COMPUTERIZED MAINTENANCE AND ADMINISTRATION SUPPORT III (COMAS III) DESCRIPTION CROSSBAR TANDEM OFFICE

CONTENTS PAGE

1. GENERAL

1.01 This section describes the Computerized Maintenance and Administration Support III (COMAS III) which is a stand-alone minicomputer system. The central unit of COMAS III is a Digital Equipment Corporation (DEC) PDP 11/40 processor which records and analyzes ineffective attempts (IA) and prints exception reports whenever preselected thresholds are reached. It will also provide all codes route verification for route relay markers, ring markers, and translators.

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

1.03 An overview of COMAS III is shown in Fig. 1. A single COMAS III installation will serve a single tandem marker group equipped with a trouble recorder. A scanner/distributor combination (mini-DAS) is used to interface between the tandem office and the minicomputer. COMAS III connects to the trouble card perforator by use of the existing 129 leads, and connection is made by removing the existing connectors and inserting them into a new mounting plate located behind the perforator.

*Registered trademark of Digital Equipment Corporation.

These new connectors provide a termination for the minicomputer and the trouble card perforator and can easily be disconnected in the event of a failure which could affect the punching of trouble cards. This method of attachment takes advantage of the multiplexing capability that is built into the trouble recorder connector and uses the trouble recorder multiplexing relays to provide isolation.

1.04 Various types of printouts are provided automatically or upon request. They are as follows:

- Ineffective attempts by trouble type
- Number of short reports against specific equipment
- Lower threshold setting for equipment types
- Upper threshold setting for equipment types
- Individual marker peg count
- Individual transverter ANI-AI peg count
- Number of inhibits in effect at time of summary reports
- Number of filters in effect at time of summary report
- All codes test feature test results
- Test failure results of scan and distributor boards

1.05 COMAS III has the capability to direct output messages to tandem or trunk maintenance teletypewriters (TTYs).

2. EQUIPMENT ELEMENTS

A. DEC H960-C Cabinet

2.01 The H960-C cabinet is divided into six 10-1/2 inch levels with the equipment layout as shown in Fig. 2. Fig. 2 shows the cabinet layout as viewed from the front of the equipment.

B. Power Distribution

2.02 The 861C power controller, which is located on level 6 of the computer cabinet, is supplied power from an 120V ac/60Hz power source. The power controller connects ac power to the H742 power supply which, in turn, supplies 20-30 volts ac to the regulators. Five regulators, slot A, B, C, D and E, are required for COMAS III. The slot C regulator provides the +5V regulated direct current for the scanner and distributor units.

2.03 The -48V dc power for COMAS III is obtained from the miscellaneous circuit trouble recorder frame SD-27049-01.

2.04 Power to the system is controlled by a three-position switch located on the processor console. A removable key is provided to vary the switch position. The designation and function of each switch position is as follows:

- ***OFF***—Power is removed from the processor.
- ***POWER***—Power to the processor is on and all switches function normally.
- ***LOCK***—Power to the processor is on but the control switches are disabled. The switch register is still functional.

C. PDP 11/40 Processor

2.05 The PDP 11/40 processor has a 16K core memory and a control console which is provided to perform the following functions:

- Collect sort and analyze IA data
- Control a marker all codes test
- Control a scan and distribute board test

2.06 The use of the processor is controlled via instruction from the switch register and from the console teletypewriter. The processor reads office data from a scanner matrix and controls this data collection with distributor matrices.

D. Unified Bus Converter Unit (SD-94837-01)

2.07 The unified bus converter unit is used to interface the PDP 11/40 UNIBUS* to the scanner matrix unit and signal distributor matrix units. This circuit receives and transmits address, data, control and sync information from the processor via the UNIBUS to and from the scanner and distributor units. The circuit will operate in either

a read (scan) mode or in a write (distribute) mode. In the write (distribute) mode, data received from the UNIBUS is written into the selected row of latches in the distributor unit. In the read (scan) mode, data is transmitted from the selected row of scan points in the scanner circuit to the UNIBUS via the bus converter. The two operating modes differ only in the direction of data transmission which is determined by the state of the control bit.

*Registered trademark of Digital Equipment Corporation.

E. Scanner Matrix Unit (SD-94838-01)

2.08 The scanner matrix unit transforms electromechanical contact opens and closures with or without resistance battery into digital logic TTL levels. This voltage transformation is provided by individual scan networks which are organized in a 16-word by 16-bit matrix (256 points) that are accessed by an 8-bit name (high order address bits). The states of the scan points in the row (word) selected by the address are read out as 16 bits of data from the row of scan points selected by the low order 4 address bits and slave sync pulse.

