NO. 4 ELECTRONIC SWITCHING SYSTEM
NETWORK MANAGEMENT
OPERATING CONSIDERATIONS

CONTENTS PAGE

1. PRECUTOVER CONSIDERATIONS . . . 1
2. AUTOMATIC CONTROLS 3
3. OPERATING CONSIDERATIONS . . . 5
4. OVERALL VIEW 5
5. TRAFFIC SEPARATIONS 6
6. INEFFECTIVE MACHINE ATTEMPTS . . 6
7. COMPLETIONS 6
8. TRUNK SUBGROUP PERFORMANCE . . 7
9. CONTROL EFFECTS 7
10. MACHINE STATUS 7
11. CONTROL PAGES 7
12. SYSTEM PHASES 7

FIGURES

1. Display System 9
2. Traffic Separations 10
3. IMA 11
4. Completions 12
5. TSG Performance 13
6. Control Effects 14

CONTENTS PAGE

7. Machine Status 15
8. Control Pages 16

TABLE

A. ABBREVIATIONS AND ACRONYMS . 17

1. PRECUTOVER CONSIDERATIONS

GENERAL

1.01 Certain items must be addressed prior to the No. 4 Electronic Switching System (ESS) being turned up for service. Three intervals have been identified as being significant; prior to equipment order, prior to office data assembler (ODA), and prior to service date. It is important that hardware requirements be considered prior to the equipment order and a floor plan developed. The type of exception panel, wall mounted or console, and quantity and locations of cathode ray tubes (CRTs) and teletypewriters (TTYs) must be determined.

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

1.03 The title for each figure includes a number(s) in parenthesis which identifies the paragraph(s) in which the figure is referenced.

1.04 The machine administrator (MA) and network manager (NM) have related interest in the NM data base. The MA can use this data to effectively administer the machine. The work load

and organizational structure may dictate that the MA and NM duties are administered by the same person. It is recommended that the NM and MA centers be colocated where practicable.

1.05 To provide adequate control capability for traffic switching into and out of the No. 4 ESS, it may be necessary to provide some equipment at the distant end of selected trunk subgroups (TSGs). The quantities, types, and location of the equipment must be ordered in time to meet the No. 4 ESS schedule. Items to consider are as follows:

- Directional reservation equipment
- Hardware necessary to respond to dynamic overload control (DOC) signals sent by the No. 4 ESS.
- Hardware necessary to transmit DOC signals to the No. 4 ESS.

1.06 If a remote network management control center or EADAS/NM is to be used, the type of exception panel and quantity and location of CRTs and TTYs must be identified.

(a) Facilities will be required to implement automatic controls and remoting of NM operations. These include:

(1) Transmit DOC signals to non-common channel interoffice signaling (CCIS) office

(2) Receive DOC signals from non-CCIS office

(3) DOC acknowledge to and from non-CCIS office

(4) Information to remote exception panel, TTYs, and CRTs.

(b) In the No. 4 ESS location, consideration should be given to the following items:

(1) Telemetry equipment to transmit information to a remote exception panel

(2) Telemetry equipment to transmit and to receive information for remote TTYs and CRTs

(3) Signal processor scan points to recognize DOC signals from a non-CCIS office

(4) Signal processor distributor points to transmit DOC signals to a non-CCIS office.

1.07 A plan should be designed to effectively use the tools available to the NM. The following items will have an impact on the size of call store to be installed.

(1) The number of automatic out-of-chain routing (AOCR) data blocks.

(2) The size of the miscellaneous scanner number (MSN) and miscellaneous distributor number (MDN) translators must include scan and signal distributor point assignments for transmitting and receiving selective dynamic overload control (SDOC) signals.

(3) Adjunct trunk subgroup headcells are needed to provide TSG control capabilities as well as NM data collection. It is recommended that the maximum number be ordered.

(4) The quantity of hard to reach (HTR) counter blocks required. Two counter blocks are provided as standard equipment. A maximum of six more may be ordered, as optional equipment, to provide foreign numbering plan area (NPA) central office code (NXX) resolution. It is recommended that the maximum number be provided.

(5) Memory for creating onsite display pages.

1.08 Information which must be provided to the MA in order to implement NM strategies should be provided prior to the ODA input. These would include traffic separation considerations, AOCR plan, DOC transmit and receive assignments, non-reroutable codes, etc.

1.09 Prior to the service data for the No. 4 ESS, thresholds associated with the NM system should be established. This task should be started between the office data assembler (ODA) input and the service date. The parameter, which number more than 100, cannot be input until the CRT system is in service. However, due to the variety of parameters to be established, it is recommended that planning be initiated as soon as available data allows.

1.10 Some No. 4 ESS machines will be installed in the network as hi-volume tandems. In this case, the following strategies should be considered in the deployment of NM controls within its home area and in distant areas being served.

(a) ***Directional Reservation Equipment:*** The directional reservation equipment (DRE) should be installed on each 2-way final intertoll (IT) and toll connect (TC) TSG from subtending offices within the home area. A DRE unit should be provided for each subgroup of 40 trunks. Consideration to the type of traffic, peak day, business, etc, should be given in this requirement.

(b) ***Selective Dynamic Overload Control Within the Home NPA:*** The SDOC should be arranged to (1) ***cancel to*** or (2) ***trunk make busy*** at subtending offices. These controls to be activated upon MC1 threshold. The SDOC should be deployed at subtending offices to the extent that its operation will affect at least 40 percent of originating attempts. At subtending electronics translation system (ETS) and No. 1 ESS offices, receipt of SDOC should cause 75 percent ***cancel to*** of direct and alternate routed traffic. At card translator, crossbar tandem (XBT), and No. 5 crossbar offices, receipt of SDOC should ***trunk make busy*** 75 percent of trunks in TSGs to the No. 4 ESS. All hi-usage TSGs receiving SDOC commands should also cancel alternate routes.

(c) ***Selective Dynamic Overload Control Distant NPAs:*** Consideration should be given to transmitting the MC2 SDOC signal to distant switching systems having 200 (equivalent) 2-way trunks to the No. 4 ESS. Where there are several machines within one NPA following in this category, a single channel may be used to send MC2 to several offices. At the receive end (distant switcher), receipt of the MC2 signal should do the following:

At ETS offices—75 percent ***cancel to*** of direct and alternate routed traffic.

At card translator—75 percent ***trunk make busy.***

Where the TSG to the No. 4 ESS is a hi-usage, the alternate route should be cancelled. It may be desirable to apply MC2 control to offices with less than 200 equivalent trunks, if that office's group also serves as the alternate route for a large quantity of less than 200 circuit, noncontrolled hi-usage TSGs.

