                AV4<                        >< >  < >  <  >
                AV5<                        >< >  < >  <  >   ...TOTAL NUMBER OF
                AV6<                        >< >  < >  <  >      ACTIVE REROUTES
                AV7<                        >< >  < >  <  >
------------------------------------------------------------------------------
```

Figure 19. CN18—RDM Specific Reroute Control Page

```
CN19 SPRAY REROUTE SCHEDULING PAGE      DATA TIME          SENT AT
------------------------------------------------------------------------------
  ... CIN OF AB TSG [                    ]
  ADD OR DELETE   [ ]
  START TIME      [    ]
  STOP TIME       [    ]

  DAYS OF THE WEEK
                    MON [ ]
                    TUE [ ]
                    WED [ ]
                    THU [ ]
                    FRI [ ]
                    SAT [ ]
                    SUN [ ]

                                                        TRANSFER TSG
                                                     REG RR CONTROL ( )
                                                    CODE RR CONTROL ( )
                                                     RDB RR CONTROL ( )
                                                   TARR RR INVENTORY ( )
------------------------------------------------------------------------------
```

Figure 20. CN19—Spray Reroute Scheduling Page

```
CN20 MODIFY INITIALIZATION FOR TRANSACTION <    > FILE < >       TIME

-EDIT OPTION--+----ELT-------------LIST CONTENTS SPECIFICATION----------------

( ) DISPLAY             B=4      INTEGER=0              CIN=3
( ) DELETE              ( )      <        >      <    >  <              >
( ) INSERT              ( )      <        >      <    >  <              >
( ) REPLACE             ( )  --  <        >  --  <    >  <              >
                        ( )      <        >      <    >  <              >
-LIST SPECS---+         ( )      <        >      <    >  <              >
                        ( )  --  <        >  --  <    >  <              >
<    > NAME             ( )      <        >      <    >  <              >
<    > TYPE             ( )      <        >      <    >  <              >
<    > WIDTH            ( )  --  <        >  --  <    >  <              >
<    > FIRST            ( )      <        >      <    >  <              >
<    > LAST
<    > #ELTS                     GENERAL=2
                        <                        >
--------------+         <                        >
                        <                        >
                        <                        >
                        <                        >
--------------+-------------------------------------------------------------
```

Figure 21. CN20—Modify Initialization For Transaction

9.08 For each TSG under control, PA17 displays the following information:

- Percentage of traffic to be controlled
- Codes to be controlled [HTR or HTR plus NHR (ALL)]
- Final handling treatment (NCA, EA1, or EA2) to be received

9.09 Options for this display are listed below:

- Selection of either 5-minute or 15-minute data (Fifteen minute data is the default.)
- Selection of data for an individual control (CANT, CANF, or SKIP)
- Scrolling the list forward or backward for more data
- Transfer of a single TSG to another page for more detail or to the proper control page if a change in control action is desired

MA - IMA Data Display Pages

A. General

9.10 The display pages listed on the MA-IMA directory page (Figure 4) reflect Ineffective Machine Attempt (IMA) data and present information on the machine status.

B. IMA Data

9.11 In the 4ESS switch, every recognized seizure that does not result in successful completion of address signaling is considered an IMA. Extensive data collected and processed in the data base make it possible to take precise action to correct any IMA problem by individual type. For example, IMA data attributable to equipment failures is identified as equipment ineffective attempts (EIAs) and is available on a per TSG basis.