F. Signal Distributor Matrix Units (SD-94839-01)

2.09 The signal distributor matrix units interface 5-volt digital logic TTL to electromechanical circuits by use of 337A mercury relays. A make contact is provided for each relay as the signal distributor point and each relay is controlled by a latch. The signal distributor is organized in a 4-word by 16-bit matrix (64 points) and since COMAS III requires two distributor units, a total of 128 distribute points are provided. Both distributors receive an 8-bit address, a control bit, a master sync pulse, and 16-bits of data from the processor; however, only one recognizes the 6-bit name (high order address bits). The named unit writes the 16-bits of data into the row of latches selected by the lower order 2-address bits and returns a slave sync signal indicating all-scans-well.

G. Power Control Unit

2.10 The power control unit provides 5-volt fusing, power control key-lamps, battery and ground test posts and jacks, and a TEL jack.

H. Miscellaneous Relay Unit

2.11 The miscellaneous relay unit provides a computer record relay (CRCD). When operated, this relay connects ground to distribute points for controlling multiplexing relays. A +5 volt fuse alarm relay and fuse alarm resistor are also provided.

I. Connector Access Unit

2.12 The connector access unit provides ten 20-pin male and six 64-pin female connectors mounted on a plate which bolts to the rear of the trouble recorder frame. There are also ten 20-pin female connectors which are locally cabled to the ten 20-pin male connectors. (See Fig. 4.) Also, two pairs of 64-pin female connectors are mounted at the rear of the trouble recorder above the new connector unit. These connectors are used as test connectors for connecting the 128 scan points to all of the 128 distribute points.

J. PDP 11/40 Computer Control Console

2.13 The control console is located on level 4 of the H960-C cabinet in the front panel of PDP 11/40 processor. It provides means to connect or remove power to the processor, status indicator lamps to display the state, function in progress or operation of the processor, and control switches to start, change, examine, and stop the processor. See Fig. 5 and Table A for location and definitions of console lamps, switches, and keys.

K. Console Teletypewriter

2.14 The console TTY is an ASR-33 equipped with a low-speed paper tape reader and punch (110 baud, 10 characters per second) which is used for computer diagnostics and maintenance, loading of paper tape programs, and as a backup for the maintenance center TTY. Since the loading of paper tape programs requires the console TTY and PDP 11/40 control console key and switch operations, the console TTY must be located adjacent to the processor cabinet.

L. Maintenance Teletypewriter

2.15 Since the console TTY is not designed for heavy duty operation, a KSR-35 TTY is provided as an input/output device to set thresholds, invoke filters and inhibits, request searches, and

receive exception reports, periodic summaries and all codes testing results.

M. Optional Teletypewriter(s)

2.16 One or two KSR-35 TTY(s) may be provided on an optional basis to be used at a trunk maintenance center and/or an analysis bureau. These TTYs should be without paper tape readers or punches but equipped with EIA interface board and capable of mounting a modem.

N. Data Sets/Modem

2.17 The 108D and 108E are used to interface the maintenance TTY and optional TTYs to the PDP 11/40 computer. If the maintenance TTY is located less than 50 feet from the computer, a DEC H312A null modem can be used instead of the data sets. (See Fig. 6.)

O. Data Ports

2.18 Two data ports are provided to send IA reports to some remote point via optional data links.

3. METHOD OF OPERATION

3.01 The COMAS III is provided with two copies each of the following binary tapes which are used to load the particular feature into the processor:

- Ineffective Attempt Analysis, TP-25334-01
- All Codes Testing, TP-25334-02
- Scanner and Distribute Test, TP-25324-03

3.02 Each feature is loaded into the processor by use of the low-speed reader unit on the ASR-33 console TTY, and only one feature can be operational at a time. When a tape is loaded, a printout of the J code number and TP number will be printed on the console TTY and should be verified against the tape identification.

A. Ineffective Attempt Analysis Feature

3.03 The IA feature provides that each seizure of the trouble recorder connector is monitored for certain trouble types. If these trouble types are detected, the computer will collect the trouble data. If other trouble types are detected, the recorder-connector circuit will operate and a trouble record card will be perforated. Any record other than OITT that encounters a trunk identifier time-out will have a trouble record card perforated.

3.04 The trouble recorder connector, start trouble recorder lead (STRS) is sampled by the computer every 20 milliseconds. If a ground is present, the trouble type leads are scanned for ground. These leads indicate the type of trouble for which the computer must acquire additional data. See Table B for list and definitions of trouble type leads.

3.05 Circuit progress leads are also monitored and analyzed to determine if the computer will accept the trouble data, or if the trouble recorder will have a trouble card perforated. They are as follows:

(a) ***MS***—If grounded on marker seizure, a trouble record card will be perforated.

(b) ***P6***—If grounded, and a NIT or IF trouble type lead is also grounded, the computer will accept the trouble data. Otherwise, a trouble record card will be perforated.

(c) ***TM***—If grounded on data transfer seizure, a trouble record card will be perforated.