(d) ***Dynamic Overload Control from Distant NPAs:*** The internal features of a No. 4 ESS may be utilized to enhance network efficiency when a distant switcher gets into congestion. It is proposed that distant switchers with 200 or more equivalent 2-way trunks to the No. 4 ESS be equipped to transmit a DOC signal when that office (distant switcher) is in overload. The signal may be triggered by sender queue low (SQL) or sender queue high (SQH). The triggering condition should be determined for each office, depending on type of controls, trunking configuration, etc. Upon receipt of a DOC signal from a distant switcher, the No. 4 ESS should be arranged to do one or more of the following.

Cancel to control of 100 percent of alternate routed calls to NXXs on HTR list.

Cancel to control of either 50 percent or 100 percent of first routed calls to NXXs on HTR list.

The strategy for each office will have to be considered separately along with the SQL/SQH decision. However, preference should always be given to controls on HTR traffic as this type of control gives greatest overall network efficiency.

2. AUTOMATIC CONTROLS

2.01 The NM will be concerned with making decisions relating to automatic control assignment to TSGs. Prior to the cutover date, the NM should study the network of the No. 4 ESS. A plan should be developed which provides an effective way of insuring maximum call completion. The NM must look at each type of TSG and determine certain items relating to the automatic control system.

2.02 ***Selective Trunk Reservation (STR)***

Decision 1:

(a) Permanent assignment (normally on)

(b) No permanent assignment (normally off).

Decision 2:

(a) Skip option

(b) Cancel option.

If SDOC is assigned to the same TSG or STR, the same option must be specified for both.

Decision 3:

(a) Set SRL-1 to ____

(b) Set SRL-2 to ____.

Decision 4:

(a) Set unspecified FRT to ____ percent.

The STR can be implemented at the No. 4 ESS with no requirement for equipment at the far end of the TSG. This control when activated on a one-way out TSG will control traffic accessing the TSG. On a 2-way TSG, the STR reduces the pressure at the No. 4 ESS which may tend to give preference to traffic accessing the TSG from the far end. The NM should give consideration to the type of traffic to be controlled when selecting the options of control capabilities available with STR. DFMP, Division H, Section 9i(1), Table D describes the class and amount of traffic affected as each threshold is surpassed. If a connecting machine has STR capabilities, consideration should be given to coordinating STR implementation at both ends of a TSG which connect to that machine.

2.03 ***Selective Dynamic Overload Control (SDOC)***

Non-CCIS (up to 16 receive TSGs)

Decision 1:

(a) Permanent assignment

(b) No permanent assignment.

Decision 2:

(a) Skip option

(b) Cancel option.

Decision 3:

(a) Set MC1 unspecified alternate routed to ____ percent

(b) Set MC2 unspecified alternate routed to ____ percent

(c) Set MC2 unspecified first routed to ____ percent.

Decision 4:

(a) Equip for MC1 only

(b) Equip for MC2 only

(c) Equip for MC1 and MC2.

Decision 5: Transmit SDOC (up to 64 TSGs)

(a) Permanent assignment

(b) No permanent assignment.

2.04 ***Automatic Out-of-Chain Routing (AOCR)***

Decision 1: (per RDB)

(a) Assign an AOCRDB

(b) No assignment of AOCRDB.

Decision 2: (assuming AOCRDB assigned)

(a) TSG ____ will be assigned to AOCRDB.

Decision 3: (for assigned TSGs)

(a) Normally enabled

(b) Normally inhibited.

The AOCR can be a powerful tool in providing expansive controls. Reroutes can be established prior to need by using AOCR. The reroute TSG can be specified in the Automatic out of chain routing data block (AOCRDB) and left in an inhibited state. When the reroute is required, the reroute TSG could be enabled. At that time,

overflow traffic would be rerouted onto the TSG.

An advantage to using AOCR is that the system automatically monitors the TSG. When the TSG goes no circuit available (NC) or a SDOC signal is received for that TSG, the AOCR is turned off for a period of 5 to 10 minutes and a lamp on the exception panel is activated.

The normal administrative functions required to establish a manual reroute would be the same. The NM will not activate the AOCR until concurrence has been obtained from the VIA office. Administrative procedures are provided in Traffic Practice 41, Section II, Appendix B.

2.05 ***Hard to Reach (HTR)***

(Control list—INA only)

Decision 1: (FNPA, HNXX, FNXX)

(a) Set AC to ____ (3 values)

(b) Set Δ to ____ (1 value).

Decision 2: (FNPA, HNXX, FNXX)

(a) Set FC (percent) to ____(3 values)

(b) Set Δ FC to ____(1 value).

Decision 3:

(a) Assign FNPA ____ to NXX resolution.

3. OPERATING CONSIDERATIONS

3.01 The No. 4 ESS provides the NM with new tools which provide the means to more effectively administer the network. This section provides a basic view of the use of the display packages. Diagrams are used to indicate a basic strategy for proceeding through each display package.

3.02 It should be understood that at any given point in the diagrams, the NM may decide to transfer to some other display package or to the control pages for control implementation. As experience with these packages increases, the NM will develop an individual style in utilizing the displays to investigate troubles. Under certain conditions, the NM may by-pass the summary page in a package and proceed directly to the page which contains the required information. Ease in transferring from one display to another is provided by the transfer section at the bottom of each page.

3.03 The circles used in the diagrams are intended to indicate points at which the NM must decide, based on the information at hand, what display page should be called up.

3.04 The exception panel is the alerting system which informs the NM of a situation other than normal. The CRT display system provides information which permits the NM to identify the problem. The six basic display packages have a distinct relationship to certain sections or groups of lamps on the exception panel:

Traffic Pattern Section	— Traffic Seps Display
IMA Lamps	— IMA Display
Ineffective Lamps	— Completions Displays
TSG Perform Section	— TSG Perform Displays
Network Controls Section	— Control Effects
Machine Status Section	— Machine Status Displays

This arrangement provides a means to readily identify the display package required to investigate an exception reported by the exception panel.

3.05 Throughout the NM system when calculations are performed, the resultant figures are never rounded up to the next number, ie, 90.9 = 90, etc.

4. OVERALL VIEW

4.01 The chart in Fig. 1 indicates the general flow in proceeding through the NM display system.

4.02 The exception panel alerts the NM to some significant occurrence. The NM will use the display system to obtain data relevant to the indicated situation.

4.03 Parameters associated with the exception panel are established by the NM. In some cases, exceeding a threshold will indicate that the NM should closely monitor certain data. In other cases, surpassing of a threshold will require the NM to implement some type of control action.

4.04 To investigate a problem, the NM will determine which display package contains the required information. The next step is to call up the directory page to access the desired package.

4.05 Figures 2 through 8 show the basic structure of these display packages.

5. TRAFFIC SEPARATIONS

5.01 Figure 2 provides a diagram of the page grouping in this package. These pages will identify the reason for onset of lamps in the traffic pattern area of the exception panel.

