

**MECHANIZED AIDS TO MANAGEMENT
ENGINEERING AND ADMINISTRATION DATA
ACQUISITION SYSTEM/NETWORK MANAGEMENT
SYSTEM DESCRIPTION**

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NOTICE

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1. GENERAL

1.01 This section describes the computerized system Engineering and Administration Data Acquisition System/Network Management (EADAS/NM). This system is the second phase of the EADAS development and employs the traffic data gathered by EADAS central control units and 4A Electronic Translator Systems—Peripheral Bus Computers (4A ETS-PBC) to provide centralized, real-time network management surveillance and control capabilities.

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

1.03 References in this section to methods, planning, data requirements, service levels, and equipment quantities are based on American Telephone and Telegraph Company recommendations.

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

1.05 The network design order is the basic source document for the preparation of Western Electric Company EADAS/NM Questionnaire Form E-8125, which is used for ordering EADAS/NM equipment (including quantities, features, and options). The questionnaire is comprised of two parts. Part 1 is for central control unit equipment and software, and Part 2 pertains to the network exception display board. Accordingly, the questionnaire format is recommended as a guide for the network design engineer to furnish the information that is to be included in the network design order.

2. SYSTEM DESCRIPTION**GENERAL**

2.01 EADAS/NM is a computerized system which allows centralized, real-time surveillance and control of all levels of the switching hierarchy, from regional centers to selected end offices, within predefined segments of the network. EADAS/NM monitors the status of switching machines and trunk group functions and reports immediately when potential congestion is imminent. This is

accomplished by analyzing traffic data as it is being gathered from all types of switching machines via EADAS or directly from 4A ETS-PBC machines. This provides a more effective and more responsive network management capability to maintain the switching efficiency of the network. See Fig. 1 for the Total Network Data System (TNDS) and Fig. 2 for EADAS/NM generalized arrangements.

2.02 Similar to EADAS, EADAS/NM employs a minicomputer and peripherals which provide the following features:

(a) Real-time surveillance of switching machine and trunk group interaction. This function is accomplished by performing calculations at 5-minute intervals on the most recently acquired traffic data; analyzing the status of selected discrettes (off/on status conditions) and alarms; and then reporting specific exceptions to the network manager for possible action.

(b) A network exception display system, which is driven by the computer when user-defined thresholds have been exceeded in the 5-minute data and by the status of selected discrettes and alarms. This display system includes receive-only printers (ROPs), cathode-ray tube (CRT) terminal devices, and a modular network exception display board.

(c) Centralized, remote network management control capability is provided via the interactive mode of the CRTs. This capability enables the network manager to institute expansive or protective, preplanned controls quickly when required to maintain and protect the call carrying capacity of the network.

(d) The Inter-EADAS Communications System which is a computerized arrangement for transferring selected exception data among EADAS/NM centers. This predefined data will be transmitted to the data transfer point for processing and retransmission to EADAS/NM centers related to the exceptions. Computer connection is accomplished via an 1800-baud data link from the EADAS/NM computer to the data transfer point computer.

(e) Centralized surveillance will be available at the network operations center (NOC). The NOC is a computerized system arranged to receive and process exception data from the Inter-EADAS

Communications System. It functions as the coordinating center for the entire North American Network.

2.03 EADAS/NM builds upon the traffic data collection capabilities of EADAS and PBCs. EADAS/NM is connected directly to EADAS and PBCs to acquire the data required to manage the network. This arrangement allows EADAS/NM to utilize the data collected for engineering and administration for network management on a real-time basis at a reasonable cost.

2.04 The major components of the EADAS/NM system are:

- (a) Central control unit minicomputer (PDP 11/70)
- (b) Ferranti-Packard network exception display board
- (c) Teletype Corporation keyboard display printers (CRTs)
- (d) Teletype Corporation receive-only printers (ROPs)
- (e) E2A telemetry-computer translators (TCTs).

CENTRAL CONTROL UNIT

2.05 The selection of the geographic site for the EADAS/NM central control unit entails the consideration of all related factors, as follows:

- (a) Cost and availability of the required data links to EADAS and PBCs
- (b) Cost and availability of suitable building space
- (c) Environmental considerations (temperature, humidity, etc)
- (d) Data link testing capabilities (maintenance, etc)
- (e) Backup power availability
- (f) Cost and availability of data links for E2A telemetry and 4A ETS channel 2 teletypewriter ports

(g) Accessibility to higher management.

2.06 Similar to the EADAS central control unit, the EADAS/NM central control unit is a coordinated lineup of Digital Equipment Corporation (DEC) cabinets housing all the necessary DEC and Western Electric Company equipment. Depending upon the number and types of data sources and switching machines being accommodated, the central control unit consists of seven or eight cabinets (Fig. 4). Of the seven basic cabinets, five house the basic DEC minicomputer hardware, including the processor, core memory, a 9-track, 1600-bit per inch magnetic tape unit, and other assorted equipment which is required for all installations. One drawer is optional and is only required when interfacing with more than two EADASs. As the network management system approaches its maximum configuration, an eighth cabinet will be required to house additional Western Electric Company equipment (E2A telemetry, data sets, etc). In addition to the cabinet configuration, the central control unit includes a free-standing disc drive, a table top mounted punched card reader, and a free-standing teletypewriter-like device which serves as the processor console (called a DECwriter). See Fig. 5 for the central control unit sample floor plan.

EADAS/NM CENTRAL CONTROL UNIT

2.07 The EADAS/NM central control unit in its maximum configuration (8 cabinets) will contain the following input/output facilities (Fig. 6):

- (a) Eight TCTs, which in turn accommodate a maximum of 32 E2A remote units (4 remotes per TCT)
- (b) Six EADASs or equivalent, collocated or remote
- (c) Sixteen No. 4 crossbar/ETS machines, equipped with the PBC
- (d) Five DATASPEED® 40 stations (CRTs)
- (e) Two ROPs
- (f) One DECwriter (processor console)
- (g) Network exception display board with a maximum of 4095 indicators

- (h) Sixteen ASCII links to 4A/ETS channel 2 teletypewriter buffer
- (i) Punched card reader
- (j) Data sets
- (k) Tape drive and controller.

2.08 The *generic program* that controls standard EADAS/NM functions such as arithmetic calculations, priority procedures, CRT routines, etc, is common to all EADAS/NM installations. This program is developed and maintained by the Bell Telephone Laboratories and installed in central control unit memory by the Western Electric Company during the testing phase of the installation. Updates or revisions of the program are issued by Western Electric Company, as required.

2.09 The *generic program*, in conjunction with the *data base*, which is *user defined*, provides the system with the unique ability to perform its function for all clusters. The *data base* includes information relative to the switching offices (switcher profiles), trunking arrangements, routing information, control assignments, etc, and is coordinated with the display board and CRT routines. *Data base* information is converted to cards and input via a card reader.

NETWORK EXCEPTION DISPLAY BOARD

2.10 A system standard network exception display board is an integral part of the system. It is manufactured by Ferranti-Packard Limited and ordered through Western Electric Company using questionnaire E-8125. See Fig. 7 for the network exception display board.

2.11 The network exception display board is a modular assembly of slotted metal panels, with a colored plastic facing. The display area consists of columns of four 22-inch-high panels upon which indicators are associated with lettered placards identifying offices and trunking.

2.12 Up to 4095 computer activated indicators may be assigned and individually mounted on the pre-slotted metal panels.

2.13 Each column has a display area 88 inches high and either 36 or 22 inches wide, corresponding to internal and external columns,

respectively. These columns are assembled to form the network exception display board (Fig. 7).

2.14 Three background colors are available as standard options: bayberry (an olive green), salem blue, and charcoal. These colors create a strong contrast with the indicator colors.