3.06 The trouble identification data is processed and expanded into a larger more definitive group of trouble types. These trouble types are placed in a system nomenclature used in all computer printouts. See Table C for the system names and the crossbar trouble types that are formed to make up the system name.

3.07 After the data has been collected and formed into an internal record, it is passed to a program that inspects the data and decides whether this record should be immediately printed out while entering the hopper. This technique is known as a ***FILTER*** which will cause an immediate printout of a record. Filters are established, changed, or removed by use of the TTY to instruct the computer. Up to 10 filters can be used at one time.

3.08 ***INHIBITS*** can be used to block certain records from the real time hopper. For example, when a local office loses its ANI capability, an inhibit could be used to block ANI failures from

that office only. Inhibits are established or removed by use of the TTY to instruct the computer and up to 10 inhibits can be used at a time.

3.09 A record that enters the real time hopper will become subject to either a low or high threshold report. This feature compares the new record to all other records in the hopper and if certain requirements are met, a low or high threshold report will be printed. When the 1A feature begins, the low threshold for each equipment group is set at 5 which can be changed by the user from 1 to 15. The high threshold is set for each equipment group at 99 which can be changed by the user from 1 to 99. Although the high threshold should be set higher than the low threshold for each equipment group, the high threshold of one equipment group may be set lower than the low threshold of some other equipment group.

3.10 When the low threshold is reached for a particular piece of equipment, a short exception report will be printed to show the trouble type, equipment identity, threshold setting, date, and the time of the first and last IA that comprised the report. When the high threshold is reached, a long exception report will be printed to show the details of the IAs and the time of occurrence of each IA.

3.11 Threshold values will be printed on the half-hour summary report in the form of low and high thresholds for each equipment group and code group. A count of equipment groups that have reached a low threshold during the last half-hour and a total of low thresholds during the 24-hour day will be printed. The user can also ask for the value of the thresholds that are currently in effect by use of the TTY.

3.12 The details of any record in the hopper can be examined at any time by the issuance of a search command from any TTY within the system. These searches can be made by trouble type, equipment group, or code group or by specific equipment or code.

3.13 A summary printout will occur every half-hour on all designated TTYs. This summary will show the amount of failures by trouble type for the last half-hour and up to current time, the low and high threshold values in effect for each equipment or code group, and the amount of low threshold reports per equipment or code group that occurred during the last half-hour and the total up to current time. A total usage for the last half-hour for marker usage and transverter automatically identified calls is provided. Also, a count of filters and inhibits in effect is also provided. (See Fig. 7 for example of summary printout.)

B. All Codes Testing Feature

3.14 The all codes testing feature is a paper tape program which will automatically test the route-relay markers (SD-25361-01), ring markers (SD-27069-01), and translator route cross-connections and provide a TTY printout of the results.

3.15 This feature uses a stand-alone program, which means that no other program may be resident within the computer while this test is operational.

3.16 In order for the program to determine the type of test to be performed, where to begin, and what inputs to provide, a short dialogue between the computer and the user by way of the console TTY is required. After the dialogue is completed, the console TTY will be used to direct the operator to perform the proper marker test circuit key and switch settings. When these settings are completed, a "BEGIN" command will be typed by the user and testing will begin.

3.17 The computer will begin testing by seizing the lowest-numbered marker under test, distributing inputs for the called code, timing for a route-relay operated or string firing signal, collecting and storing routing information and releasing the marker. The same marker is then continually reseized on a route advance basis with the same input until all route advances have been exhausted. The next higher marker is tested, comparing its route information with results collected and stored from the first test. This process will continue until all markers have been tested for their initial routes and all route advances for this particular code. After all markers have been tested for all route advances for this code, a resultant printout will be printed on the maintenance TTY. The lowest number marker is then reseized and tested for the next appropriate input. This process will continue until all tests have been completed or until the user types a command to suspend or cancel testing. A continue command is also provided for continuing a test that has been suspended.

3.18 If a continuous test over several independent testing sessions is required, a punched tape of the unique routes stored in the permanent memory hopper may be made which can be reloaded into the hopper prior to the next testing session. This procedure will also reduce the size of the resultant printout.

3.19 Procedures are also provided to find overlapping outgoing trunk groups by analyzing all unique routes stored in the permanent memory hopper and printing the results on the maintenance TTY.

4. MAINTENANCE

4.01 The processor portion of COMAS III contains sophisticated, high speed electronic circuitry and mechanical equipment requiring preventive and corrective maintenance.

4.02 A scanner and distribute program, TP-25334-03, is provided to test the scan and distribute matrices (mini-DAS). The program is divided into four tests which are as follows:

(a) ***Test 1***—Tests that all scan words are clear and clears any set distribute points with the plugs not connected.

(b) ***Test 2***—Tests that all scan words remain clear with the CC (0,2) or CC (1,3) plugs in the XCS connector and the CC (4,5) plugs in the XCD connector.