```
PA17  ROUTE CONTROL INVENTORY         DATA TIME [   ] [   ]  SENT AT [     ]
                                                    --CONTROL COUNTS---
BTFN TOWN ST BL FBS IO      CTRL PCT CODE  TRAF  PRF ANN  4TH  3RD  2ND  NEW
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
[                 ] []( )   [ ]  [ ]  [ ]   [ ]  [ ] [ ]  [  ] [  ] [  ] [  ]
 5-MIN( )       CANT( )  SKIP( )      FRWD( )   PART     XFER TO OUT CNTRL( )
15-MIN( )       CANF( )   ALL( )      BKWD( )    OF              TSG TREND( )
                CRO ( )               PART< >
                                              DIRECTORY[]   P[]
```

Figure 22. PA17—Route Control Inventory

C. Sample IMA Display Pages

9.12 Display pages MA1, *IMA Overview* (Figure 23), and MA9, *Trunk Subgroup IMA* (Figure 24), have been selected to show the format and type of information found in the MA package.

9.13 Display page MA1, Figure 23, presents a listing of the IMA counts scored for network management purposes. When the MA1 page is displayed on the CRT screen, an asterisk identifies IMAs that have exceeded the preset thresholds.

9.14 Display page MA9, Figure 24, is used to identify TSGs affected by high IMA count. You can designate the **EIA-IN**, **EIA-OUT**, or **NSD** measure to call up those TSGs that have high EIA or NSD counts. Since the list of TSGs experiencing a high EIA count may be long, the size of the listing can be reduced in several ways. The listing can be limited to trunks above a certain failure count by designating the **NEW**, **COUNT**, or **CUTOFF** category. Also you may select TSGs within the domestic network, international network, or both, as desired. By entry of the CIN, information may be expanded for a specific TSG. Expansion data permits examination of the trunk subgroup for the four most recent 15-minute periods plus the current period by both failure count and percentage of failures. For further information, the entire list of TSGs can be transferred to the network analysis page (TG5) or the network trend page (TG6).

CC—Code Completions

A. General

9.15 The display pages listed on the code completions directory page (Figure 5) provide information for investigation of the completions performance for 3- and 6-digit destination codes.

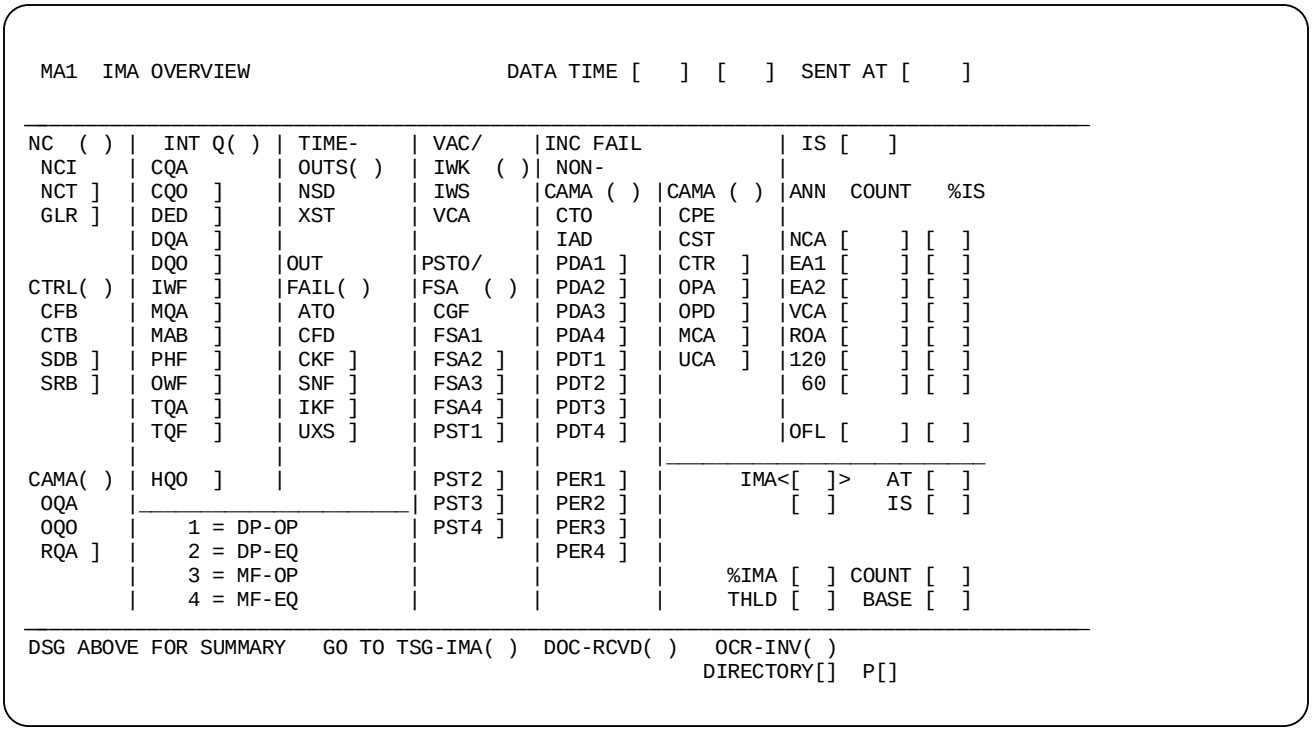

Figure 23. MA1—Ineffective Machine Attempt Overview

9.16 The individual displays of this package differ both in scope and function. For example, some displays show completion data for a broad coverage, such as a region or entire network; others provide greater detail for a limited set of destination codes. All the displays share a common per-code data base from which total count and exception data is taken.

9.17 Some CC package displays are designed to present information for a preestablished network of codes that are of special interest to network management. Data provision for these special networks requires the input of a coordinated system of initial lists. One list defines specific codes of interest and the second gives a network name to be associated with each set of codes. Networks of special interest can be developed for both domestic and international codes. These initial lists are entered into the system through the EF14 display page.