2.15 Indicator colors are of the fluorescent "day-glo" type. Four indicator colors are available: red, golden (yellow), white, and green.

2.16 The primary lettering color is white for all of the background colors; secondary lettering colors depend on the background selected. Black, blue, and orange lettering are available for bayberry. If either salem blue or charcoal is selected as the background color, then only orange has sufficient contrast to serve as a secondary color. Use of secondary lettering colors should be kept to a minimum; thus, enhancing its effectiveness.

2.17 *Internal columns* display exceptions to and at switching systems within the EADAS/NM cluster. Trunk exceptions to these offices are displayed on the *incoming trunk group panel* (Fig. 8). Machine exceptions and discretets for these offices appear on the *office panels* (Fig. 9). Exceptions on trunking to machines outside the EADAS/NM serving area are displayed on the *external columns* (Fig. 10). A limited quantity of switching machine performance exceptions are activated on the external columns via Inter-EADAS/NM Communications.

2.18 Exceptions such as trunk group pressure (ACH [attempts per circuit per hour], % OFL [percentage of overflow]) and machine service performance (IML [incoming matching loss], DTS [dial tone speed], SADR [sender attachment delay recorder]) are displayed and updated each 5 minutes. Discretets which reflect status of machine congestion (SADR, etc) or controls (DOC [dynamic overload control], or DRE [directional reservation equipment], etc) are updated each 20 seconds.

2.19 Recommendations for the organization of the network exception display board are available in General Letters 74-09-029 and 75-12-039; Dial Facilities Practices, Division D, Section 6; Western Electric questionnaire E-8125, Part 2, and drawing ED-3B065. The board should be designed by personnel knowledgeable with the network hierarchy for the cluster location and should begin

after the switching machines, which will connect with EADAS/NM have been determined.

2.20 The EADAS/NM network exception display presents a number of significant user advantages.

- (a) Meaningful arrangement of switching and trunking exception indicators allows rapid understanding of network problems.
- (b) Standard arrangements of all EADAS/NMs facilitate communication between network management centers.
- (c) Compatible organization of the display board and the demand data base allows quick access to support data via CRTs.
- (d) Use of the Ferranti-Packard equipment minimizes power requirements.

KEYBOARD DISPLAY PRINTERS

2.21 The keyboard display printer terminal devices, which are referred to as CRTs, are used to request and display data on demand and initiate control action. These terminals are equipped with a full send-receive keyboard for entry of requests; a CRT for display of the response, and a printer to provide a hard copy of the display. These terminal devices are Teletype Corporation DATASPEED® 40s.

RECEIVE ONLY PRINTERS

2.22 Two ROPs are required with each network management system. One ROP provides a hard-copy record of each calculation that exceeds its assigned threshold (ie, each exception). A second ROP is used by the monitor subsystem. The printers are Teletype Corporation ROPs.

E2A TELEMETRY COMPUTER TRANSLATORS

2.23 The E2A TCT is, basically, an interface device used to connect the E2A remote units over the telemetry link to the central control unit. The E2A TCT functions over a 1200-baud 4-wire data link with E2A remote units located in crossbar tandem or No. 4 crossbar switching machines. E2A telemetry is not employed in conjunction with No. 5 crossbar, No. 1 crossbar or No. 1 ESS offices. The central control unit may be equipped with a

maximum of 8 TCTs, which will serve up to 32 remote units (4 per TCT). This is accomplished by placing a multiport data bridge circuit on the E2A telemetry link (Fig. 11). The E2A TCT and telemetry link is used to execute controls and transmit control information to the central control unit, ie, DOC, DRE, etc.

3. SWITCHING MACHINE INTERFACE WITH EADAS/NM

3.01 4A Crossbar Equipped With the Electronic Translator System: 4A/ETS offices interface directly with EADAS/NM. The 4A/ETS must be equipped with a PBC (generic program 3, or later) and the EADAS-port option. An interface must be ordered with EADAS/NM to acquire the network data (software registers) for network management. The EADAS/NM must be equipped with PBC interface.

3.02 Interface arrangements for discretetes and reverse controls for DRE, SADR, and for DOC are available. The interface with the 4A/ETS controls will be via the channel 2 teletypewriter port; the interface for other controls and for discretetes will be via E2A telemetry.

3.03 4A Crossbar Equipped With Card Translator (4A/CT): Register data from the 4A/CT will be provided to EADAS on a standard basis, either through EADAS traffic data converter or through the existing traffic data recorders peg count and TUR converters (PCC and TURC). Standard E2A telemetry interfaces for discretetes and controls associated with the DOC consoles, SADR circuit, and DRE are available.

3.04 No standard arrangements have been developed for interfacing E2A telemetry with the route transfer controls of the 4A/CT traffic supervisory cabinet. Long Lines has devised such arrangements, which are now operational with E2 telemetry in Chicago 2/3. It is recommended that this arrangement be installed in 4A/CT switching offices.

3.05 Crossbar Tandem: Register data from crossbar tandems is provided to EADAS through the EADAS traffic data converters, PCCs, and TURCs. Standard interface arrangements for DOC equipment, DRE units, SADR units, and the route transfer keys of the traffic supervisory cabinet are available. Depending on the volume of discretetes and reverse controls, a crossbar tandem may be accessed for these features by E2A telemetry or

by appropriate standard appliques to the EADAS traffic data converters. The addition of a **command module** in offices without traffic supervisory cabinets provides limited controls via the EADAS traffic data converters. Crossbar tandems equipped with traffic supervisory cabinets must utilize E2A telemetry when discrete and reverse controls are required.

3.06 No. 5 Crossbar: Register data, discrettes and reverse controls are handled via the EADAS traffic data converter. Additional input cards must be installed in the EADAS traffic data converter, and a command module that is 8 inches high must be mounted below the EADAS traffic data converter to exercise reverse controls. Standard interfaces are available for directional reservation equipment, line load control, sender group busy circuits, etc.

3.07 No. 1 ESS: The standard interface between EADAS and the No. 1 ESS is available beginning with the CTX-8, Issue 4, generic program. This single interface will provide network administration and engineering data, network management data, status data, and reverse controls. All of this information will be transmitted over one 1200-baud channel between No. 1 ESS and EADAS. Recommendations for the provision of specific network management features for No. 1 ESS are available in General Letter 75-06-077.

3.08 Coincident with CTX-8, Issue 4, the higher transmission rate of 1200 baud requires a new universal input/output (I/O) device. The device utilizes an SD1A147-02 universal teletypewriter circuit and is identified as the EADAS or remote port. In the No. 1 ESS office, the interface is employed exclusively for association with EADAS and is never employed in conjunction with a teletypewriter. No. 1 ESS always interfaces via EADAS.

3.09 Other Switching Systems: Network data for No. 1 Crossbar, Step-by-Step, and Panel Switching Systems are available through the EADAS traffic data converters, PCC, or TURC. Reverse controls and discrettes are not available for No. 1 Crossbar, Step-by-Step, or Panel Switching Systems. No. 4 ESS will interface with the network management system, beginning with generic program 4E2.

3.10 Local Control: In general, EADAS/NM does not preclude local control or local discrete data. Control and discrete data are retained at the remote offices as a backup in case of failure in the telemetry or EADAS/NM systems. The override switch, which determines local backup or EADAS/NM control, will be located at the switching system. All local control options can be monitored by EADAS/NM through the discrete data. The following features of DOC cannot be activated via EADAS/NM:

- (a) Sender queue threshold setting
- (b) Sender queue load recorder
- (c) Individual loop control.