5.02 The pages are grouped into two distinct subgroups (incoming and outgoing). The separations summary can serve to determine the course of subsequent investigations. This page may indicate a problem connected with incoming categories, in this case the NM will proceed down the left branch of the displays to identify TSGs per INSEP which are contributing to the exception. If an outgoing problem is indicated, the NM will proceed through the displays in the right branch.

5.03 As an example, suppose that inspection of the separations summary indicates that one or more of the incoming categories is contributing an unusually large portion of traffic. The objective is to identify and evaluate the TSGs that are involved. The first step is to identify a single INSEP class. This can be accomplished using either the traffic origins analysis or the single DESEP analysis displays. When the single INSEP has been identified, the NM can employ the TSGs per INSEP display to identify the TSGs associated with the INSEP. Dynamic and static data for the TSGs is provided.

5.04 A similar procedure is used to identify an outgoing problem. The CELL monitor display enables the NM to monitor trends, by intervals of 15 minutes, for the data of individual cells that appear to be of interest.

INEFFECTIVE MACHINE ATTEMPTS

6.01 Using the chart in Fig. 3, the NM will identify ineffective machine attempts (IMAs) which are affecting traffic in the No. 4 ESS.

6.02 Using the overview page, the NM will determine what types of IMAs caused lamps on the exception panel to be onset. After this determination is made, the NM will access one of seven pages illustrated in the diagram. These pages give the NM a breakdown of the percentages and exceptions associated with each type of IMA.

6.03 From any of these seven pages, the NM will decide what further information is required. This information may be obtained from other pages in this package or other display packages. As an example, the NM can determine the types of TSGs being affected by a specific type of IMA. The NM could then consider controls which would enhance completion on these TSGs.

7. COMPLETIONS

7.01 The completions package is a set of eleven pages designed to permit investigation of code completion data for 3- and 6-digit destination codes. Some displays have broad coverage showing exception information for the entire switching network or a region of the network. Other displays provide greater detail about some limited set of destination codes (those within a single NPA area). These analytic displays let the NM combine both code and TSG data to locate specific points of call blockage within an NPA area.

7.02 The illustration in Fig. 4 indicates the relationship of the display pages to the completion lamps on the exception panel. The diagram indicates those pages which are directly related to the group of lamps in the completion section. As an example; suppose a lamp in the home ineffective network attempt (INA) group is lighted. This indicates that one or more NXXs in the home NPA has exceeded the related threshold. To identify the problem area, the NM would call up the ***ordered NXX inventory*** display. This provides a list of NXX codes by percent INA. After identifying the codes involved, the NM would transfer to the ***routing analysis*** display to identify the problem area in the network. The decision must then be made as to what action is required.

8. TRUNK SUBGROUP PERFORMANCE

8.01 The onset of lamps in the TSG performance area of the exception panel can be explained using these displays. The diagram in Fig. 5 represents the display grouping in the TSG performance package.

8.02 The two displays above the heavy black line will provide information to identify conditions which have caused the lamps to be onset. These two displays are basically the same type. The by degree display contains data from the 5-minute data base. This will indicate all TSGs which have an adjunct assigned. The by degree 15 minute display uses data from the 15-minute data base. This display provides percent IN and percent OUT equipment ineffective attempt (EIA) counts, holding time (HT), and percent occupancy which are not available in the 5-minute data base.

8.03 The displays listed below the heavy dark lines will be used when the NM requires more detailed information. Included are displays which the NM inputs site specific data to permit close suveillance of the network or some portion of the network.

8.04 As an example; suppose a no start dial (NSD) lamp was activated in the second row of the TSG performance area. The NM would access the control TSGs by degree (05 minutes) display. After designating study class 2, which is indicated by the lamp in the second row being lighted, and percent NSD along with a time interval, the 16 TSGs with the largest percent NSD will be presented. From these TSGs the NM would designate a particular TSG and detailed information would be presented on the right-hand side of the page. With this situation the NM can identify a problem with the use of only one page. This same procedure could be used replacing the ***by degree 05*** display with the ***by degree 15*** display. If the NM required information related to HT or percent occupancy, the ***by degree 15*** display would be accessed.

9. CONTROL EFFECTS

9.01 The diagram for control effects is illustrated in Fig. 6. By calling up the control summary page, the NM is provided with an overall view of the controls currently in effect. As a supplement to this page, the NM can ascertain those controls which are available to be implemented. At this point, the NM will decide what type of information is required. This could be data relevant to manual reroutes, subgroup controls, etc.

9.02 By accessing the RDB display, the NM can monitor control effects on traffic to a particular destination.

9.03 If there is doubt, the subgroup controls page should be reviewed prior to implementing a control on a TSG.

10. MACHINE STATUS

10.01 The machine status display package is illustrated in Fig. 7. The NM will access the summary page to obtain counts relative to the items displayed in the machine status section of the exception panel. From this data the NM will identify the problem area.

10.02 The NM will then access one of six other pages for more information. More than one of the six pages may be involved and the NM will determine the order in proceeding through this package.

11. CONTROL PAGES

11.01 The diagram for the control pages is illustrated in Fig. 8. When the NM determines that control action is required these pages will be accessed. The NM will determine what operations are to be performed and the appropriate page to be called up.

11.02 The selective code reroute page combines functions of the code block/HTR pages and outgoing trunk page to assist the NM in implementing controls which would require many transfers between these two pages.

12. SYSTEM PHASES

12.01 System reinitialization is indicated in the machine status section of the exception panel. The phase 4 will affect the NM system data. When a phase 4 occurs, all NM data which is not on disk memory will be lost. Threshold information is on disk and will be retained.

12.02 When the phase 4 is terminated, the system will restore the adjunct trunk subgroup headcell (ASGHC) and control status to the state

prior to the phase. For the Chicago 7 installation, the code block control status will not be restored; however, code blocks will be restored for the Kansas City machine.

Inhibits which were on TSGs, to deny AOCR, will be returned to their status prior to the phase. Three items will not be restored. The NM will be required to manually input the following:

- Manual HTR designations
- HTR override designations
- Manual SDOC designations.

12.03 A phase 4 will extinguish all lamps on the exception panel except the phase 4 indicator in the machine status section. At the completion of the phase, event lamps will be restored. Lamps with 30-seconds, 5-minutes, or 15-minutes update intervals will not be restored until the next update interval.

12.04 A key operation at the maintenance operating center (MOC) can zero all NM thresholds. There may be an occasion when this will be necessary. If this situation arises, the system will not restore the threshold values. The NM will be required to manually re-enter the threshold values. It would appear prudent for the NM to retain a hard copy of current threshold values.