(c) ***Test 3***—Tests all distribute words and all scan bits on scan words with CC (0,2) plug in the XCS connector and the CC (4,5) plugs in the XCD connector.

(d) ***Test 4***—This test is identical to Test 3 except the CC (1,3) plugs are in the XCS connector and the CC (4,5) plugs are in the XCD connector.

As each test proceeds, a printout of errors will be provided. With this information and some analyzation of the tests, a determination can be made of which scan or distribute board is most likely to be defective.

4.03 The light emitting diodes located in the unified bus converter circuit can be tested by the operation of two keys located on the power control unit. The operation of the LED key causes +5 volts to be applied to the LED lead, and operation of the TST key causes all the light emitting diodes to light.

5. REFERENCES

5.01 The following is a list of sections containing information on the Computerized Maintenance and Administration Support Interface III.

SECTION	TITLE
220-422-301	INEFFECTIVE ATTEMPTS OPERATING PROCEDURE
220-422-302	ALL CODES TEST OPERATING PROCEDURE
220-422-303	TROUBLE SECTIONALIZING
220-422-304	INPUT and OUTPUT MESSAGE MANUAL
SD-28104-01	APPLICATION SCHEMATIC FOR COMAS III

TABLE A

DEFINITIONS OF PDP 11/40 CONSOLE LAMPS AND CONTROLS

LAMP DISPLAY	DEFINITION
RUN	Processor clock is running
PROCESSOR	Processor has control of the bus
BUS	UNIBUS is being used
CONSOLE	Console mode (manual operation)
USER	Processor executing program in user mode
VIRTUAL	Not applicable to COMAS III
ADDRESS	Address of data just examined or deposited
DATA	Data just examined or deposited
CONTROL SWITCHES	
LOAD ADRS	Transfers contents of switch register to the bus address register to the bus address register
EXAM	Data in location specified on address register is displayed on data register
CONT	Processor continues operation
ENABLE/HALT	ENABLE allows processor to continue operation. HALT causes processor to stop.
DEP	Switch register contents are deposited into location specified by bus register
START	Start a program
OFF	Power removed from processor
POWER	Power to the processor
LOCK	Power to the processor but control switches disabled
0—17 Switch Registers	Used to set octal numbers for loading programs