3.11 EADAS/NM assumes that network data (software registers), discrete data, and control capabilities are available in the switching systems. If these features are required, but not available, they should be included as a separate order from the system itself. It is suggested that a review of installed network management controls be conducted early during the planning phase to determine those circuits requiring modifications and additional requirements.

4. PLANNING CONSIDERATIONS

4.01 EADAS Traffic Data Converters:

Discrettes collected via the EADAS traffic data converter require additional cards, which supplement the data collection cards. Each card will accommodate 32 discrettes. The discrettes, which are on/off indications reflecting line load control, DRE status, etc, require a maximum of two additional cards. Discrettes are polled by EADAS and transmitted to EADAS/NM at 20-second intervals.

4.02 Reverse controls via the EADAS traffic data converter are processed by a "command module" 8 inches high, which is mounted below the EADAS traffic data converter. This additional space should be considered when EADAS traffic data converters are engineered, if reverse controls are planned.

4.03 No. 5 crossbar always employs EADAS traffic data converters for discrettes and reverse controls. Crossbar tandems without traffic supervisory

cabinets utilize the EADAS traffic data converter, also, for discrettes and limited reverse controls.

4.04 Recommended EADAS traffic data converter assignments for data collection devices (DCDs) concerning network management in all electromechanical switching systems, except panel, are provided in Traffic Facilities Practices, Division B, Section 9-b. DCD assignments for EADAS with the individual circuit usage recording (ICUR) feature should also be completed, considering the requirements of EADAS/NM. That is, all usage items of interest to network management should be grouped in blocks of 32 DCDs or the equivalent of EADAS traffic data converter input cards (Traffic Facilities Practices, Division B, Section 9-c). Use of these assignment procedures will allow EADAS/NM to request a minimum number of blocks of 32 DCDs and will provide a more responsive network management system. It is recommended that DCD assignments for all EADAS traffic data converters be completed with the assumption they will ultimately be associated with EADAS/NM.

4.05 EADAS Central Control Unit: EADAS/NM is connected directly to EADAS via a 9600-baud synchronous line interface. In addition to ordering the appropriate interface equipment for the EADAS/NM central control unit, additional equipment is required at the EADAS central control unit. This equipment includes matching synchronous line interface equipment, a second moving head disc (previously optional), and generic program IN1A or later.

4.06 Information relative to ordering EADAS traffic data converter discrete cards command modules, EADAS central control unit hardware, and generic program IN1A is provided in the EADAS questionnaire E-8109.

4.07 Traffic Data Recorder Converters: Traffic data recorder converters will interface with EADAS/NM via EADAS. EADAS will then transmit the specified blocks of 32 DCDs (software registers) to EADAS/NM for analysis at 5-minute intervals.

4.08 Converters of this type are not arranged to provide discrete or reverse control capability. If this capability is desired, consideration should be given to the replacement of at least one converter (preferably the peg count converter) with an EADAS traffic data converter.

4.09 The assignments within traffic data converters, which will provide network management surveillance data, should have their layouts reviewed to see if reassignment of the data source terminations would be advantageous. If the number of such converters is small in relation to the EADAS/NM serving area and if the network management data transfer requirements do not encompass a complete converter, reassignment should not be necessary.

4.10 Outside Vendor Terminal Devices:

Some operating companies are presently utilizing data terminals manufactured by outside vendors. These terminals are usually of the scanner/accumulator variety in that they accumulate the data in electronic registers (DCDs) until, upon command or clock signal, they transmit the data to either a local teletypewriter or to a remote minicomputer. For these terminals to be compatible with EADAS/NM, they must first be modified to become compatible with EADAS, which will actually collect the data. General Letters 75-02-146 and 75-10-152 provide information relative to the EADAS/OSV interface specification.

4.11 If the outside vendor terminal device meets the required interface to function with EADAS, it will be polled by the EADAS central control unit, which will request data in predefined blocks of 250 registers (DCDs). Although EADAS is capable of collecting a maximum of 2000 registers per channel from outside vendor terminals, the system will poll a maximum of two blocks of 250 registers (DCDs) per channel for network management. EADAS then transmits the information to EADAS/NM for analysis. Therefore, register assignments of concern to network management should be within two blocks of 250 registers (DCDs) per channel.

4.12 Outside Vendor Data Acquisition Systems: In order to interface with EADAS/NM, the data acquisition system must emulate EADAS. To facilitate the planning for interfacing these systems with EADAS/NM, General Letter 76-12-103 released the preliminary EADAS-EADAS/NM interface specification.

5. FLOOR SPACE AND LAYOUT CONSIDERATIONS

5.01 Central Control Unit: Figure 5 reflects a typical EADAS/NM floor plan. A false floor is not mandatory; however, the free-standing disc file and the punched-card reader cables, which are limited to 15 feet of cabling (maximum), are

SECTION 6a

too short to run in on an overhead rack and may present a tripping hazard if not protected. Otherwise, the building floor and space requirements for the central control unit are as follows:

- (a) Floor loading—100 pounds per square foot, maximum
- (b) Floor space—200 square feet, minimum
- (c) False floor—recommended.

5.02 Network Management Center Floor Space Selection:

The network management center should be located in an area with no exterior windows in order to control the light and prevent condensation in the room. A floor space in the order of approximately 3600 square feet will accommodate a large display board, the work stations, printers, miscellaneous teletypewriters, discs, work tables, manager's office, and training room.

5.03 The network management computer can be located up to 500 cable feet from the display board; however, if the computer is located adjacent to the network management center, maintenance and troubleshooting tasks are more easily coordinated.

5.04 A satisfactory arrangement for the network management center is essential for efficient operation of the center. Figure 12 reflects a typical network management center.

6. OPERATION

DATA ACQUISITION

6.01 Network data (software registers) are collected by EADAS in real time via EADAS traffic data converter or traffic data recorder converters for electromechanical switching systems. No. 1 ESS and outside vendor scanner accumulator terminals are polled at 5-minute intervals by EADAS to acquire the accumulated network management data. Data collection for 4A/ETS switching systems is performed in real time by the PBC.

EXCEPTION CALCULATIONS

6.02 At the end of each 5-minute interval, EADAS/NM requests specific groups of data from EADAS and PBCs. Calculations are then

performed using this data. The calculation results are compared to the preset threshold for ACH, connections per circuit per hour (CCH), etc. If the calculation result exceeds the threshold value, the computer updates the exception indicators on the display board, activates audible alarm and/or causes printout on the exception printer. A considerable volume of additional data, referred to as **demand data**, is available on request using the CRT terminals.

DISCRETES

6.03 Discretets (off/on indications) reflecting the status of DOC, short sender timing, etc, are processed in the following manner.

(a) The EADAS traffic data converter is employed for No. 5 crossbar and crossbar tandems without traffic supervisory cabinets. Discretets from the switching system circuits interface via discrete cards located in the EADAS traffic data converter. EADAS requests the discretets at 20-second intervals via the EADAS traffic data converter data link and transmits the information to EADAS/NM for analysis.

(b) E2A telemetry is utilized for 4A Switching Systems and crossbar tandems equipped with traffic supervisory cabinets. The switching system circuits are connected to the E2A remote unit. Since the remote units are connected directly to EADAS/NM via a 1200-baud data link, the computer simply requests the discretets at 20-second intervals for analysis.

REVERSE CONTROLS

6.04 Reverse controls (re-routing; code blocking; etc) are initiated by network management personnel that are operating the CRT devices. Reverse controls are processed, as follows:

(a) The EADAS traffic data converter employed for No. 5 crossbar and crossbar tandems without supervisory cabinets. In response to a request for control action at a CRT, the EADAS/NM computer encodes a message and transmits the request via EADAS to the "command module" associated with the EADAS traffic data converter. The command module activates the control with a contact closure in the switching system and transmits a message via EADAS to

EADAS/NM confirming that the action was completed.

