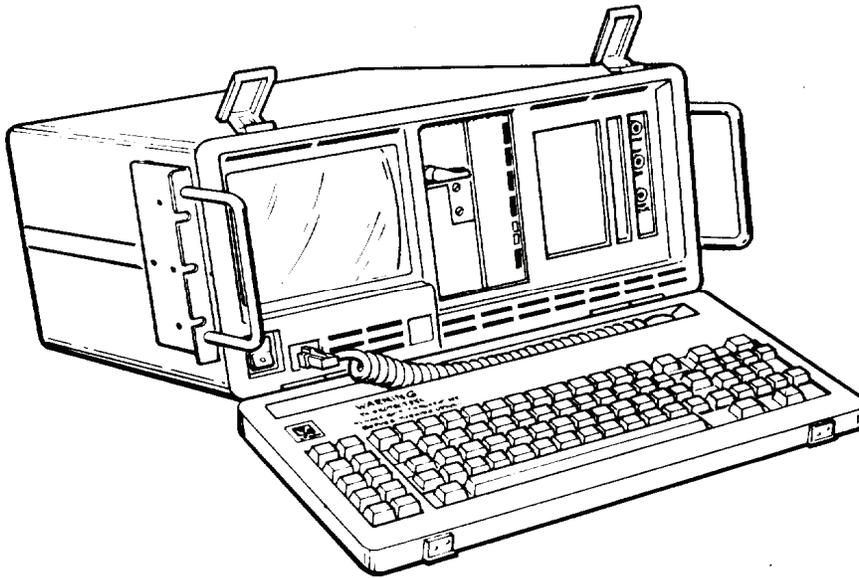


# TECHNICAL MANUAL

## UNIT, INTERMEDIATE DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



### TRANSMISSION TEST SET AN/USM-608 (NSN 6625-01-246-8206) (EIC: KD8)

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**5**

**SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK:**

**1**

**DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL.**

**2**

**IF POSSIBLE, TURN OFF THE ELECTRICAL POWER.**

**3**

**IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL.**

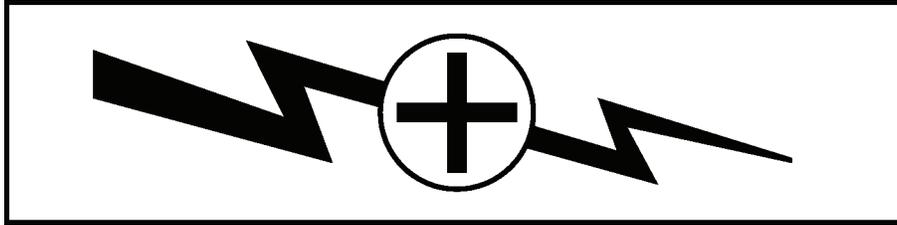
**4**

**SEND FOR HELP AS SOON AS POSSIBLE.**

**5**

**AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION.**

**WARNING**



**HIGH VOLTAGE**

is used in the operation of this equipment.

**DEATH ON CONTACT**

may result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When technicians are aided by operators, they must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 115-Volt ac input when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

**WARNING**

Do not be misled by the terms "LOW VOLTAGE."  
Potentials as low as 50 Volts can cause death  
under certain conditions.

For First Aid, refer to FM 4-25.11.



# CAUTION



THIS EQUIPMENT CONTAINS PARTS  
AND ASSEMBLIES SENSITIVE TO  
DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).  
USE ESD PRECAUTIONARY PROCEDURES WHEN TOUCHING,  
REMOVING OR INSERTING PRINTED CIRCUIT BOARDS.

## ESD CLASS 1

### NOTE

The symbol for static sensitive devices in military inventory is as depicted in the caution block above.

### GENERAL HANDLING PROCEDURES FOR ESD ITEMS

- USE WRIST GROUND STRAPS OR MANUAL GROUNDING PROCEDURES.
- KEEP ESD ITEMS IN PROTECTIVE COVERING WHEN NOT IN USE.
- GROUND ALL ELECTRICAL TOOLS AND TEST EQUIPMENT.
- PERIODICALLY CHECK CONTINUITY AND RESISTANCE OF GROUNDING SYSTEM.
- USE ONLY METALIZED SOLDER SUCKERS.
- HANDLE ESD ITEMS ONLY IN PROTECTED AREAS.