TABLE B

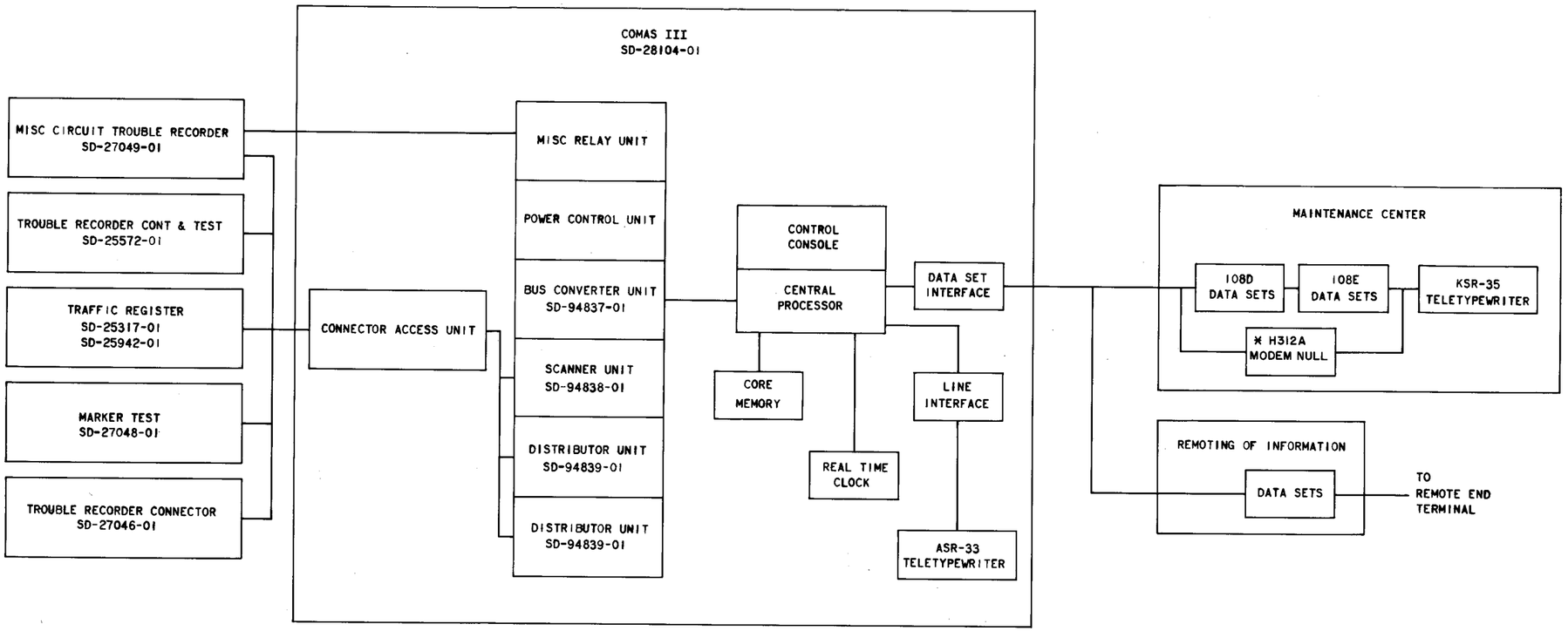
TROUBLE TYPE LEADS

TROUBLE TYPE LEAD	DEFINITION
AN1	No start dial
AN2	Misrouted CAMA call
AN3	Vacant code coin
IF	ANI Identification failure
NID	RSS seizure without trunk identification
NIT	ANI number identification trouble
OITT	Operator identified trouble
OF	Overflow
PD	Partial dial
PS	Permanent signal
RSS	Record stuck sender
VC	Vacant code announcement

TABLE C

SYSTEM NOMENCLATURE

	SYSTEM NAME	CROSSBAR TANDEM TROUBLE TYPE	
AIF	ANI Incoming Failure	IF	Incoming failure
ANF	ANI number failure	NIT	Number identification trouble
CPF	Continuity Polarity Failure	NID, TGF	Trunk guard failure
		RSS, TGF	
		RSS, TGF, OF	
		NID	
ITT	Incoming trouble trace	OITT	Operator identified trouble trace
MCA	Misrouted CAMA	AN2	Announcement 2 call
MIF	Miscellaneous incoming failure	OF	Good called number
NSD	No start dial	AN1	Announcement 1
OTT	Outgoing trouble trace	OITT	With outgoing type trouble code
PDR	Partial dial registers	PDR	Incomplete called number from 10-digit register
PDT	Partial dial timeout	OF	Incomplete called number
PMD	Pulsing error mutilated digit	OF	Overflow (mutilated called number)
PSR	Permanent signal register	PSR	No called number in 10-digit register
PST	Permanent signal timeout	OF	No called number
SSR	Stuck sender	NID	No identification
		NID, OF	Overflow
		NID, AN1	
		NID, AN2	
		NID, AN3	
		RSS	Record stuck sender
		RSS, OF	
		RSS, AN1	
		RSS, AN2	
		RSS, AN3	
UXS	Unexpected stop	NID, UXS	Unexpected stop
		RSS, UXS	
VCA	Vacant code announcement	VAC	Vacant code
VCC	Vacant code coin	AN3	Announcement 3



* TELETYPE IS LOCATED WITHIN 50 FEET OF THE PROCESSOR CABINET.

Fig. 1—Computerized Maintenance and Administration Support III (COMAS III)