(b) E2A telemetry is employed for 4A Switching Systems and crossbar tandems with traffic supervisory cabinets. The EADAS/NM computer encodes a message in response to the control request and transmits the request direct to the E2A remote unit. The E2A unit takes the control action and transmits a message to EADAS/NM confirming that the action was completed.

6.05 A dedicated ASCII teletypewriter link is connected directly from EADAS/NM to the 4A/ETS channel 2 teletypewriter circuit. The 4A/ETS console functions, such as code blocks, preprogrammed controls, etc, are executed via the teletypewriter link.

6.06 No. 1 ESS will employ the same high-speed data link employed by EADAS for data collection to transmit reverse controls and discrete data. Similar to EADAS traffic data converter operation, reverse controls and discrete data will be transmitted from EADAS/NM via EADAS to No. 1 ESS, and vice versa.

NETWORK EXCEPTION DISPLAY BOARD

6.07 The display board indicators, which are electromagnetic, are activated by the EADAS/NM computer. The computer receives network data and performs exception calculations at 5-minute intervals. Calculation results which exceed the user-defined thresholds for such items as ACH, overflow, CCH, etc, are marked as exceptions by the computer. Upon completion of all calculations, the computer updates the display board by activating or deactivating the appropriate indicators. The EADAS/NM computer receives discrettes at 20-second intervals and activates indicators on the display board immediately.

CATHODE-RAY TUBE OPERATION

6.08 Analysis of the indicators and the exception printouts will often suggest the requirement for additional information. CRT terminals are utilized to interrogate the computer for this additional information. It is displayed to the network manager on the CRT screen in a format referred to as a

CRT page. The CRT pages are formatted to facilitate identification of:

- Congested machines and/or trunk groups
- Trunk groups which alternate route to a specified group
- Controls available on a per office basis
- Reroutes available, etc.

7. ABBREVIATIONS AND ACRONYMS

ABBREVIATION	TITLE
ACH	Attempts Per Circuit Per Hour
CCH	Connections Per Circuit Per Hour
CRT	Cathode-Ray Tube
CT	Card Translator
DCD	Data Collection Devices
DEC	Digital Equipment Corporation
DOC	Dynamic Overload Control
DRE	Directional Reservation Equipment
DTS	Dial Tone Speed
EADAS/NM	Engineering and Administration Data Acquisition System/Network Management
ESS	Electronic Switching System
ETS-PBC	Electronic Translator System—Peripheral Bus Computer
ICUR	Individual Circuit Usage Recording
IML	Incoming Matching Loss
I/O	Input/Output
NOC	Network Operations Center
OFL	Overflow
PBC	Peripheral Bus Computer

SECTION 6a

ROP	Receive Only Printer	TDRS	Traffic Data Recorder
SADR	Sender Attachment Delay Recorder	TNDS	Total Network Data System
TCT	Telemetry Computer Translator		

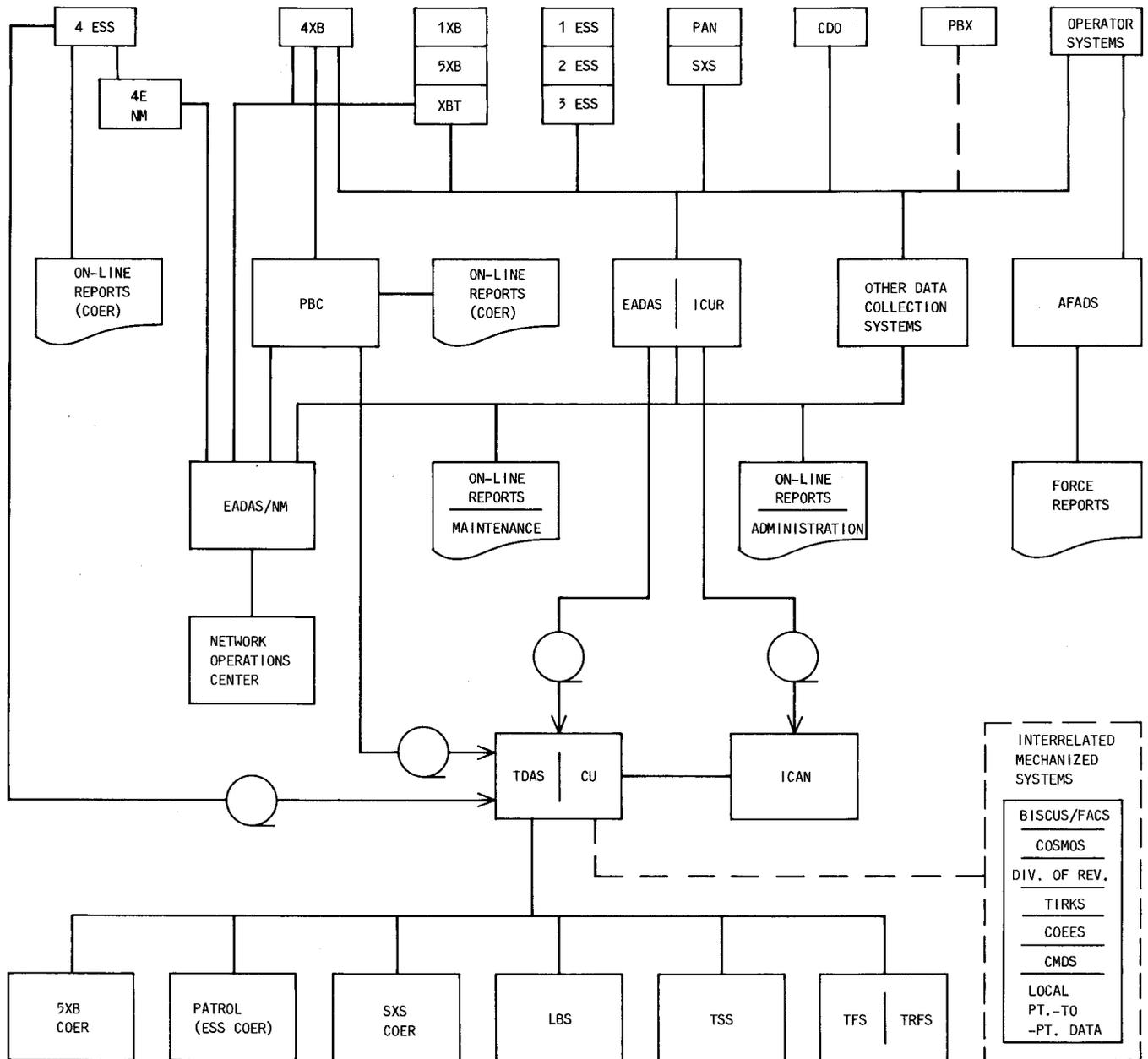


Fig. 1—Total Network Data System (TNDS) (2.01)