### MANUAL GROUNDING PROCEDURE

- MAKE CERTAIN EQUIPMENT IS POWERED DOWN.
- TOUCH GROUND PRIOR TO REMOVING ESD ITEMS.
- TOUCH PACKAGE OF REPLACEMENT ESD ITEM TO GROUND BEFORE OPENING.
- TOUCH GROUND PRIOR TO INSERTING REPLACEMENT ESD ITEMS.

### ESD PROTECTIVE PACKAGING AND LABELING

- INNER COVERING OF ANTISTATIC MATERIAL WITH AN OUTER WRAP OF EITHER TYPE 1 ALUMINIZED MATERIAL OR CONDUCTIVE PLASTIC FILM OR HYBRID LAMINATED BAGS HAVING AN INTERIOR OF ANTISTATIC MATERIAL WITH AN OUTER METALIZED LAYER.
- LABEL WITH SENSITIVE ELECTRONIC SYMBOL AND CAUTION NOTE.

**CAUTION**

Devices such as CMOS, NMOS, VMOS, HMOS, thin-film resistors PMOS, and MOSFET used in many equipments can be damaged by static voltages present in most repair facilities. Most of the components contain internal gate protection circuits that are partially effective, but sound maintenance practice and the cost of equipment failure in time and money dictate careful handling of all electrostatic sensitive components.

The following precautions should be observed when handling all electrostatic sensitive components and units containing such components.

**CAUTION**

Failure to observe all of these precautions can cause permanent damage to the electrostatic sensitive device. This damage can cause the device to fail immediately or at a later date when exposed to an adverse environment.

- STEP 1. Turn off and/or disconnect all power and signal sources and loads used with the unit.
- STEP 2. Place the unit on grounded conductive work surfaces.
- STEP 3. Ground the repair operator using a conductive wrist strap or other device using a 1 M series resistor to protect the operator.
- STEP 4. Ground any tools (including soldering equipment) that will contact the unit. Contact with the operator's hand provides a sufficient ground for tools that are otherwise electrically isolated.
- STEP 5. All electrostatic sensitive replacement components are shipped in conductive foam or tubes and must be stored in the original shipping container until installed.
- STEP 6. When these devices and assemblies are removed from the unit, they should be placed on the conductive work surface or in conductive containers.
- STEP 7. When not being worked on, wrap disconnected circuit boards in aluminum foil or in plastic bags that have been coated or impregnated with a conductive material.
- STEP 8. Do not handle these devices unnecessarily or remove them from their packages until actually used or tested.

CHANGE }  
No. 1 }

Headquarters  
Department of the Army  
Washington, D.C., 19 February 2007

**UNIT, INTERMEDIATE DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL  
FOR  
TRANSMISSION TEST SET  
AN/USM-608  
(NSN 6625-01-246-8206) (EIC: KD8)**

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TECHNICAL MANUAL  
NO. 11-6625-3187-24

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 01 May 1988

**UNIT, INTERMEDIATE DIRECT AND GENERAL SUPPORT  
MAINTENANCE MANUAL  
FOR  
TRANSMISSION TEST SET AN/USM-608  
(NSN 6625-01-246-8206) (EIC: KD8)**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U. S. Army Aviation and Missile Command, AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via email, fax or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial 256-842-6546. Our email address is: [2028@redstone.army.mil](mailto:2028@redstone.army.mil). Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hardcopy 2028. For the World Wide Web use: <https://amcom2028.redstone.army.mil>.

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### HOW TO USE THIS MANUAL

This manual tells you about the Transmission Test Set, AN/USM-608, and contains instructions on how to maintain it. Familiarize yourself with the operating procedures contained in TM 11-6625-3187-10 and the maintenance procedures contained in this manual.

If you don't know how the test set operates, read the Principles of Operation section in Chapter 1 of this manual.

Read the operator's manual, TM 11-6625-3187-10, to learn how to operate the Transmission Test Set, AN/USM-608.