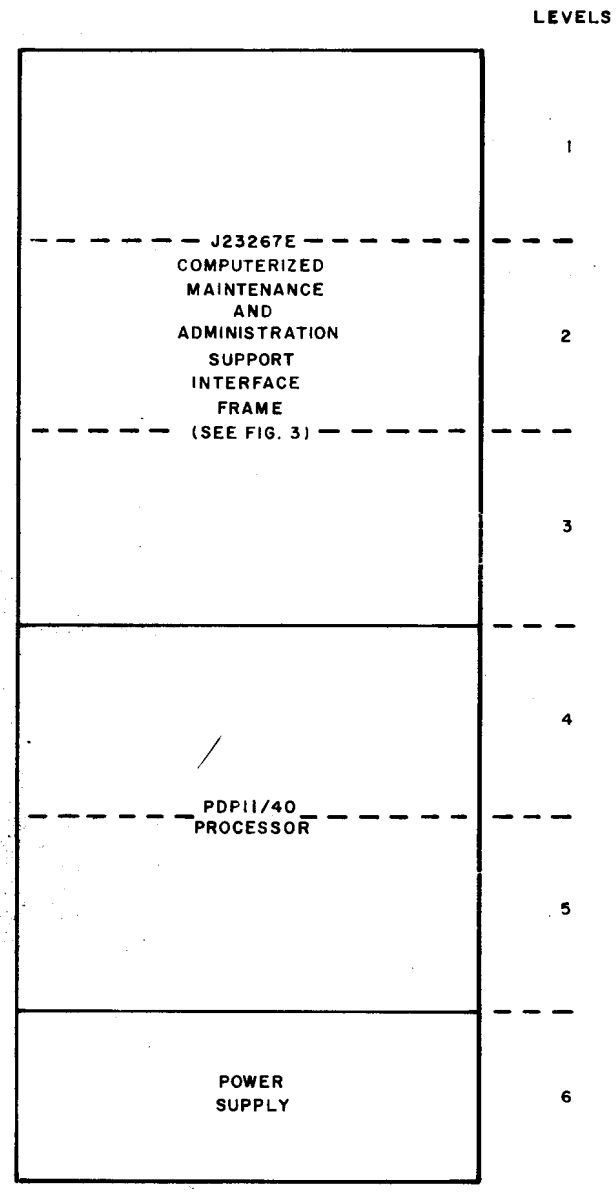


Fig. 2—DEC H960 Cabinet

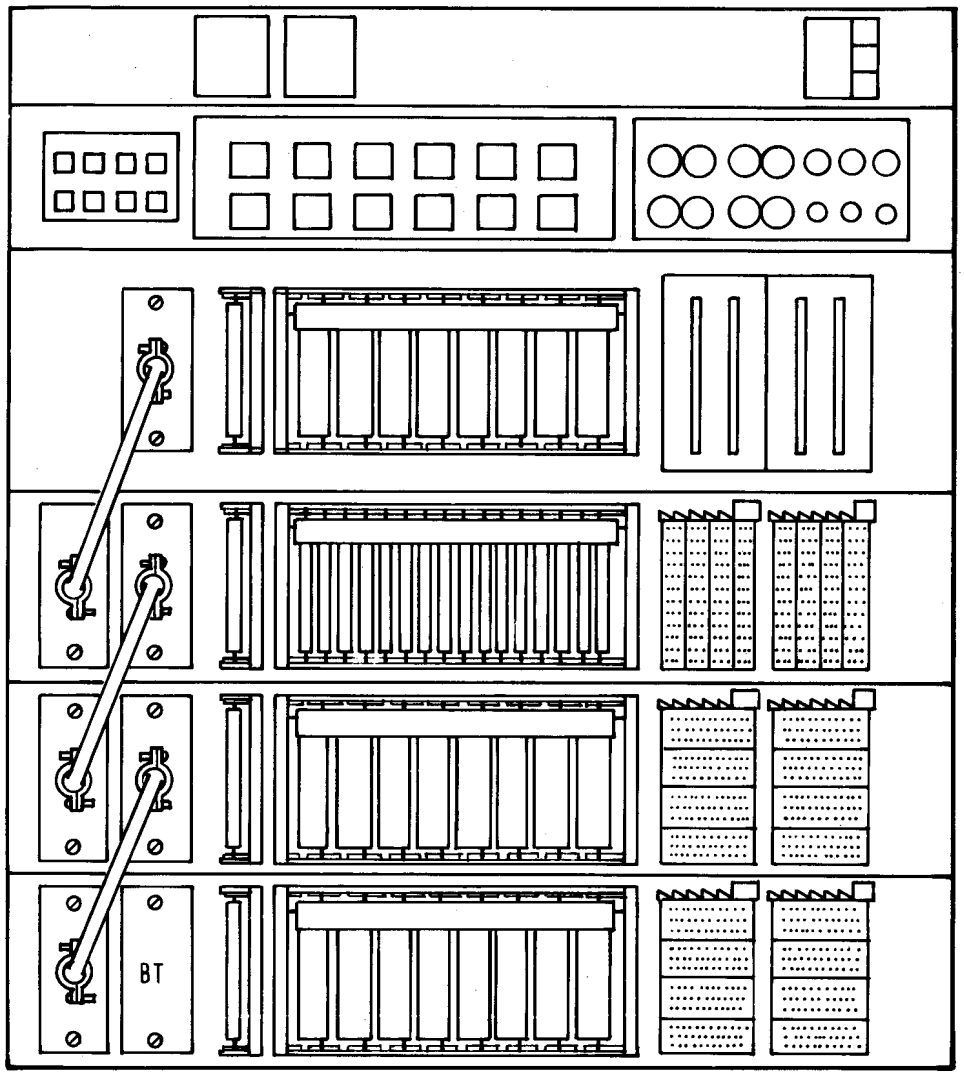


Fig. 3—J23267E Computerized Maintenance and Administration Support Interface Frame