9.18 The CC displays present data about volume (machine attempts) and failure rates [either Ineffective Machine Attempts (IMA) or Ineffective Network Attempts (INA)].

9.19 Some of the CC displays show a window labeled **CUTOFFS**. This window allows entries that exclude a small volume of codes with statistically unstable failure percentages.

B. Sample CC Display Pages

9.20 Display pages CC6, *6-Digit Code Inventory* (Figure 25), and CC8, *Routing Analysis* (Figure 26), have been selected to show the format and type of information found in the CC package.

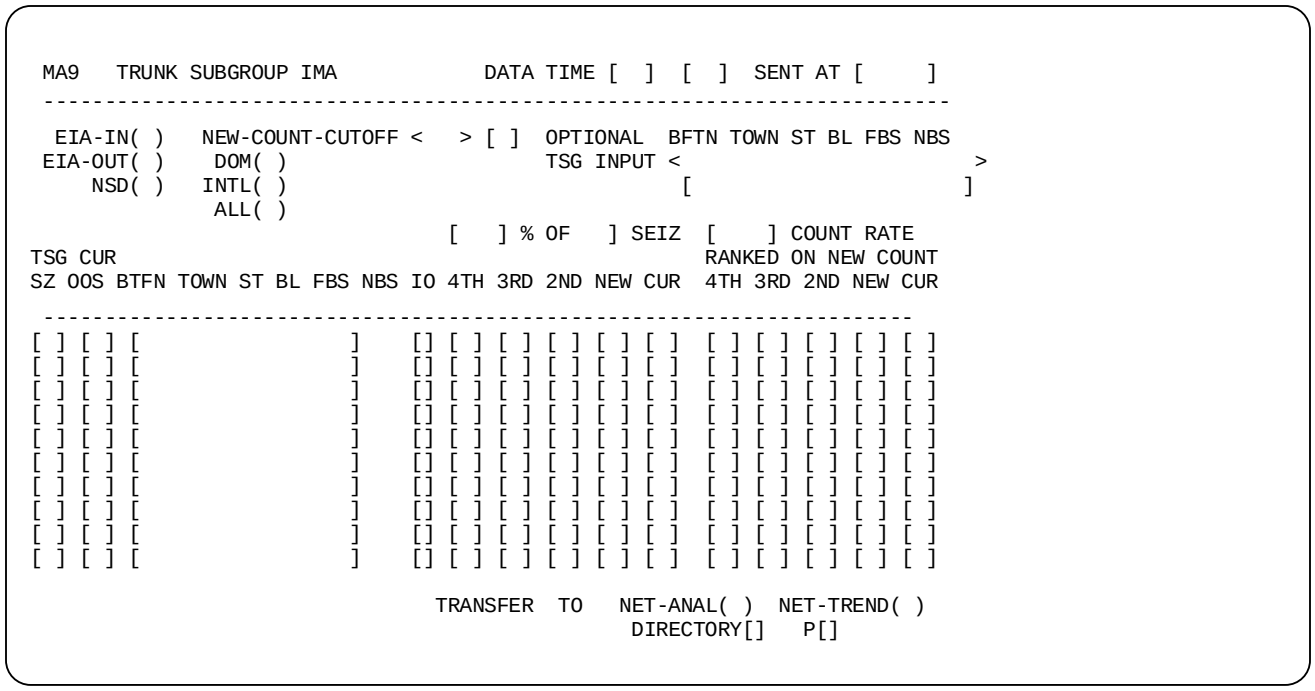

Figure 24. MA9—Trunk Subgroup IMA

CC6

9.21 Display page CC6, (Figure 25), shows the volume of traffic and failures for NXX codes within a 3-digit NPA currently on 6-digit resolution. The 3-digit NPA prefix of any 10-digit code can be put on NXX resolution. This includes 800 service, mass calling, overseas, etc. This display performs a ''screening'' function to generate a list of 6-digit codes that has the largest attempt and/or failure counts, but it does not indicate potential problems. It is left up to network management personnel to decide if a problem condition exists. This decision is based on the analysis of the data presented.

9.22 The following are some characteristics of this display:

- Since only 15 codes can be displayed at one time, the display can be scrolled to see additional codes.
- Any NPA or NXX within the NPA on 6-digit resolution may be entered in the ''NPA-NXX trend'' windows and expanded into three 5-minute increments.
- The transfer option allows you to transfer a single code or consecutive list of codes to either of two displays. It can be transferred to the 6-Digit Code Trend display (CC7) or to the Routing Analysis display (CC8).

CC8

9.23 Display page CC8, (Figure 26), presents the geographic scope of a completion problem within any NPA area. Code completion data, as measured by IMA or INA, are presented by RDB so the traffic destination can be identified. Individual trunk group measures are available for all routes in the RDB. Using this information, blockage can be detected on distant links. The CC8 display is unique because it cannot be accessed directly. It can only be accessed by transferring from another

code completions display (either CC6, CC7, CC9 or CC10).

9.24 Some facts pertaining to display page CC8 are listed below:

- The display requires three separate items of transferred information: the NPA code, the list of NXXs within that NPA, and a designation for either IMA or INA data.
- The display shows the name of the first choice TSG and selected traffic measures. This information allows network management personnel to make a general performance evaluation on the TSGs.
- The code-related data shown on the left-hand side of the display can be either 5-minute (NEW) or 15-minute (ALL), depending on the request you make.
- All TSG data contained in the display is for the 15-minute interval except for the counts shown for 5 minutes on the extreme right-hand side of the display.
- You can expand both the RDB and the TSG data. Expanding the TSG data provides selected control counts and performance measurements. Expanding a given RDB provides the following information:
  - — A list of the transferred NXX codes that use the specified RDB
  - — A breakdown of the completion statistics (IMA or INA) for each NXX
  - — A list of all TSGs in the RDB