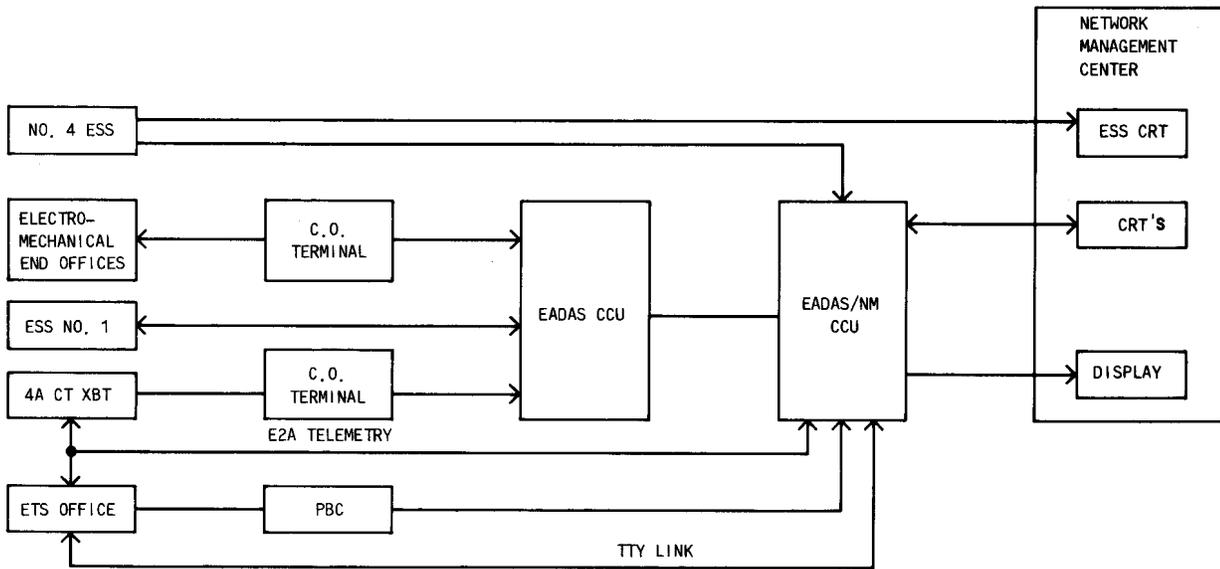


Fig. 2—EADAS/NM Generalized Arrangement (2.01)

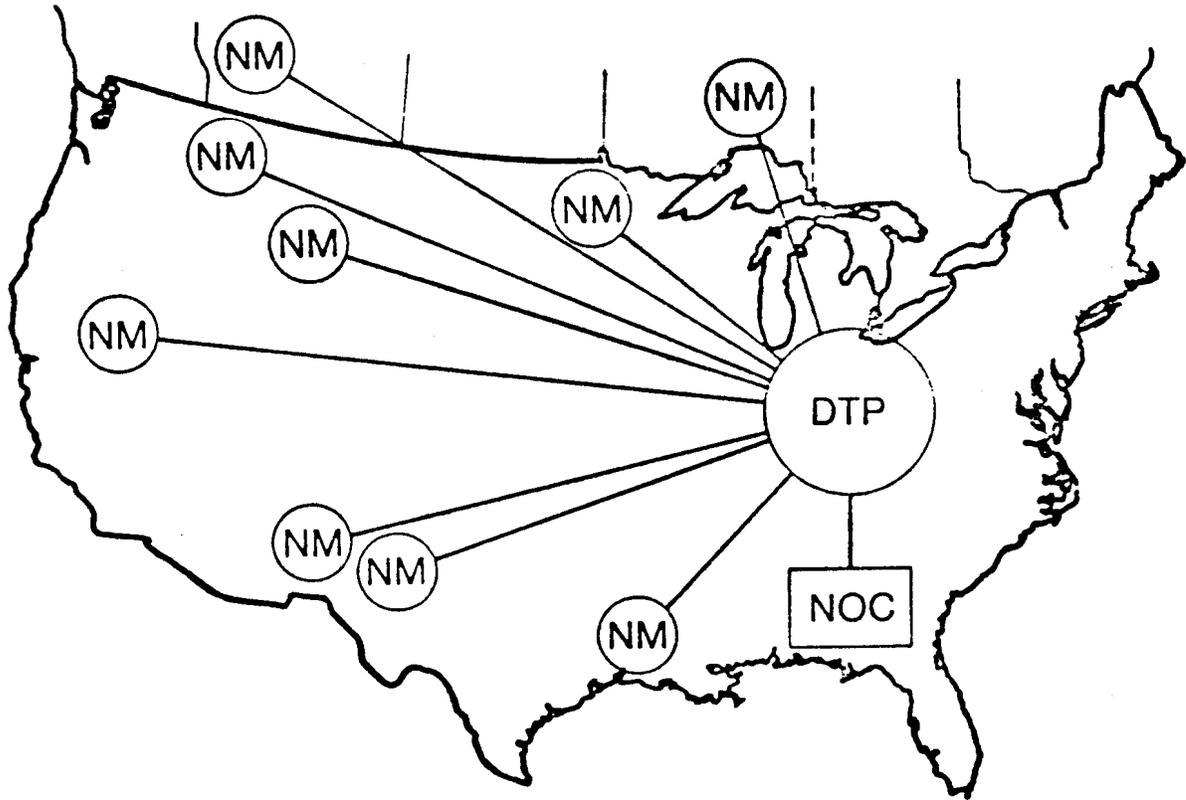


Fig. 3—Data Transfer Network—Inter-EADAS/NM Communication (2.02)

SECTION 6a

2 TCT'S PER SHELF	2 TCT'S PER SHELF OR 1 209 DATA SET	ALARM PANEL					
		WALL BOARD DRIVER CIRCUIT PACK	P/O MULTI DISTRIBUTION CIRCUIT			—	P/O PDP - 11/70
		108 DATA SETS	P/O MULTI DISTRIBUTION CIRCUIT	P/O MULTI DISTRIBUTION CIRCUIT		—	
		202 DATA SETS	DRAWER NO. 3	DRAWER NO. 2	PROCESSOR DRAWER	—	MAGNETIC TAPE TRANSPORT
						MEMORY DRAWER	
		POWER SUPPLY					
C OPTIONAL	C	B	5	4	3	2	1

Fig. 4—EADAS/NM Cabinet Configuration (Maximum Condition) (2.06)