12.05 The condition may arise where the system data and thresholds are lost. To recover from this situation, the CRT system will have to be reinitialized using the NM data tape before the threshold values can be input.

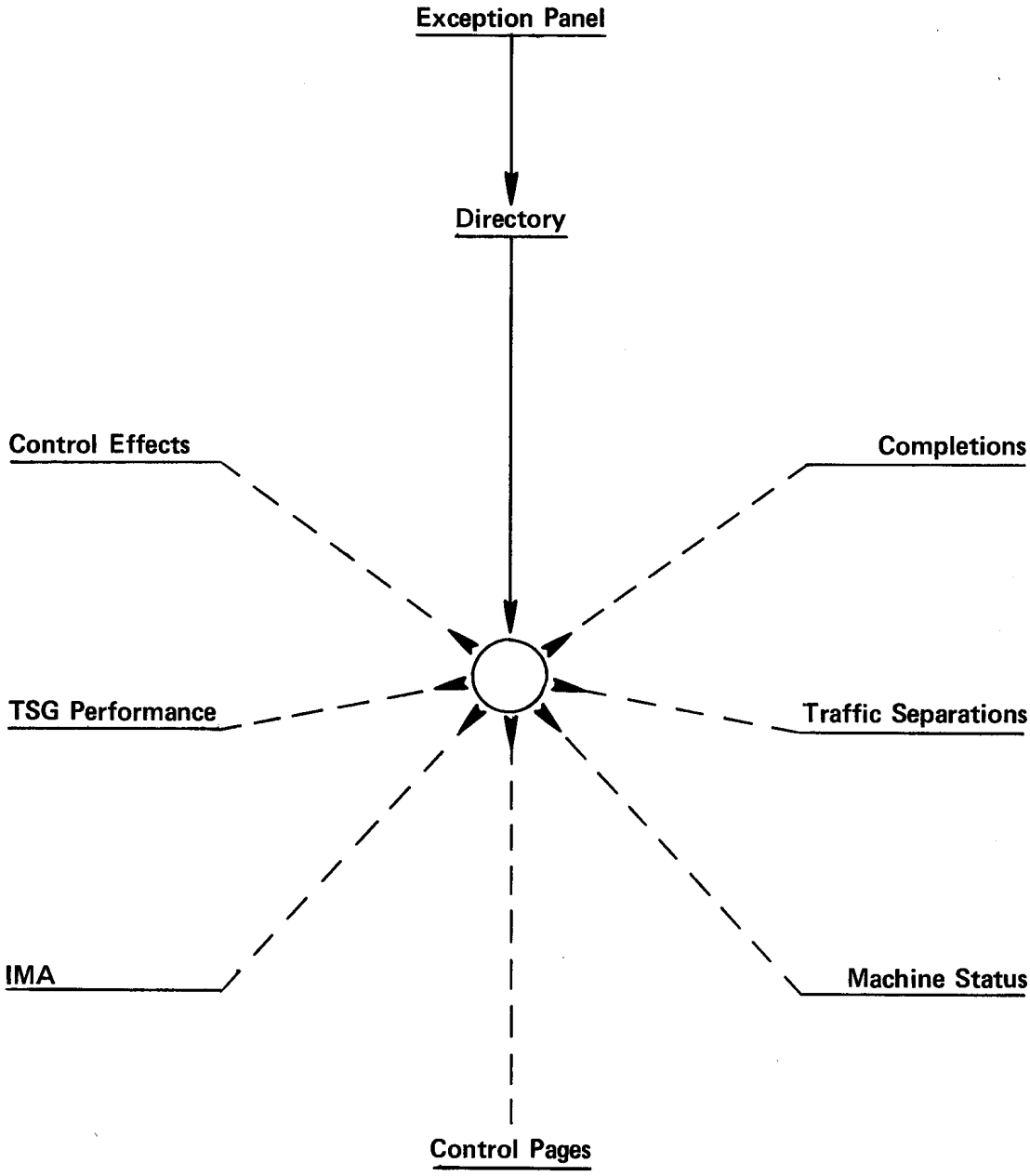

Fig. 1—Display System (4.01)