```
CC6  6-DIGIT CODE INVENTORY        DATA TIME [  ]  [  ]  SENT AT [      ]
------------------------------------------------------------------------------

NPA                    [ ] CODES BY [  ]                 NPA - NXX TREND
[ ]( )          NXX   MA  IMA  %IMA   NA  INA  %INA    <   >-<   >   AT
[ ]( ) [ ]( )  [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]         -      [  ]
[ ]( ) [ ]( )  [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]
[ ]( ) [ ]( )  [ ]- -[ ] [ ]  [ ]- -[ ]  [ ]   [ ]     3RD   2ND   NEW
               [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]   MA [ ]  [ ]   [ ]
ORDERED BY     [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]  IMA [ ]  [ ]   [ ]
  MA( )        [ ]- -[ ] [ ]  [ ]- -[ ]  [ ]   [ ] %IMA [ ]  [ ]   [ ]
%IMA( )        [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]
%INA( )        [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]   NA [ ]  [ ]   [ ]
               [ ]- -[ ] [ ]  [ ]- -[ ]  [ ]   [ ]  INA [ ]  [ ]   [ ]
5-MIN          [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ] %INA [ ]  [ ]   [ ]
  NEW( )       [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]
  N+2( )       [ ]- -[ ] [ ]  [ ]- -[ ]  [ ]   [ ]
  ALL( )       [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]    TRANSFER ITEM<   >
               [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]             THRU<   >
CUTOFFS        [ ]   [ ] [ ]  [ ]   [ ]  [ ]   [ ]       TO 6-D TREND( )
MA<    >[  ]                                                 IMA-RTG( )
NA<    >[  ]       FRWD( )   PART<  >   PART                 INA RTG( )
                   BKWD( )                OF[ ]
                                                  DIRECTORY[]   P[]
```

Figure 25. CC6—Six-Digit Code Inventory

- The transfer option allows you to transfer a specific TSG to the Trunk Subgroup Trend display (TG9) or the Outgoing Trunk Control display (CN02).

TG—Trunk Subgroup Display Pages

A. General

9.25 The display pages listed on the TG directory page, (Figure 6), provide data that permits the investigation of a large variety of conditions relating to TSG performance. Data presented on the TG displays is dependent on both static and dynamic information contained in the 4ESS switch data base. The structure of this data base permits the retrieval and storage of both types of data.

B. Static Data

9.26 The static information, which is contained in the trunk block translators, presents data for TSGs on a per call basis. Static information also includes data taken from RDB and CIN translators of the data base.

9.27 The following static data is stored in trunk block translators:

- ***Directionality:*** One-way in, one-way out, or two-way TSG
- ***Incoming Separation (INSEP):*** Class to which a TSG has been assigned
- ***Type of Trunk (TOT):*** Centralized automatic message accounting (CAMA), automatic number identification (ANI), operator, secondary, intertoll, etc.