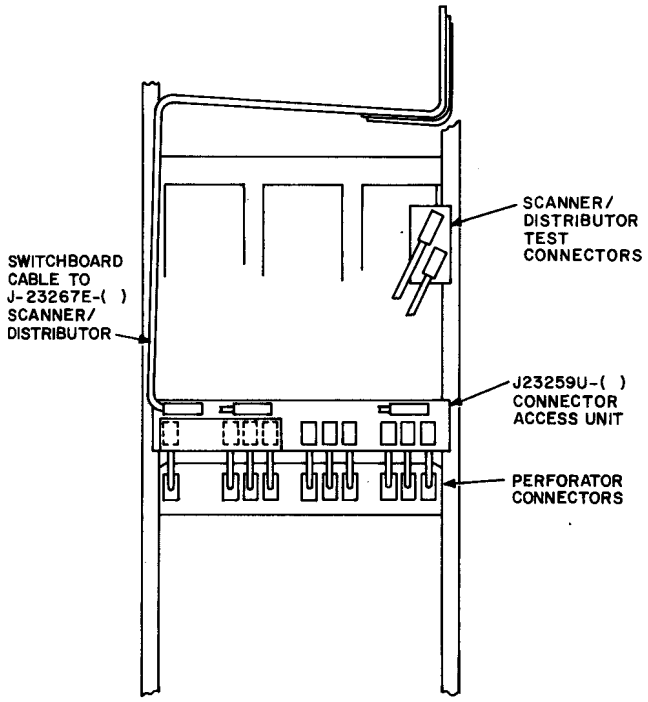


Fig. 4—Connector Access Unit Located at Rear of Trouble Recorder Frame

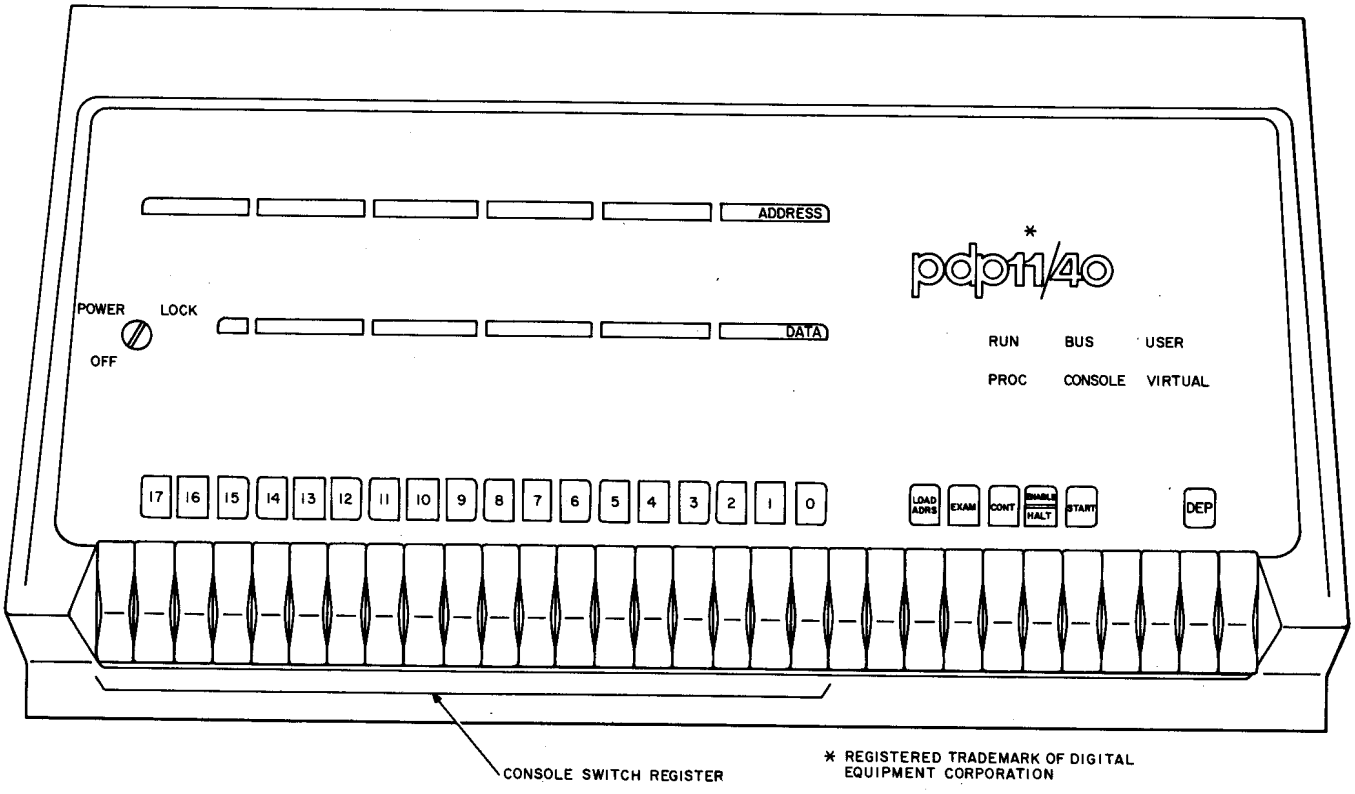


Fig. 5—Control Console

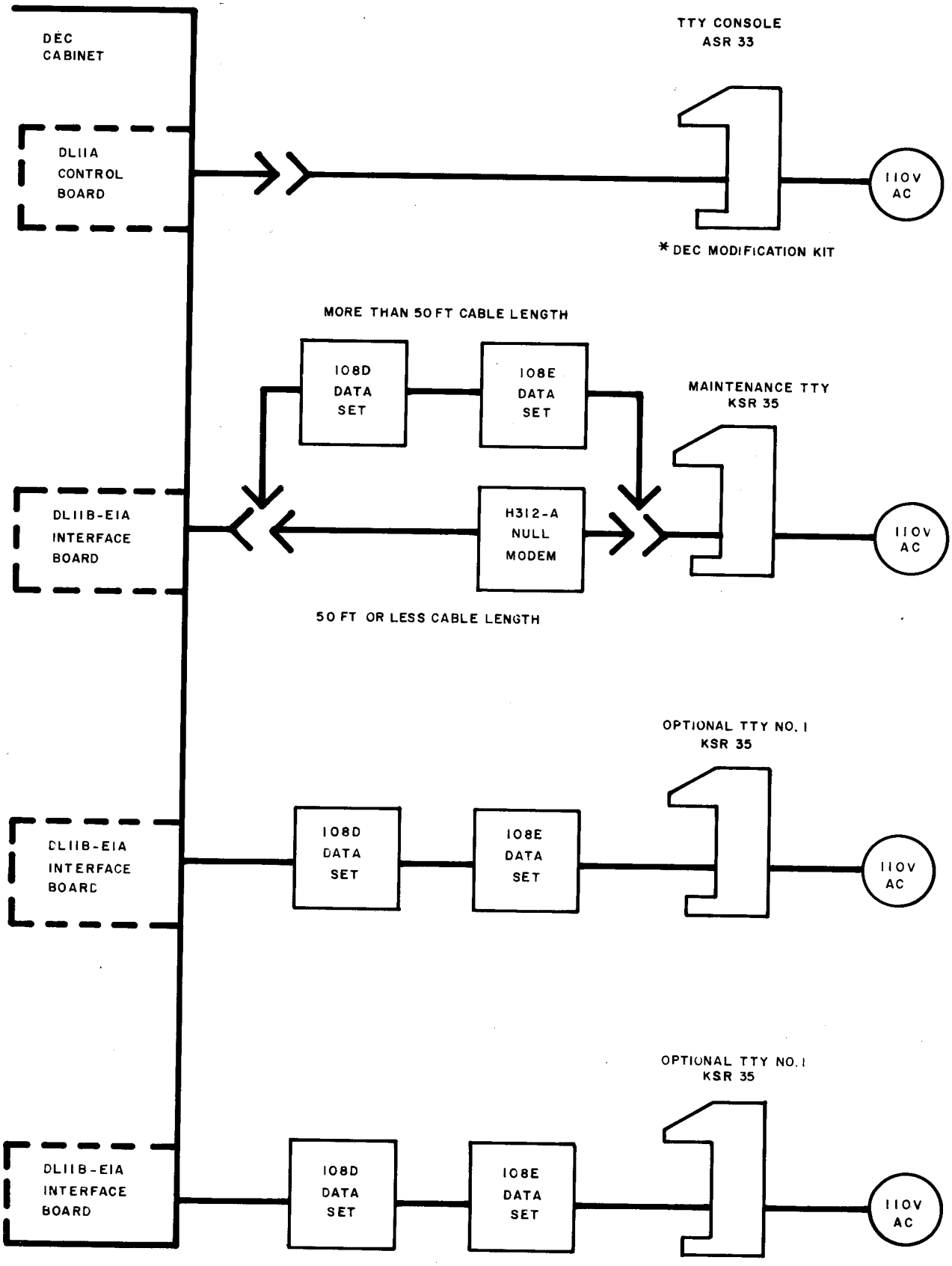


Fig. 6—Teletype Modems

COMAS SUMMARY REPORT 10/18/74 00:00

	IA RECORDS		THRS		LTRS	
TYPE	LAST	TOTAL	LO/HI	EQPT	LAST	TOTAL
CPF	00002	00002	05/99	INC	00000	00000
UXS	00002	00002	05/99	OGT	00000	00000
SSR	00002	00002	05/99	SDR	00000	00000
OTT	00002	00002	05/99	ABC	00000	00000
ITT	00002	00002	05/99	CRV	00000	00000
PSR	00001	00001	05/99	CIN	00000	00000
PDR	00001	00001	05/99	CMA	00000	00000
ANF	00001	00001	05/99	CLG	00000	00000
AIF	00001	00001	05/99	REG	00000	00000
VCA	00002	00002	03/99	POS	00000	00000
MIF	00002	00002	05/99	FAC	00000	00000
PDT	00002	00002	05/99	CHL	00000	00000
PMD	00002	00002				
PST	00002	00002				
NSD	00002	00002				
MCA	00002	00002				
VCC	00002	00002				
	---	---				
	00030	00030				

PEGS MKR 0—7 TOTAL
00019 00020 00005 00005 00021 00021 00015 00015 00000121
TV—AI PEGS 0—11
00019 00020 00005 00005 00021 00021 0000091

FILTERS IN EFFECT = 00
INHIBITS IN EFFECT = 00
$

Fig. 7—COMAS III Summary Report