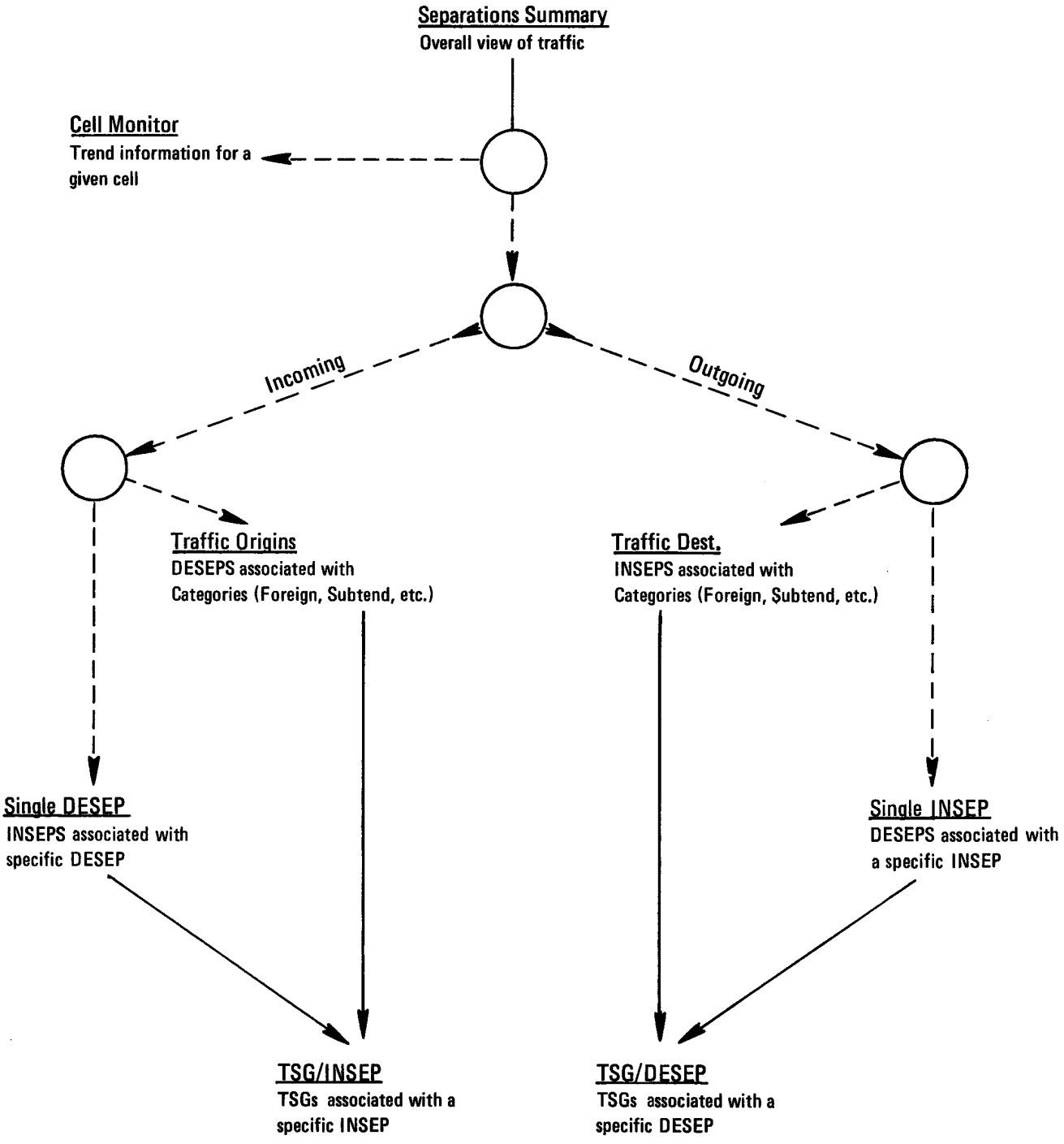

Fig. 2—Traffic Separations (4.05, 5.01)

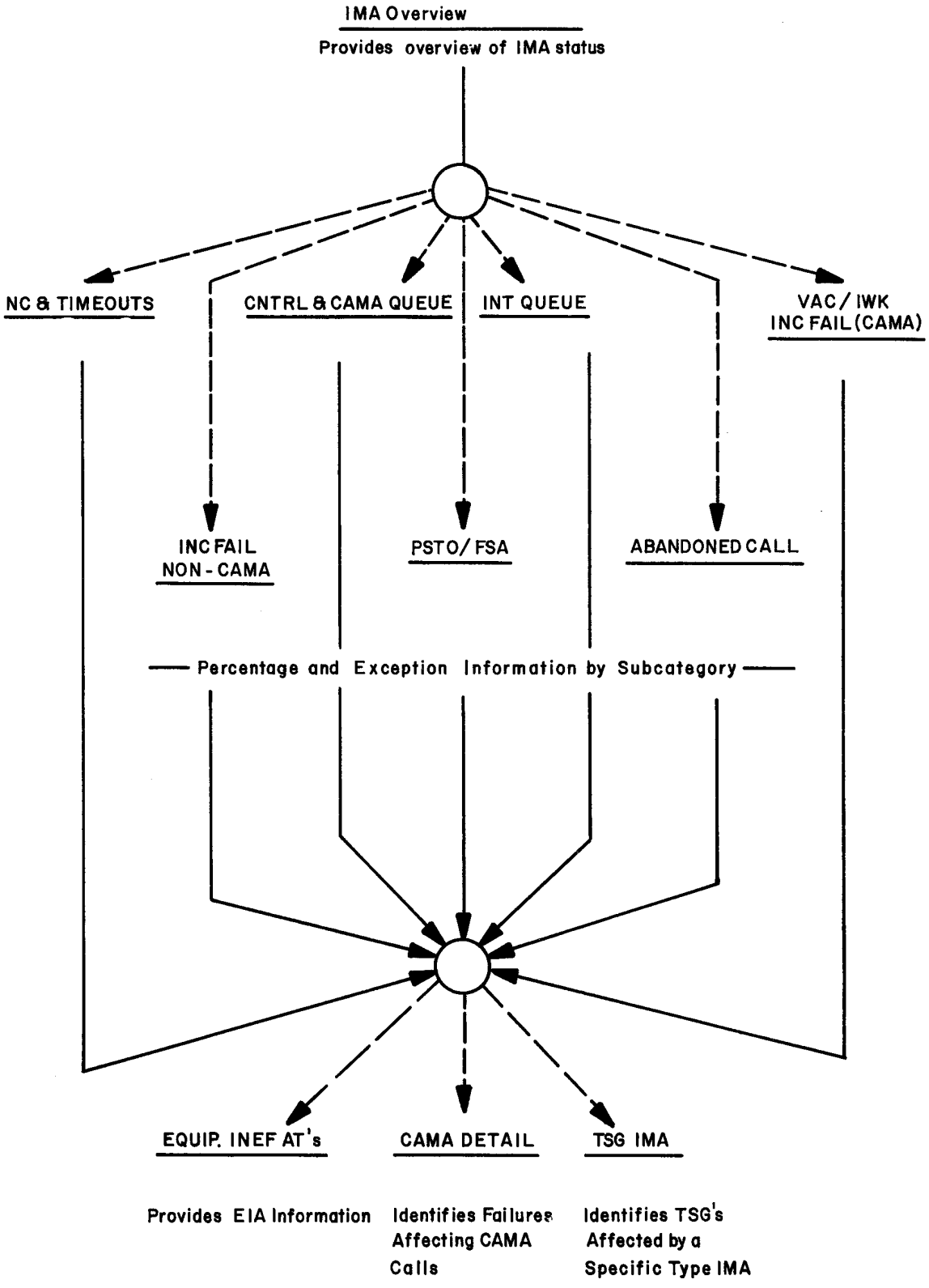

Fig. 3—IMA (4.05, 6.01)