```
CC8    ROUTING ANALYSIS          TSG DATA TIME [  ] [  ]  SENT AT [     ]
                                 CODE DATA TIME [  ]   [                 ]
NPA [ ] POOLED [ ]                                        TSG EXPANSION
RDB   NXX  % COUNT    DIRECT TSG   %OFL  CCH  HT %NSD  [            ]  ]
[  ]( )   [ ] [  ]    [         ]( ) [ ] [  ] [  ] [  ] [ ]
[  ]( )   [ ] [  ]    [         ]( ) [ ] [  ] [  ] [  ] [ ]  RDB [  ]  SIZE  ]
[  ]( )   [ ] [  ]    [         ]( ) [ ] [  ] [  ] [  ] [ ]   HT [  ]  %OCC  ]
[  ]( )   [ ] [  ]    [         ]( ) [ ] [  ] [  ] [  ] [ ]
[  ]( )   [ ] [  ]    [         ]( ) [ ] [  ] [  ] [  ] [ ]         15-MIN 5-MIN
[  ]( )   [ ] [  ]    [         ]( ) [ ] [  ] [  ] [  ] [ ]      TIME  [  ] [    ]
5-MIN  NEW( )         FRWD( ) PART                              OUTSZ  [  ] [    ]
       ALL( )         BKWD( )   OF                                %OFL  [  ] [  ]
                                                                   ACH  [  ] [  ]
NXX [      ]          RDB [  ]     %OFL  CCH  HT %NSD            OCCH  [  ] [  ]
[ ] [ ] [ ]           [       ]( )  [  ]  [  ] [  ] [  ] [ ]      ICCH  [  ] [  ]
[ ] [ ] [ ] CODE DATA [       ]( )  [  ]  [  ] [  ] [  ] [ ]      %NSD  [  ] [  ]
[ ] [ ] [ ]   [   ]   [       ]( )  [  ]  [  ] [  ] [  ] [ ]    RR ATT  [  ] [  ]
[ ] [ ] [ ]           [       ]( )  [  ]  [  ] [  ] [  ] [ ]    RR SUC  [  ] [  ]
[ ] [ ] [ ] TSG DATA  [       ]( )  [  ]  [  ] [  ] [  ] [ ] MAN CTLD  [  ] [  ]
[ ] [ ] [ ]   [   ]   [       ]( )  [  ]  [  ] [  ] [  ] [ ]AUTO CTLD  [  ] [  ]
[ ] [ ] [ ]           [       ]( )  [  ]  [  ] [  ] [  ] [ ]
FRWD( ) PT            FRWD( )  PART   XFER DSG TSG TO
BKWD( ) OF            BKWD( )    OF   OUT TSG CONTROL( )    TSG TREND( )
                                                 DIRECTORY[]   P[]
```

Figure 26. CC08—Routing Analysis

- ***Screening Class Mark (SCM):*** Identity of the screening on TSG used for routing selection
- ***Domain:*** Network definition used to select routing
- ***Insignaling Type:*** Method of digit insignaling; for example, MF, DP, CCIS/CCS7
- ***Outsignaling Type:*** Method of digit outsignaling; for example, MF, DP, CCIS/CCS7
- ***Far-End Numbering Plan Area (FENPA):*** NPA code for the far end
- ***Grade:*** Service grade of TSG; for example, either high usage or full/final
- ***Facility:*** Terrestrial or satellite
- ***Far-End Rank:*** Indication of whether far-end office has hierarchy rank equal to or greater than reference office.

C. Dynamic Data

9.28 Dynamic data distinguishes between TSGs of two categories: 1) TSGs that are controllable (through control action or assignment to a study class) and 2) those that are not controllable. All TSGs, controllable and noncontrollable, that supply data have head cell assignments. In addition, the TSGs selected for control or study group assignment have an adjunct TSG head cell assigned that presents control counts on a 5-minute basis.

9.29 Dynamic data for the TSG is either stored in the head cell or the adjunct head cell. The TSG head cell stores the following information:

- Incoming trunk seizure
- Outgoing trunk seizure
- Overflow
- Rerouted to outgoing trunk seizures
- Busy/idle counters that are incremented when a trunk enters either the service or maintenance busy state and decremented when a trunk enters the idle slot
- Nominal size of the TSG, the number of circuits in the TSG, and the status of the TSG (active or maintenance busy)
- Maintenance busy count.

9.30 The Adjunct TSG Head Cell stores the following data:

- Study group status
- Count of NSD time-outs
- Count of calls affected by manual ‘‘prehunt’’ controls according to type (SDOC or STR)
- Control option currently specified for automatically activated ‘‘prehunt’’ controls (skip or cancel)
- Control option set for manually activated "post hunt’’ control (cancel from or reroute)
- Count of calls affected by ‘‘post hunt’’ control
- Identity of TSG to be used for manual reroute control.

D. Data Collection

9.31 Data is collected at 15-minute intervals, 5-minute intervals, and instantaneously on an event basis. The 15-minute data base, also referred to as the traffic measurements base, reads data from all the structures and retains the values for the four most recent quarter-hour periods. At 5-minute intervals, the network management system makes a record of selected statistics for all TSGs that are in the controllable state. Study class assignments are entered into the system through display page TG20.

E. Special Networks

9.32 Some of the TG package display pages permit the analysis of data for certain preestablished networks of special interest to network management. These special networks may be established on a geographical or functional basis as determined by the needs of the office. For

the system to provide the data for a special network requires the input of a coordinated system of two initial lists. The first list defines the TSG content and labeling for the various stored networks. The second list creates a pairing between network names and indexes. Network management personnel make the assignment of TSGs to study classes. The TSG assignments are entered into the system through the EF13 display page.

F. Organization of TG Package

9.33 The pages in the TG package are organized in different levels. The first pages are broad in scope and lead into pages that present a detailed analysis for a narrow spectrum of TSGs. For the purpose of investigation, use the displays in the proper sequence. The first displays serve as a screening function to determine the TSGs that warrant a closer examination by the detailed display pages. (Figures 27 and 28)

9.34 Displays in the TSG package permit the network manager to address certain specific questions relating to TSGs. For example, if a particular NPA-NXX code is experiencing an unusually high rate of ineffective network attempts, a display can be called up that gives the performance data for the TSGs in the route advance chain. Entering the identity of the NPA-NXX code on the display page presents a summary of the performance for each TSG in the specified routing data block.