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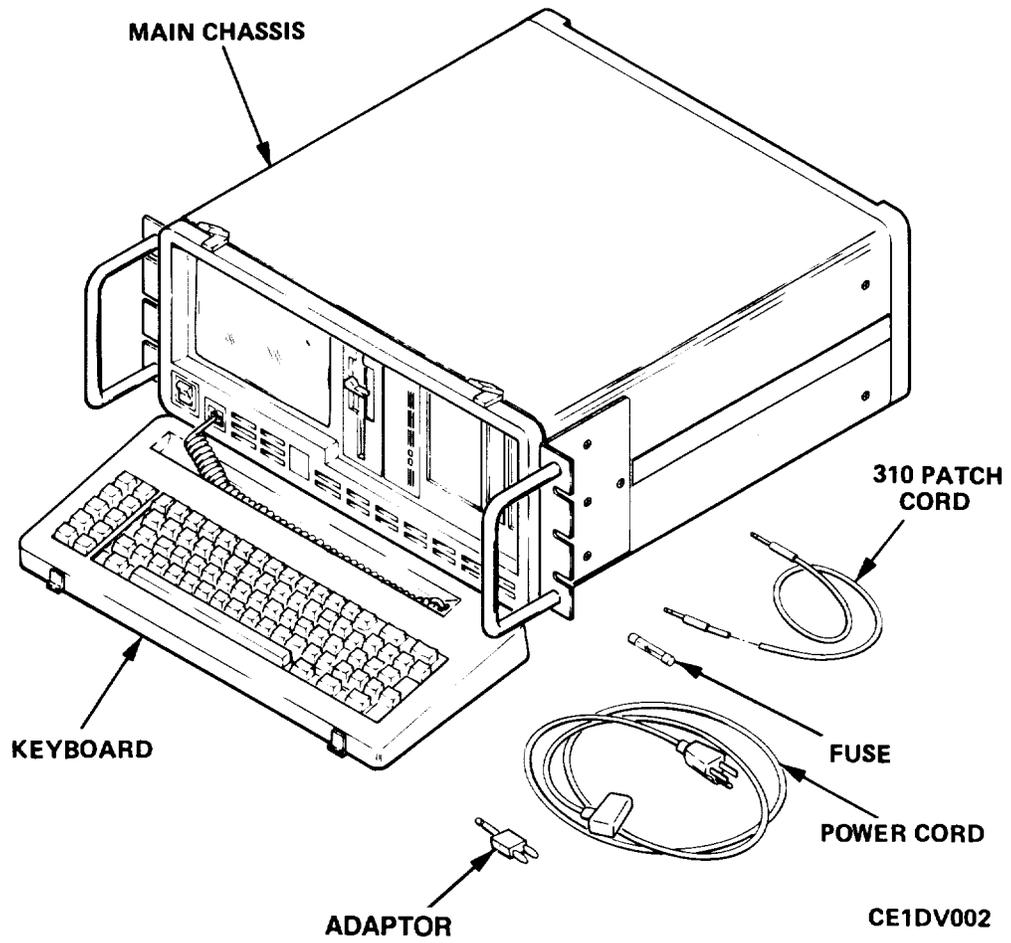


Figure 1-1. Transmission Test Set AN/USM-608

# CHAPTER 1 INTRODUCTION

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## Section I. GENERAL INFORMATION

### 1-1. SCOPE.

This manual describes the Transmission Test Set, AN/USM-608 (test set), and gives instructions for unit maintenance and intermediate direct and general support maintenance. The test set (fig. 1-1) is a combined Transmission Impairment Measurement Set (TIMS) and Return Loss (RL) tester designed to test telecommunications networks.

### 1-2. CONSOLIDATED ARMY PUBLICATIONS AND FORMS INDEX.

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

### 1-3. MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 750-8, as contained in The Army Maintenance Management System (TAMMS) Users Manual.

### 1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL TO PREVENT ENEMY USE.

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

### 1-5. PREPARATION FOR STORAGE OR SHIPMENT.

Storage and shipment procedures are in Chapter 2, Section IV.

### 1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Aviation and Missile Command, AMSAM-MMC-MA-NM, Redstone Arsenal, AL 35898-5000. We'll send you a reply.

**1-7. WARRANTY INFORMATION.**

LP COM warrants the goods manufactured by it to be free from defects in material and workmanship, under normal and proper use and service within specified operating conditions for one (1) year from the date of shipment, provided however, that goods or parts which are replaced or repaired under this warranty are warranted only for the remaining unexpired portion of the original warranty period applicable to the goods, or ninety (90) days from date of replacement or repair, whichever is longer. Report all defects in material or workmanship to your supervisor, who will take appropriate action.