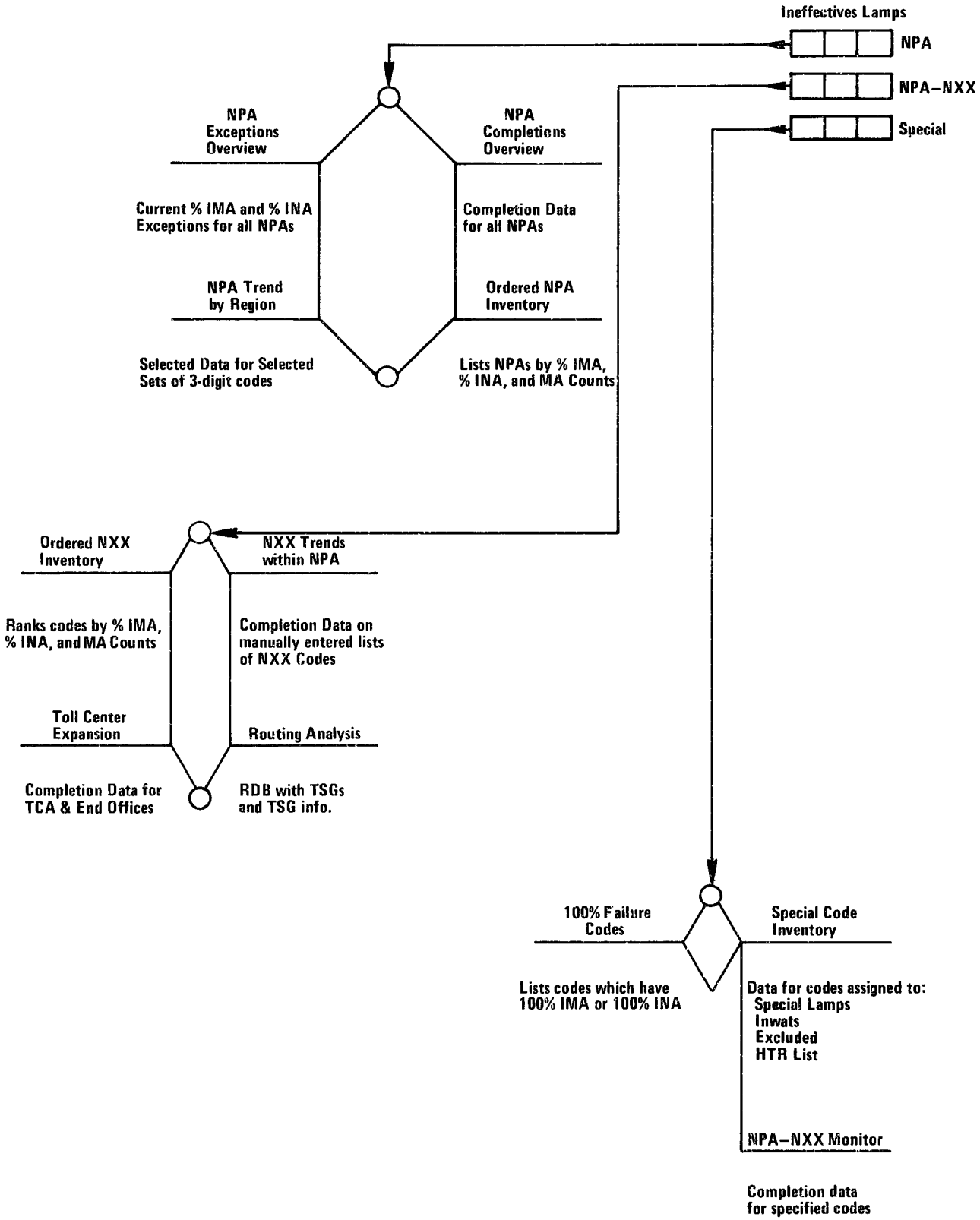

Fig. 4—Completions (4.05, 7.02)

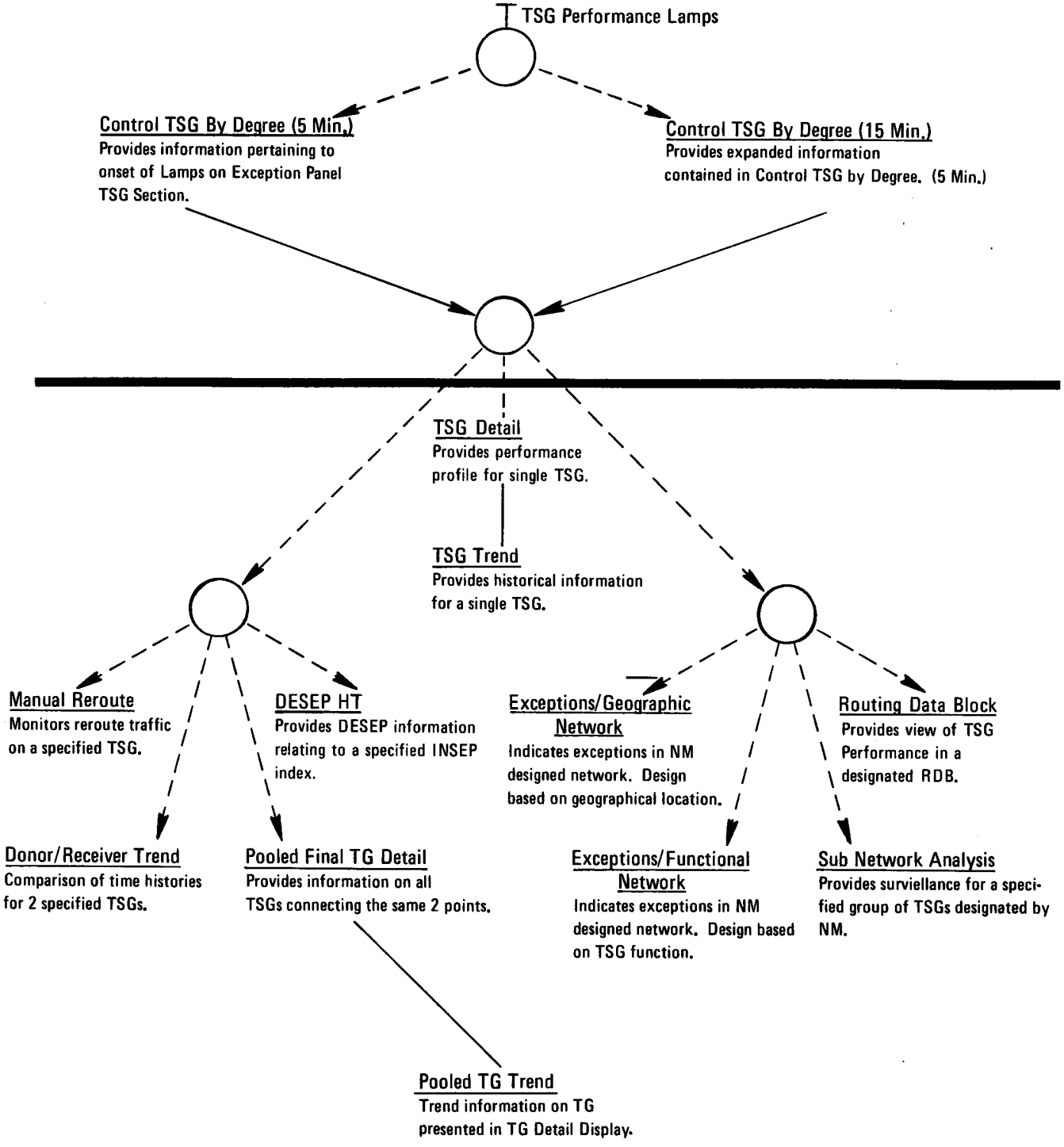

Fig. 5—TSG Performance (4.05, 8.01)