```
TG7  STUDY CLASS INVENTORY         DATA TIME [  ] [  ]  SENT AT [      ]

CLASS< >   MEASURE  BTFN TOWN ST BL FBS IO   [  ] [             ]     ]
           %OFL( )  [                 ] [](  )[  ] AS OF   %OUT EIA     ]
INTERVAL    OFL( )  [                 ] [](  )[  ] [   ]   %IN  EIA     ]
 5 NEW( )   ACH( )  [                 ] [](  )[  ]          DATA TIME [ ]
 5 2ND( )   CCH( )  [                 ] [](  )[  ]  ATTEMPTS [  ]     ACH   ]
 5 3RD( )  OCCH( )  [                 ] [](  )[  ]  OUTSEIZE [  ]     OCCH  ]
15 NEW( )  ICCH( )  [                 ] [](  )[  ]   INSEIZE [  ]     ICCH  ]
           %NSD( )  [                 ] [](  )[  ]  OVERFLOW [  ]     %OFL  ]
NO 5-MIN   %RRT( )  [                 ] [](  )[  ]       NSD [  ]     %NSD  ]
DATA FOR %O-EIA( )  [                 ] [](  )[  ]       RRT [  ]     %RRT  ]
CLASS O  %I-EIA( )  [                 ] [](  )[  ]  MAN CTLD [  ]     %OCC  ]
           %OOS( )  [                 ] [](  )[  ] AUTO CTLD [  ]       HT  ]
CLASS TSGS %OCC( )  [                 ] [](  )[  ]    RR ATT [  ]
   0  [  ]   HT( )  [                 ] [](  )[  ]    RR SUC [  ]     SIZE []
   1  [  ]  OOS( )  [                 ] [](  )[  ]   NTC REC [  ]     IDLE []
   2  [  ] SIZE( )  [                 ] [](  )[  ]                     OOS []
   3  [  ]          [                 ] [](  )[  ]
   4  [  ]                                                 XFER DSG TSG TO
   5  [  ]     FRWD( )    PART         XFER PART < > TO      OUT TSG CTRL( )
               BKWD( )      OF []      NET ANAL( )            IN TSG CTRL( )
               PART<  >                NET TRND( )              TSG TREND( )
                                                    DIRECTORY[]   P[]
```

Figure 27. TG7—Study Class Inventory

9.35 All the TG displays require some input from the user. This input may be a keyboard command or a message transferred from another display.

G. Sample TG Display Pages

9.36 Display pages TG7, *Study Class Inventory* (Figure 27), and TG9, *TSG Trend* (Figure 28), have been selected as representative examples of the format and type of information found in the TG package.

TG7

9.37 Display page TG7, (Figure 27), provides the means for surveillance over the TSGs that have been assigned to a network management study group. The display has a ranking mode and a detailed mode.

9.38 The ranking mode, which must be used first, rank orders the TSGs from highest to lowest based on the performance measure selected. While in this mode, you specify the study group (0-5) to be ranked, the time interval to be considered, and the performance measure; for example, Attempts per Circuit per Hour (ACH), Connections per Circuit per Hour (CCH), etc., to be ranked. The defaults for the system are study class 1, percent overflow, and 5-minute new data.

9.39 In the ranking mode, the display also provides a census that indicates how many TSGs are assigned to each study group. From this information, you can determine how many adjuncts are currently assigned to TSGs and how many are available for use (control) on other TSGs. The study group census is automatic but is not updated after the initial display.

```
TG9    TSG TREND                    DATA TIME [  ]  [  ]  SENT AT [      ]

 BTFN  TOWN  ST  BL  FBS  NBS
[                           ] IO  RDOC
TSGN [    ]                   ]         [    ]

INTERVAL   COUNTS     4TH   3RD  2ND  NEW           MEASURES 4TH  3RD  2ND  NEW
 5 MIN( )   ATTEMPTS  [  ]  [ ]  [ ]  [ ]              ACH [ ]  [ ]  [ ]  [ ]
15 MIN( )   OUTSEIZE  [  ]  [ ]  [ ]  [ ]             OCCH [ ]  [ ]  [ ]  [ ]
             INSEIZE  [  ]  [ ]  [ ]  [ ]             ICCH [ ]  [ ]  [ ]  [ ]
             OVERFLOW [  ]  [ ]  [ ]  [ ]             %OFL [ ]  [ ]  [ ]  [ ]
STUDY             NSD [  ]  [ ]  [ ]  [ ]             %NSD [ ]  [ ]  [ ]  [ ]
CLASS A        RRTE TO [  ]  [ ]  [ ]  [ ]   CONTROL   %RRT [ ]  [ ]  [ ]  [ ]
             MAN CTLD [  ]  [ ]  [ ]  [ ] ---STATUS---
SIZE [  ]    AUTO CTLD [  ]  [ ]  [ ]  [ ]   DOC  [ ]     HT [ ]  [ ]  [ ]  [ ]
IDLE [  ]       RR ATT [  ]  [ ]  [ ]  [ ]   STR  [ ]   %OCC [ ]  [ ]  [ ]  [ ]
 OOS [  ]       RR SUC [  ]  [ ]  [ ]  [ ]   CANT [ ]
             NTC REC [  ]  [ ]  [ ]  [ ]   CANF [ ]   DOC SEND    TRANSFER TSG
               RR CAR [  ]  [ ]  [ ]  [ ]   SKIP [ ]   AUTO [ ]  REG RR CNTL( )
            NTC SENT [  ]  [ ]  [ ]  [ ]   CRO  [ ]    MAN [ ] CODE RR CNTL( )
                                                             RDB RR CNTL( )
                                                            OUT TSG CNTL( )
                                                             IN TSG CNTL( )
                                                  DIRECTORY[ ]   P[ ]
```

Figure 28. TG9—TSG Trend

9.40 For the detailed calculation, select a TSG from the ranking to be transferred to other display pages for expansion of data. It is also possible to carry a block of TSGs to other displays for further study by designating transfer to the network analysis (TG5) or network trend (TG6) pages.

TG9

9.41 Display page TG9, *TSG Trend* (Figure 28), provides the ability to trend numerous performance indicators and control counts for a single TSG. There are two ways to access the display: 1) directly by manual input of the CIN for the desired TSG or 2) it can be accessed by transfer from one of several other displays. Based on the user's selection, the display trends hourly data in 15-minute increments or 15-minute data in 5-minute increments. You can transfer the CIN displayed on the TG9 page to the outgoing TSG control display (CN02) or to the incoming TSG control display (CN03). This allows for further study of the data.

EF - Control Affects Display Pages

A. General

9.42 The entry form (EF) package allows a network manager to modify (that is, DISPLAY, DELETE, INSERT, or REPLACE) the domestic and international networks. (Sample display - Figure 29)