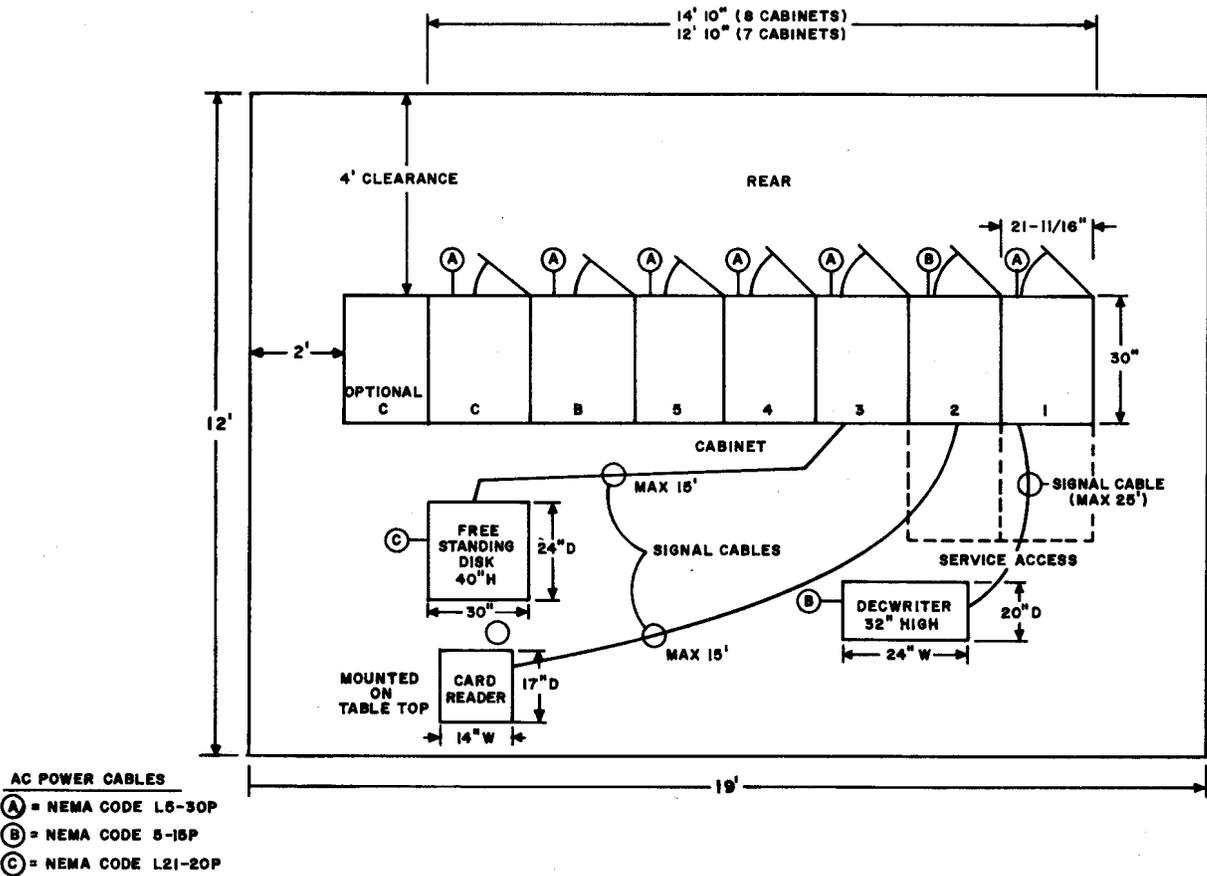


Fig. 5—EADAS/NM Central Control Unit Sample Floor Plan (2.06, 5.01)

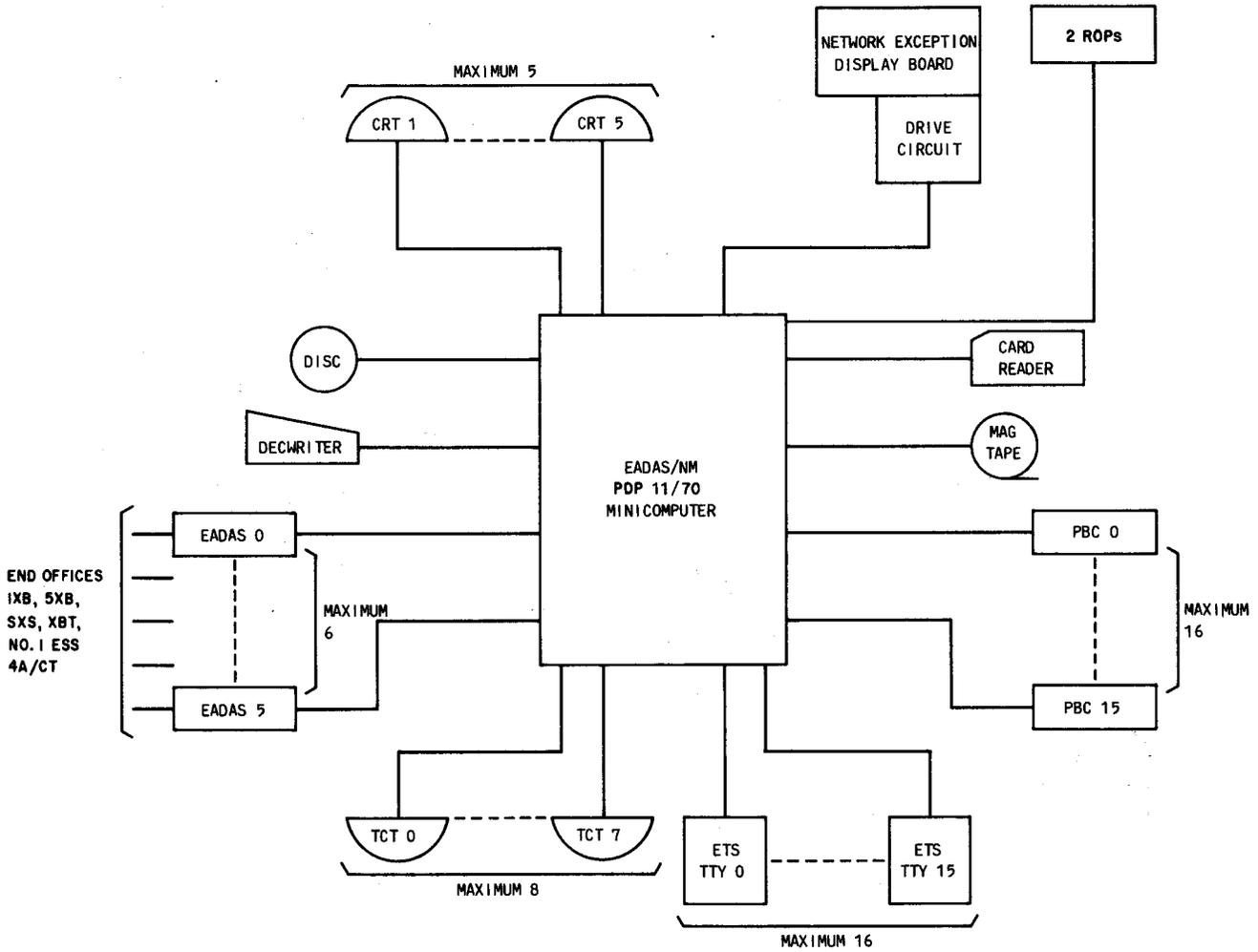


Fig. 6—EADAS/NM Maximum Configuration (2.07)

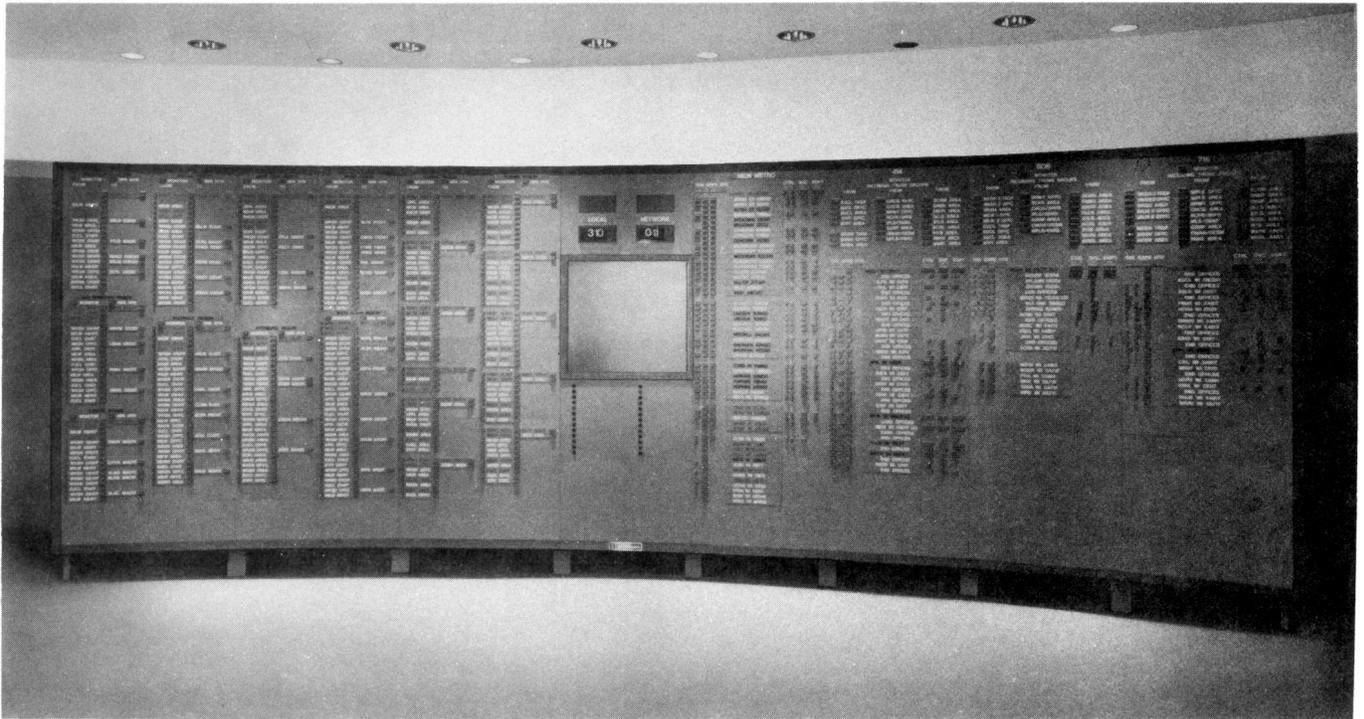


Fig. 7—Network Exception Display Board (2.10, 2.13)