**1-8. LIST OF ABBREVIATIONS.**

This list describes the abbreviations that are used in this manual.

<u>Abbreviation</u>	<u>Term</u>
AN/USM	Army-Navy/general utility-special-maintenance
CRT	Cathode Ray Tube
CTRL	Control Key
CPU	Central Processing Unit
DN	Down
DOS	Disk Operating System
DSP	Digital Signal Processor
EIR	Equipment Improvement Recommendation
EPROM	Erasable Programmable Read-Only Memory
GPIB	General Purpose Interface Bus
IEEE	Institute of Electrical and Electronics Engineering
INCR	Increment
P/AR	Peak-To-Average Ratio
R	Ring
RAM	Random Access Memory
RCV	Receive
RL	Return Loss
S/N	Serial Number
T	Tip
TAMMS	The Army Maintenance Management System
TC	Telecommunications
TIMS	Transmission Impairment Measurement Set
TLP	Transmission or Test Level Point
VOL	Volume
WB	Wide Band
XMT	Transmit

## Section II. EQUIPMENT DESCRIPTION AND DATA

### 1-9 EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

Equipment characteristics, capabilities and features are described in TM 11-6625-3187-10.

### 1-10 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The major components of the test set are shown in figure 1-1.

- KEYBOARD - Used to the enter commands that control the test set.
- MAIN CHASSIS - Contains computer, memory and test set electronics.
- 310 PATCH CORD - Used to connect RCV and XMT jacks together during self test.
- FUSE - Spare 4 ampere, slow-blow fuse.
- POWER CORD - Used to connect the test set to the AC power source.
- ADAPTER - Used to adapt a 310 phone plug to a dual banana plug.

### 1-11 EQUIPMENT DATA

Equipment data for the test set are provided in TM 11-6625-3187-10.

### 1-12 SAFETY, CARE AND HANDLING

Observe all WARNINGS, CAUTIONS, and NOTES in this manual. This equipment can be extremely dangerous if these instructions are not followed.

## Section III. PRINCIPLES OF OPERATION

### 1-13 GENERAL FUNCTIONAL DESCRIPTION

The general functional description of the test set is provided in TM 11-6625-3187-10.

### 1-14 DETAILED FUNCTIONAL DESCRIPTION

- a. *Test Set Hardware.* A detailed functional diagram of the test set is shown in figure FO-1. Locate the major assemblies in the test set using the number keys in the following description.

- (1) FARADAY BOARD Functions as the central processing unit (CPU) that controls the overall operation of the test set. It contains the following main elements:
  - Microprocessor Performs arithmetic, data transfer, logical, character string manipulation, control transfer and processor control functions. It performs these functions by executing a series of instructions which, together, form a program. The microprocessor gets these instructions from memory (see below).
  - Clock Produces timing signals which control the speed at which the microprocessor operates.
  - Random Access Memory (RAM) The microprocessor uses RAM as temporary storage space for data. The data contained in RAM disappears when power is removed from the test set.
  - Erasable Programmable Read-Only Memory (EPROM) Contains a permanent set of software instructions that remains even if power is removed from the test set. Together, these instructions form a program known as the built-in operating system (BIOS).