```
EF13 STORED NETWORKS MODIFICATION    DATA TIME                    SEND AT
+-------------------------------------------------------------------------+
 EDIT OPTIONS |                            NETWORK NAME
              |    NETWORK
(  )  DISPLAY | INDEX   NAMES    ELT   BTFN TOWN ST BL FBS NBS      ALIAS
(  )  DELETE  | <  > <        >       <                        >  <         >
(  )  INSERT  | <  > <        >       <                        >  <         >
(  )  REPLACE | <  > <        >       <                        >  <         >
______________| <  > <        >       <                        >  <         >
 LIST SPECS   | <  > <        >       <                        >  <         >
 TG<  > PAGE  | <  > <        >       <                        >  <         >
 NAMES (  )   | <  > <        >       <                        >  <         >
 NETWORK <  > | <  > <        >       <                        >  <         >
______________| <  > <        >       <                        >  <         >
 EDIT SPECS   | <  > <        >       <                        >  <         >
 FIRST/       | <  > <        >       <                        >  <         >
 AFTER    <  >| <  > <        >       <                        >  <         >
 # OF     <  >| <  > <        >       <                        >  <         >
 ELEMENTS     | <  > <        >       <                        >  <         >
______________| <  > <        >       <                        >  <         >
              | <  > <        >       <                        >  <         >
              |
              |
              |             LIST SIZE
              |
+-------------------------------------------------------------------------+
```

Figure 29. EF13—Stored Networks Modification

B. Sample EF Display Page

9.43 Display package EF13, *Stored Networks Modification* (Figure 29), has been selected as an example of the format and type of information found in the EF package.

9.44 EF13 has three areas that contain input information required to do list editing. The first area is the EDIT OPTIONS field. This area defines the edit operations that can be performed: DISPLAY, DELETE, INSERT, or REPLACE. The second area, LIST SPECS, allows you to display TG03, TG04, TG13, and TG14, *Network Names & Indices*. The third area, EDIT SPECS, is used in conjunction with the EDIT OPTIONS. Whatever edit option you select is performed on the EDIT SPECS elements.

10. Functions of Network Management Printer

10.01 The NMPR, known as the system printer, is a device available for obtaining a hard copy (printout) of the occurrence of certain events for record purposes. The NMPR functions as an alerting device for notifying network management personnel when certain preset thresholds have been met or exceeded in the call processing cycle. It is independent of the NMDTs that serve as a device for investigating or controlling potential problem areas.

10.02 Messages are output by the NMPR in the following priority: manual control messages, automatic control messages, and all other network management messages. All printouts contain the following information:

- Message output time (abbreviated format)
- Identification (event name)
- Data
- Message load time (date and hour)

Audit Reports

10.03 The 4ESS switch conducts system audits, and when failures are found, messages are output on printers located in the MOC area. For failures encountered on audits conducted on network management data, a printout is also output on the NMPR.

Trap Reports

10.04 If the NMPR configuration includes a CRT screen and keyboard, the NMPR can be used to access the data base for trapping network management data. The trapping function in the 4ESS switch is similar to the reorder trap in other switching machines. The trapping capabilities provided for network management personnel are the same as those provided to the maintenance forces. However, network management personnel only use the trapping approach when other methods of analysis (for example, NMDS) cannot be used or do not serve the need.

10.05 The basic purpose of the trapping function is to detect occurrences of a specified event. For network management data, traps consist of three types:

- Office data dumping trap
- TSG data dumping trap
- TSG call irregularities counting trap

A. Office Data Dumping Trap

10.06 The office data dumping trap can be used to detect IMAs. To use the trap, it is necessary to specify the type of IMA to be trapped, the sampling rate, and the time to start and stop the trapping operation. A trap can run for as little as 1 minute or as long as 1 hour. Table F lists the inputs required for setting the office data dumping trap and the outputs that are received.

10.07 Some output is available for every trapped call. Each line of the printout shows the time of day, the type of occurrence, and the incoming TSG on which the call was trapped.

B. TSG Data Dumping Trap

10.08 The TSG data dumping trap collects data for specified TSGs only. The output provides a line of print for each TSG. As many as 31 sets of TSGs, with each set containing six TSGs, can be specified. The input required for this trap is the CIN of the TSG(s), the sample rate, and the turn on and turn off times. The inputs and outputs of the trap are described in Table G.

10.09 This trap is used to aid in the investigation and analysis of the IMAs experienced by the system.

Table F. Office Data Dumping Trap

Inputs	Outputs
1. IMA Type(s) 2. Sample Rate(s)* 3. Time On† 4. Time Off†	1. Per Trapped Call (a) Time of Day (b) IMA Type (c) Incoming Trunk 2. When Available (a) Called Digits (b) Outgoing Trunk (c) Area of Origin (d) Calling Number (e) Maximum Zonal Band (f) Source Rate Band (g) CCS7 Signal Progress (h) CAMA Operator Trunk (i) Digit Receiver (j) CCS7 Terminal (k) Digit Transmitter (l) Signal Link Identity (m) CCS7 Service Circuit

* 1/n, Where n = 1, 2, 4, 8, or 16
† Clock Minute

Table G. Trunk Subgroup Data Dumping Trap

Inputs	Outputs (Note)
1. TSG(s)*	1. Per Trapped Call
2. IMA Type(s)*	(a) Time of Day
3. Sampling Rate†	(b) IMA Type
4. Time On‡	(c) Specified TSG
5. Time Off‡	
	2. When Available
	(a) Called Digits
	(b) Outgoing Trunk
	(c) Area of Origin
	(d) Calling Number
	(e) Maximum Zonal Band
	(f) Source Rate Band
	(g) CCS7 Signal Process
	(h) CAMA Operator Trunk
	(i) Digit Receiver
	(j) CCS7 Terminal
	(k) Digit Transmitter
	(l) Signal Link Identity
	(m) CCS7 Service Circuit

Note:
Depending upon the sampling rate, a report is generated each time the specified call irregularity occurs on a specified TSG.

* Select one or up to six TSGs. A TSG, however, may appear in only one trap at a time.
† 1/n, Where n = 100, 50, 25, 12.5, 6.25
‡ Clock Minute.

C. TSG Call Irregularities Counting Trap

10.10 The TSG call irregularities counting trap provides a count for each IMA on a designated TSG(s). The output presents a line of print for each TSG specified by the trap. Table H lists the inputs and outputs for this trap.

10.11 There are 18 types of IMAs that can be monitored by this trap.

Table H. Trunk Subgroup Call Irregularities Counting Trap

Inputs	Outputs
1. TSG(s)*	1. Time of Day
2. Time Interval†	2. TSG(s) Identification
	3. Count for each of the following IMAs per set of specified TSG(s):
	PST, PDT, PER, FSA, NSD, PDA, ANF, AIF, CST, GLC, CDT, UXS, IKF, CPF, XST, MAB, CFK, GLR

* Select up to 31 sets of TSGs consisting of one to six TSGs each.
† Select a time interval using hours.

11. Miscellaneous

Engineering Considerations

A. Facilities and Equipment

11.01 For effective use of the highly sophisticated controls built into the 4ESS switch, certain equipment and facilities must be provided at both the 4ESS switch and the distant local/toll office. For example, if CCIS/CCS7 links do not exist between offices, appropriate hardware and facilities must be installed (usually telegraph links) to enable the offices to receive and transmit dynamic overload control (DOC) signals.