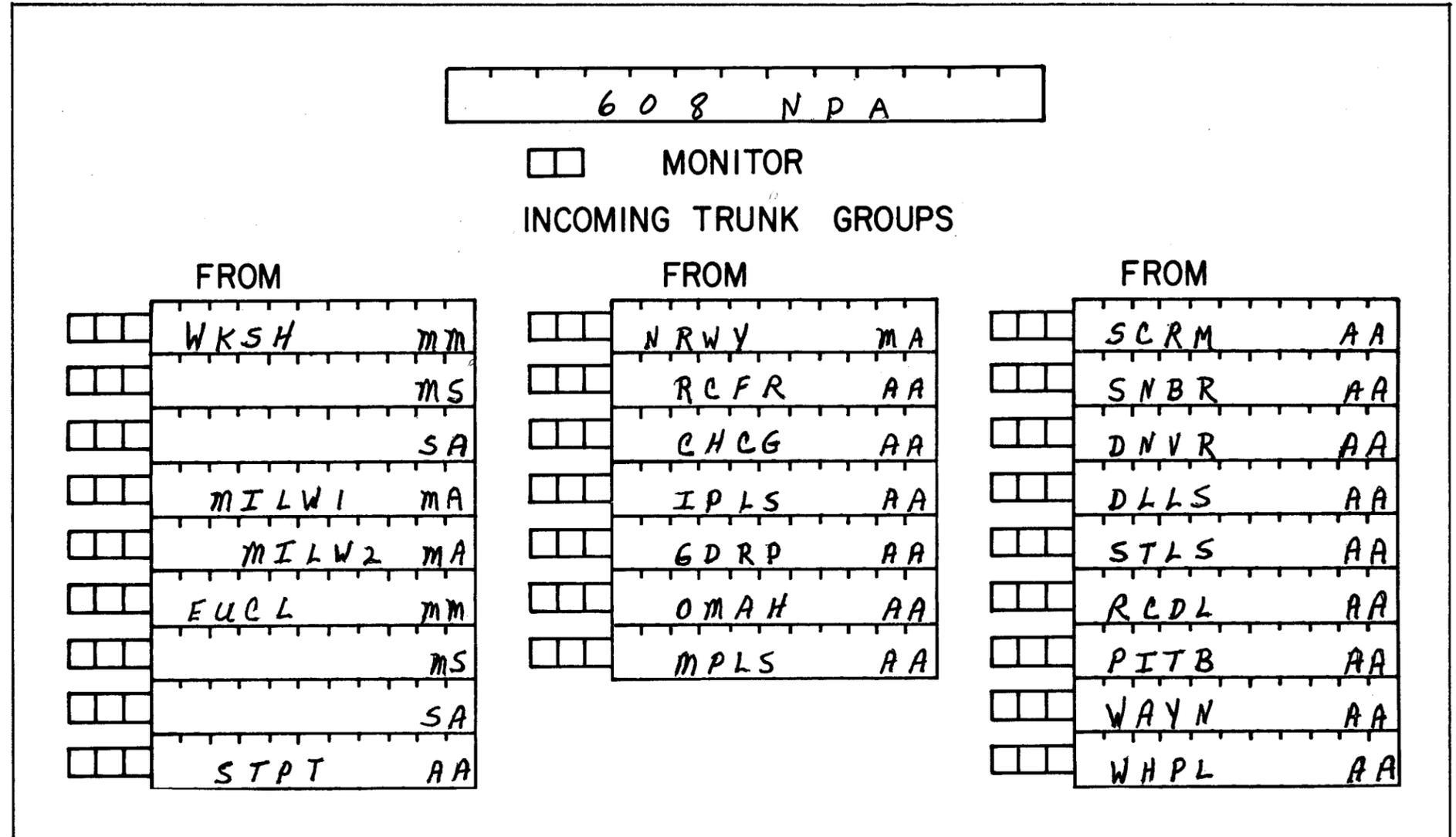


Fig. 8—Network Exception Display Board—Incoming Trunk Group Panel (2.17)

TRK GROUPS HTR				CTRL	SVC	EQPT
<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MDSN WI 01 01T (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BLK OAK 16 MGO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	KEDZIE 12 24A		<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MAIN 11 CGO		<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PFLAUM 14 224		<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SPRING 15 MGO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SYLVAN 13 23A		<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	MDSN WI 11 CGO (2)			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BARB WI 01 11T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	END OFFICES		<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	BOSC WI YA 71T			
	<input type="checkbox"/>	<input type="checkbox"/>	DGVL WI XA BIT			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	JNVL WI 01 11T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 9—Network Exception Display Board—Office Panel (2.17)