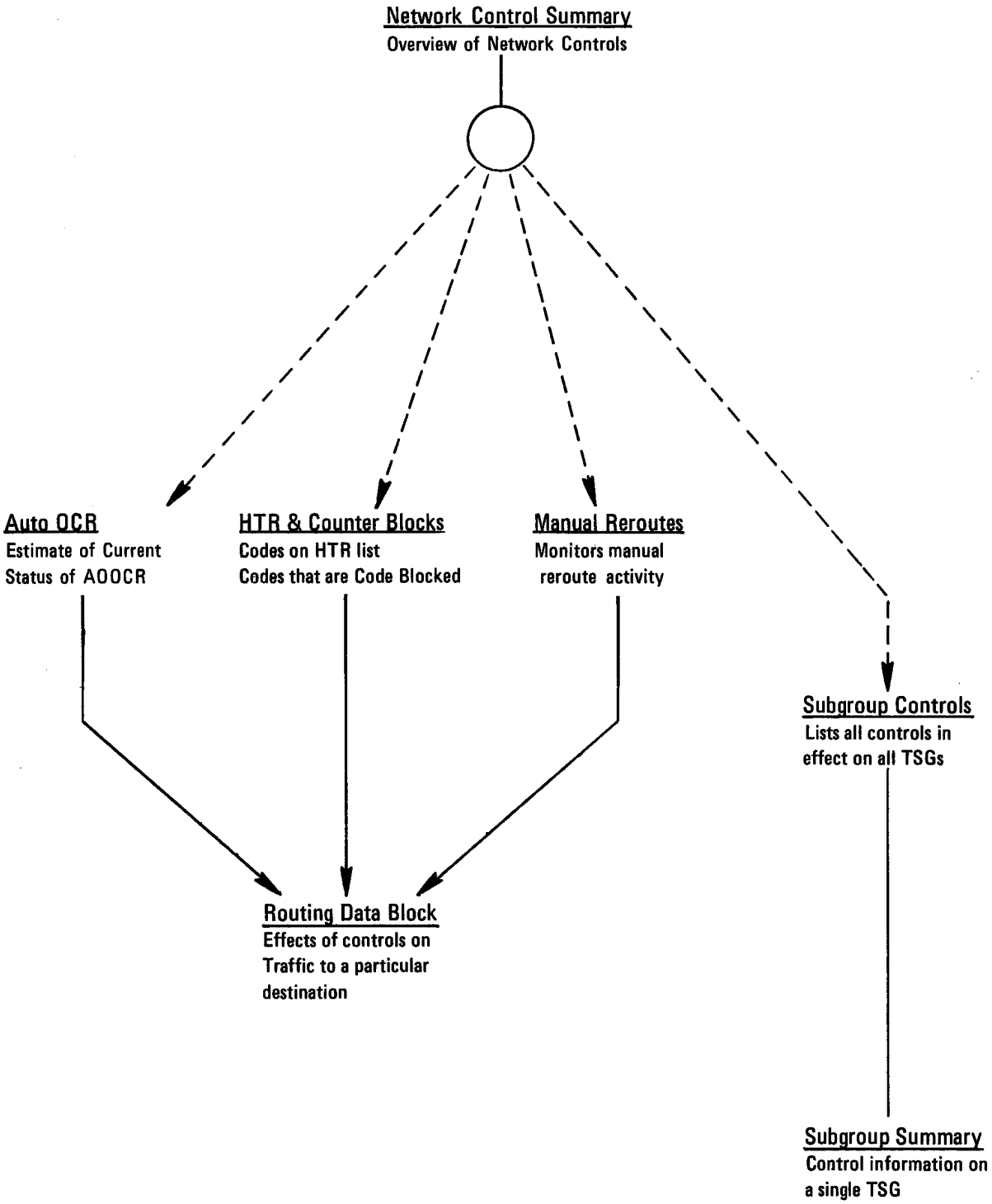

Fig. 6—Control Effects (4.05, 9.01)

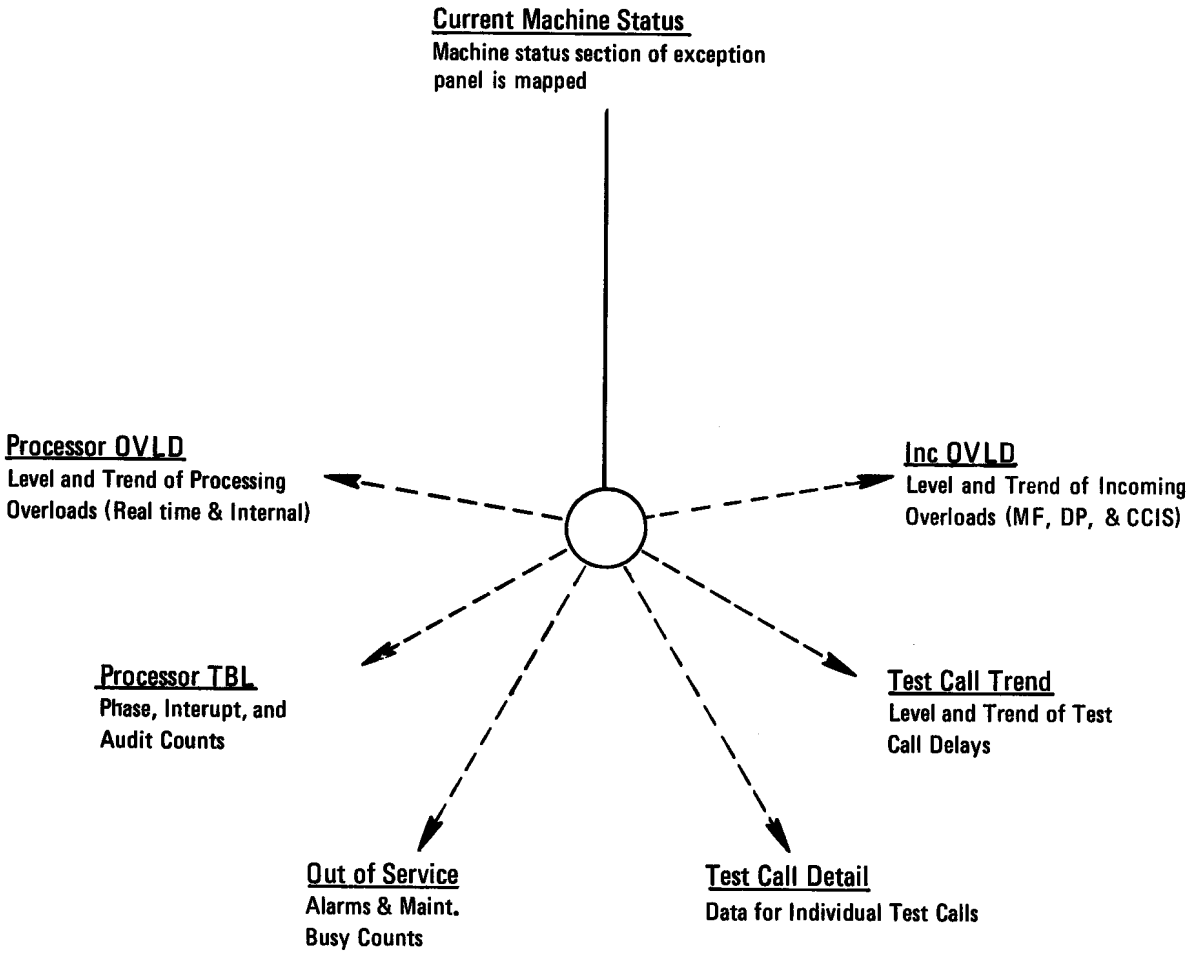

Fig. 7—Machine Status (4.05, 10.01)