B. Call Store Requirements

11.02 Tools and devices built into the 4ESS switch also have impact on the memory storage size of the system. The following items should be considered for determining the call store requirements:

- ***Number of Adjunct Trunk Subgroup Head Cells (ASGHC) Needed to Provide Trunk Subgroup (TSG) Control as Well as Data Collection Capabilities:*** The ASGHC is an engineered item and a maximum of 2047 is provided. It is recommended that the maximum number be ordered for a new office.
- ***Quantity of HTR Counter Blocks Required:*** Two counter blocks are provided as standard equipment. As many as six additional blocks can be ordered to provide data for foreign numbering plan areas (NPAs) and central office code (NXX) resolution. Provision of the maximum number of HTR counter blocks is recommended.

Impact of System Phases on Network Management System

11.03 When a phase initialization is triggered, a printout is received. (For offices using exception panels, a lamp in the machine status section of the panel is activated.) No network management data is lost unless you request a zero Call Store or totally reinitialize the data base.

12. Reference Documents

12.01 The following documents contain information related to network management:

Number	Title
234-100-000	*4ESS Switch General Description*, Issue 9 or later
234-101-000	*System Interface Devices - NMC*
TG-4	*4ESS Translation Guide*

12.02 The documents listed in the previous paragraph are stocked in Indianapolis, Indiana, at the Lucent Customer Information Center. Use the appropriate ordering method listed on the first page of this document to order copies.

Abbreviations and Acronyms

13.01 The following is a list of abbreviations and acronyms and their meanings as used in this section. This list also includes the abbreviations that appear on the control and display pages used as examples in this practice.

Term	Definition
AC	Attempts Count
ACH	Attempts per Circuit per Hour
ACK	Acknowledgment
ADL	A&T Digital Link
AIF	Automatic Number Identification Office Failure
ALT	Alternate
ANF	Automatic Number Failure
ANI	Automatic Number Identification
AR	Automatic Routing
ARA	Automatic Reservation Adjustment
ASGHC	Adjunct Trunk Subgroup Head Cell
ASN	AT&T Switched Network
AT	Attempt
ATO	Address Complete Time-Out
BI	Busy/Idle
BLC	Base Level Cycle
BOC	Bell Operating Company
CAMA	Centralized Automatic Message Accounting
CANF	Cancel From
CANT	Cancel To
CBLCL	Cummulative BLC Length
CC	Code Completions
CCH	Connections per Circuit per Hour
CCIS	Common Channel Interoffice Signaling
CCRF	Carrier Completion Rate Feature
CCS	Hundred Called Seconds
CCS7	Common Channel Signaling, System 7
CDT	CAMA Disconnect Time-Out

Term	Definition
CFB	Cancel From Blocked
CFD	Call Fail Detection
CGC	Call-Gapping Control
CGF	Carrier Group Failure
CIC	Carrier Identification Code
CIN	Circuit Identification Name
CKF	Continuity Check Failure
CLD	Customer Long Distance
CLEC	Certified Local Eschange Carrier
CLLI	Common Language Location Identification
CLSS	CCS7 Load and Service Summary (CLSS),
CMC	Cellular Mobile Carrier
CN	Control/Threshold Input
CNI	Common Network Interface
CPE	CAMA Position Error
CPF	Continuity/Polarity Failure
CQA	CCS7 Origination Call Register Queue Abandon
CQO	CCS7 Origination Call Register Queue Overflow
CR	Call Register
CRO	Cancel Reroute Overflow
CRT	Cathode Ray Tube
CSC	Carrier Skip Control
CST	CAMA Seizure Time-Out
CTB	Cancel to Blocked
CTO	Continuity Time-Out
CTR	CAMA Trouble Report
CTRL	Control

Term	Definition
DDD	Direct Distance Dialing
DECOS	Domestic End-to-End Class of Service
DED	Incoming Dial Pulse (DP) Early Digit
DESEP	Destination Separations
DIR	Direct Routed
DNHR	Dynamic Nonhierarchical Routing
DOC	Dynamic Overload Control
DOCTOR	Dynamic Overload Control for Time-Out Relief
DP	Dial Pulse
DQA	DP CR Queue Abandon
DQO	DP CR Queue Overflow
D-SDOC	DNHR-Selective Dynamic Overload Control
DSG	Designate
EA	Emergency Announcement
EADAS/NM	Engineering and Administrative Data Acquisition System/Network Management
ECOS	End-of-Class Service
EF	Entry Form
EIA	Equipment Ineffective Attempt
ERPI	ECOS Routing Pattern Identity
FCA	Fully Coded Addressing
FEN	Far-End Network
FENPA	Far-End Numbering Plan Area
HT	Holding Time
HTR	Hard to Reach
IAD	Incomplete Address
ICCH	Incoming Connections per Circuit per Hour

Term	Definition
IKF	Integrity Check Failure
IMA	Ineffective Machine Attempt
IMS	Interprocess Message Switch
INA	Ineffective Network Attempt
INH	Inhibit
INSEP	Incoming Separation
INWATS	Inward Wide Area Telephone Service
IRR	Immediate Reroute
ISC	International Switching Center
IWF	Incoming DP Work List Full
IWS	INWATS Check Failure
LDR	Load Distribution Reports
LEC	Local Exchange Carrier
LSI	Local Screening Index
LSR	Load Service Reports
LTS	Long-Term Storage
MA	Machine Administrator
MAB	Miscellaneous Abandon
MAC	Machine Administration Center
MACH	Machine
MAS	Mass Announcement System
MC	Machine Congestion
MCA	Misrouted CAMA
MF	Multifrequency
MFR	Multifrequency Receiver
MLSS	Machine Load and Service Summary
MOC	Machine Operations Center
MPR	Machine Performance Reports
MQA	MF Origination Queue Abandon
MSR	Machine Service Reports
MTSO	Mobile Telephone Services Offices
NA	Network Attempt
NC	No Circuit
NCA	No-Circuit Announcement
NCIT	No Circuit Intertoll
NCTC	No Circuit Toll Connect
NEMOS	Network Management Operations System
NHR	Non Hard to Reach
NM	Network Management
NMC	Network Management Center
NMDS	Network Management Display System
NMDT	Network Management Display Terminal
NMPR	Network Management Printer
NOC	Network Operations Center
NPA	Numbering Plan Area
NSD	No-Start Dial
NSPMP	Network Switching Performance Measurements Plans
NTC	National Trunk Congestion
NXX	Central Office Code
ODA	Office Data Assembler
OFL	Overflow
OP	Operator
OQMA	CAMA Operator Queue Abandon
OQO	CAMA Operator Queue Overflow
ORR	Overflow Reroute
OSOR	On-Site Operations Report

Term	Definition
OOS	Out of Service
OVLD	Overload
OWF	DP Outpulsing Word List Full
P	Page
PA	Traffic Pattern
PAS	Public Announcement Service
PCP	Positive Call Processing
PDA	Partial Dial Abandon
PDT	Partial Dial Time-Out
PER	Pulsing Error
PHF	Path Hunt Failure
POTS	Plain Old Telephone Service
PST	Permanent Signal Time-Out
RA	Route Advance
RBOC	Regional Bell Operating Company
RBRR	Rate Based Reroute
RCVD	Received
RDB	Routing Data Block
RNMS	Regional Network Management System
RNOC	Regional Network Operations Center
ROA	Reorder Announcement
ROP	Receive-Only Printer
RQA	Receiver Queue Abandon
SCM	Screening Class Mark
SD	Signal Distributor
SDB	SDOC Blocked
SDN	Software Defined Network
SDOC	Selective Dynamic Overload Control
SDS	Switched Digital Services
SI	Service Identity
SILC	Selective Incoming Load Control
SNF	Signaling Network Failure
SPRR	Spray Reroute
SQH	Sender Queue High
SRB	STR Blocked
SRL	Selective Reservation Level
SSP	Selective Service Protection
SSP	Service Switching Point
SSR	Separations Summary Report
STP	Signal Transfer Point
STR	Selective Trunk Reservation
TARR	Time Activated Reroute
TIRM	Technical Information Resource Management
THL	Threshold
TOT	Type of Trunk
TQA	MF Transmitter Queue Abandon
TQF	MF Transmitter Queue Entry Failure
TRB	Trunk Routing Block
TSG	Trunk Subgroup
TTS	Toll Terminating Switch
UCA	Unauthorized CAMA
UNSP	Unspecified
USDS	Universal Subscriber Data Structure
UXS	Unexpected Stop
VAC	Vacant
VCA	Vacant Code Announcement

Term	Definition
VTS	Via Toll Switch
XB	Crossbar
XST	Expect Stop Time-Out

How Are We Doing?

Document Title: ***4ESS***™ Switch Network Management Operating Guidelines Network Administration

Document No.: 234-101-015 Issue 9 Date: March 1999

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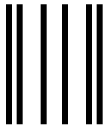

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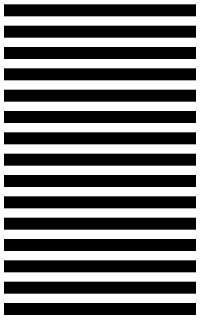

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