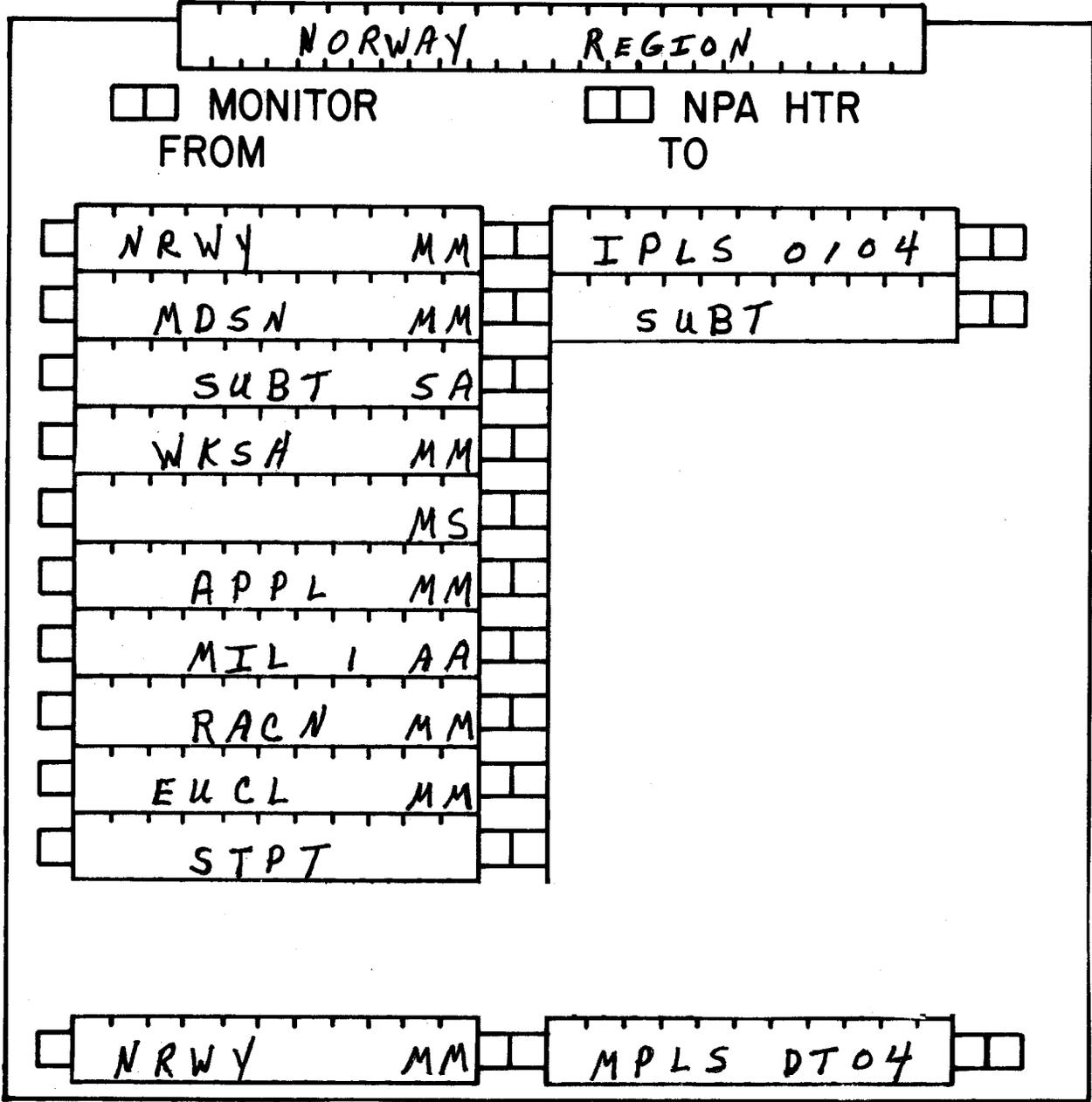


Fig. 10—Network Exception Display Board—External Panel (2.17)

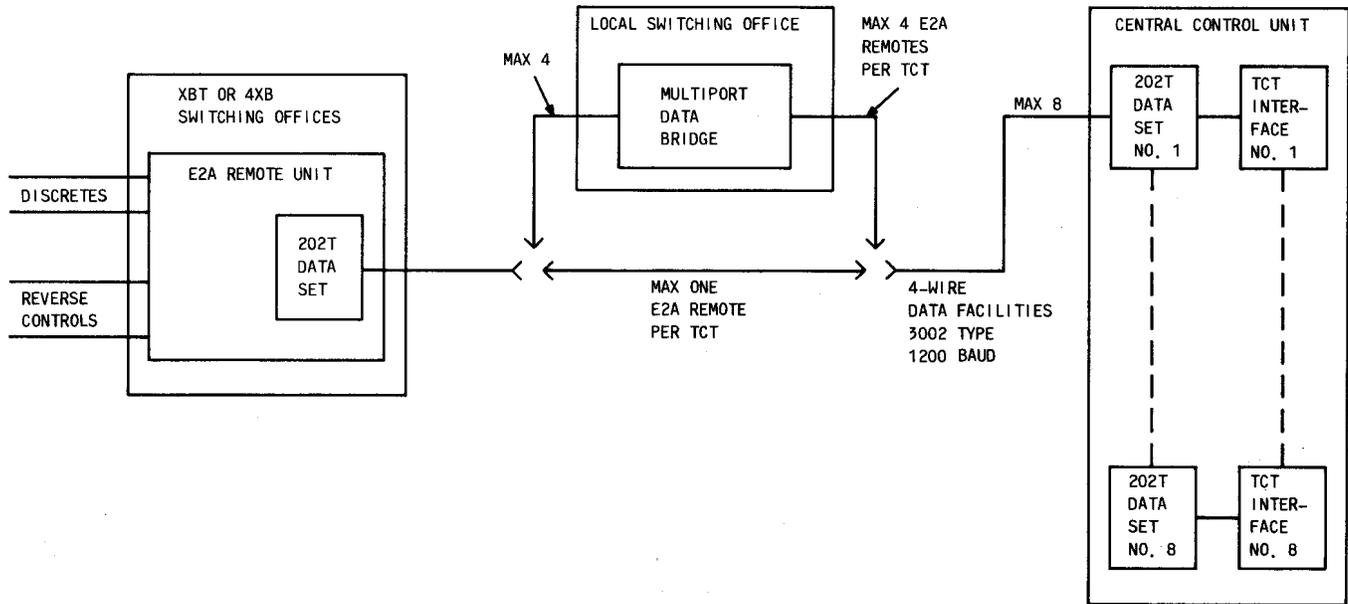


Fig. 11—E2A Telemetry Diagram (2.23)

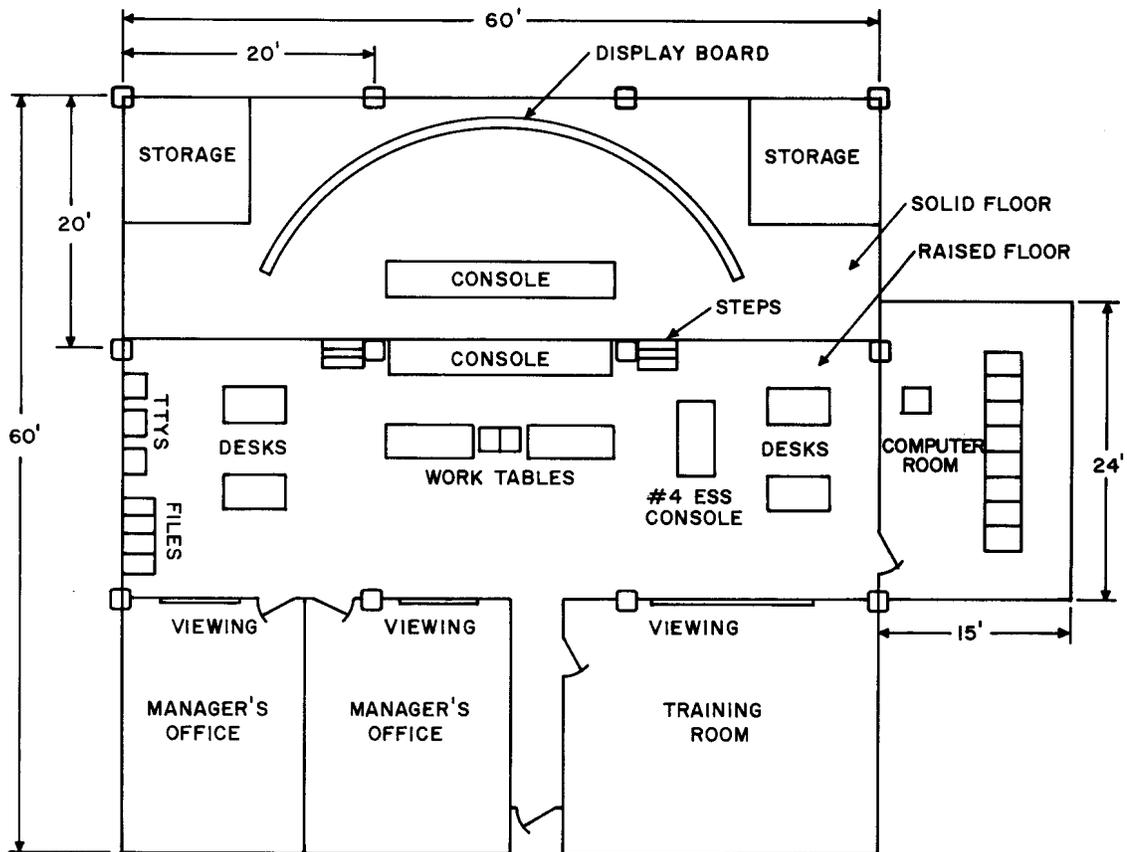


Fig. 12—Network Management Work Center (5.04)