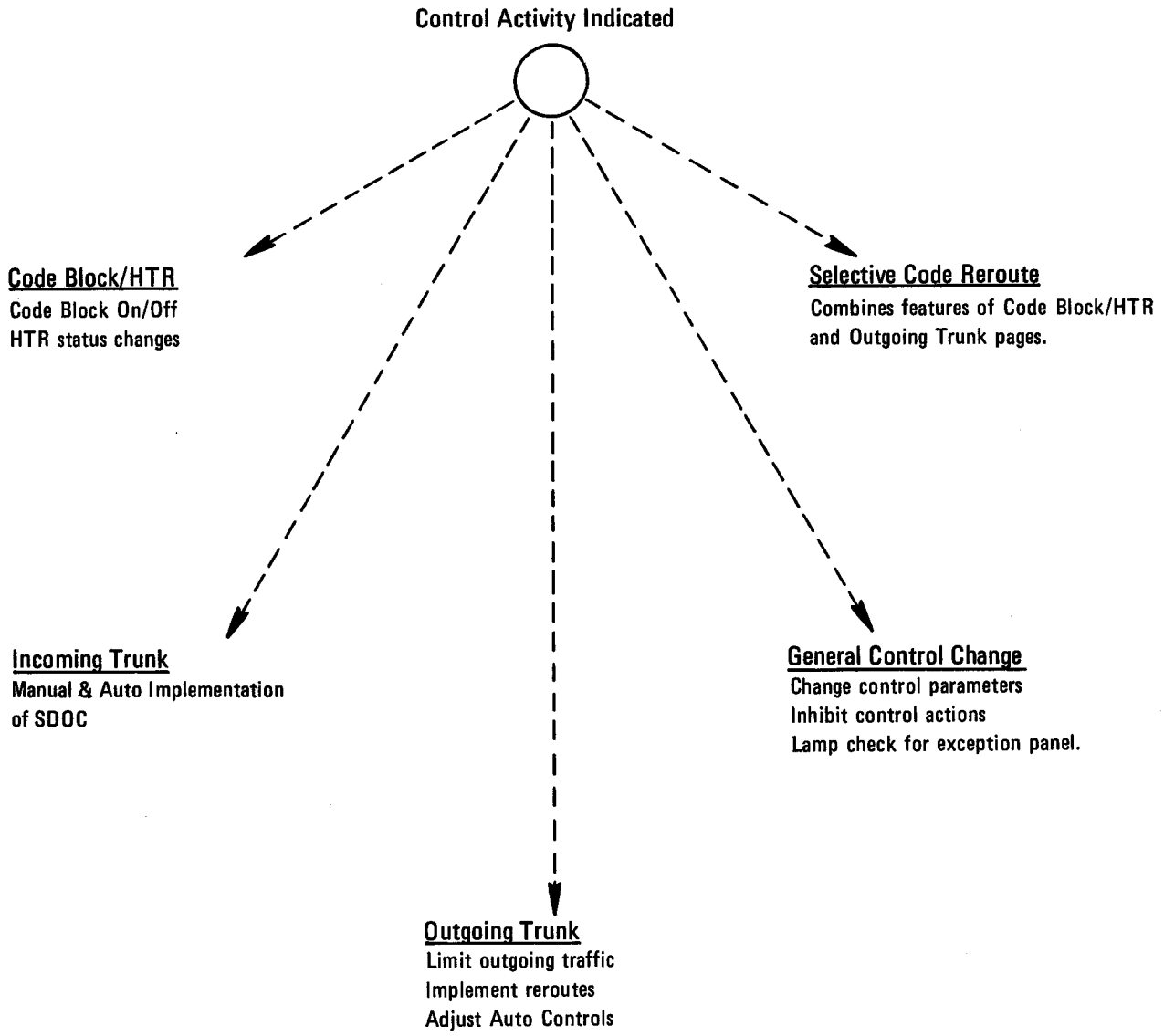

Fig. 8—Control Pages (4.05, 11.01)

TABLE A

ABBREVIATIONS AND ACRONYMS

ABBREVIATION	TITLE
ACH	Attempts per Circuit per Hour
ANI	Automatic Number Identification
ANF	Automatic Number Failure
AOC	Automatic Out of Chain
AOCR	Automatic Out of Chain Routing
AOCRDB	Automatic Out of Chain Routing Data Block
ASGHC	Adjunct Trunk Subgroup Headcell
CAMA	Centralized Automatic Message Accounting
CCH	Connections per Circuit per Hour
CCIS	Common Channel Interoffice Signaling
CRT	Cathode Ray Tube
DESEP	Destination Separation
DOC	Dynamic Overload Control
DP	Dial Pulse
DRE	Direction Reservation Equipment
EADAS	Engineering and Administration Data Acquisition System
EIA	Equipment Ineffective Attempt
ESS	Electronic Switching System
ETS	Electronics Translation System
FNPA	Foreign Numbering Plan Area
HT	Holding Time
HTR	Hard To Reach
IMA	Ineffective Machine Attempts
INA	Ineffective Network Attempts
INC	Incoming
INSEP	Incoming Separation
IT	Intertoll
MA	Machine Administrator
MAC	Maintenance Administration Control
MDN	Miscellaneous Distributor Number
MF	Multifrequency
MOC	Maintenance Operating Center

TABLE A (Cont)

ABBREVIATIONS AND ACRONYMS

ABBREVIATION	TITLE
MSN	Miscellaneous Scanner Number
MTCE	Maintenance
NC	No Circuit Available
NM	Network Manager
NPA	Numbering Plan Area
NSA	No Start Dial
NXX	Central Office Code
OC	Out of Chain
ODA	Office Data Assembler
OFL	Overflow
OOS	Out of Service
PC	Peg Count
RADR	Receiver Attachment Delay Report
RDB	Routing Data Block
SADR	Sender Attachment Delay Recorder
SDOC	Selective Dynamic Overload Control
SICO	Software Integrity Control
SQH	Sender Queue High
SQL	Sender Queue Low
STR	Selective Trunk Reservation
TC	Toll Connect
TSG	Trunk Subgroup
TTY	Teletypewriter
XBT	Crossbar Tandem
XCVR	Transeciver