- Input/output W/Q) Ports Circuits which process keyboard inputs and control the speaker output under control of the microprocessor.
  - Disk Controller Controls the operation of the 360 kB disk drive and the data flow between the drive and the microprocessor.
  - Timer Programmed by the microprocessor to produce signals at various frequencies. In the test set, the timer is used to produce an audio signal for the speaker.
  - Speaker Logic Gates the timer signal to the speaker by way of the TIMS interface board. The interface board may interrupt this signal and route its own signal to the speaker.
  - Direct Memory Access (DMA) Controller Allows direct transfers of data between memory (RAM) and other devices (such as disk drives or the DSP board) without routing the data through the microprocessor, which is normally done. This allows the microprocessor to perform other tasks while large amounts of data are being transferred. The DMA controller operates according to instructions provided by the microprocessor before the data transfer takes place.
  - Interrupt Controller The execution of a program by the microprocessor can be temporarily halted using a software interrupt instruction or a hardware interrupt signal. An interrupt causes the microprocessor to save where it is in the program and then branch to another small program. After that small program is finished, the microprocessor goes back to where it was in the original program and continues execution. The interrupt controller allows several devices (such as disk drives, graphics controller, keyboard, etc.) to interrupt the microprocessor, one at a time, to take care of their immediate needs. The interrupt controller is programmed by the microprocessor to determine the priority of interrupts and to enable or disable interrupts, as required.
  - Buffers Provide the signal strength necessary to drive the circuits to which they are attached. Most buffers can be turned on, turned off, or set to a high-impedance state. These are called tri-state buffers and are controlled by signals derived from the microprocessor.
  - Internal Data/Address/Control Bus Consists of 20 combined data/address signals and a number of individual control signals. The data signals are bi-directional (data can be transferred in both directions). The addresses are one-way signals from the microprocessor. Control signals are one-way signals to or from the microprocessor.
  - Bus Controller Programmed by the microprocessor to convert microprocessor data into signals which are used to control the memory and other circuits connected to the external data bus.
  - External Data/Address/Control Bus Similar to the internal bus. It contains eight bi-directional data lines, 20 unidirectional address lines, control signals from the bus controller, and interrupt request signals from the various devices connected to the bus. The external data/address/control bus is connected to all other circuits on the Faraday board as well as all other circuit boards. This allows the microprocessor to control the operation of the entire test set.
- (2) MOTHER BOARD - Allows various circuit boards to be connected to the external data/address/control bus. In addition, it contains an analog signal bus which interconnects the DSP board and the interface board.
- (3) IEEE-488 CONTROLLER - Converts microprocessor data into IEEE-488 data and control output signals and it converts IEEE-488 data and control input signals into data for the microprocessor. The CPU interface circuits decode or encode microprocessor commands while the GPIB interface controller decodes or encodes IEEE488 data and commands.

- (4) MB FIXED DISK DRIVE SYSTEM Consists of a fixed disk drive controller and a 10 MB fixed disk drive. The fixed disk controller automatically controls the operation of the fixed disk drive. When data are to be stored, the microprocessor notifies the controller and then transfers the data to the controller. The controller then writes the data to the disk drive. When data are to be retrieved, the microprocessor requests the data from the controller. The controller reads the data from the disk drive and sends the data to the microprocessor. The 10 MB fixed disk drive contains the disk operating system (DOS), a complete set of DOS utility programs, and TIMS/RL test software.
- (5) CONTROLLER BOARD Converts data from the microprocessor into video signals. These signals cause the cathode ray tube (CRT) display monitor to display characters or graphics that represent the data. The board contains a memory which stores character and graphics data provided by the microprocessor. The data in this memory is what is displayed on the CRT. The video output signals are supplied to both the CRT display monitor and a video output connector. The graphics controller board also contains a parallel printer driver interface circuit which is functionally separate from the graphics controller circuits.
- (6) DISPLAY MONITOR Consists of a high voltage circuit card and a CRT. The assembly receives a video signal, a horizontal sync signal (H) and a vertical sync signal (V) from the graphics controller and displays them on the CRT like a television.
- (7) (DIGITAL SIGNAL PROCESSING) BOARD A dedicated microprocessor-controlled system. The DSP board converts command and value data received from the microprocessor into the actions necessary to control TIMS/RL testing functions. The result data collected during TIMS/RL testing is manipulated and sent back to the microprocessor on the Faraday board.

The DSP board contains two microprocessors, one operating as the master processor and one operating as a slave processor. The master processor interfaces with the microprocessor in the Faraday board and controls the TIMS/RL received signal measurement functions. The slave processor controls the TIMS/RL transmitter functions. Each processor has its own memory. The programs necessary for operation of both processors are downloaded into memory by the TC system software during power up just before the main menu is displayed.

Received signals from the interface board are applied to an analog-to-digital converter (ADC). The ADC produces coded digital data that represent the characteristics of the received signal. These digital data are applied to opto-isolators. The isolators are used to change digital signal voltage levels. They convert digital input signals into light signals which are then converted back into digital signals. The digital data from the isolators are applied to the master processor. The master processor measures the characteristics of the received signal by analyzing the digital data representing the signal.

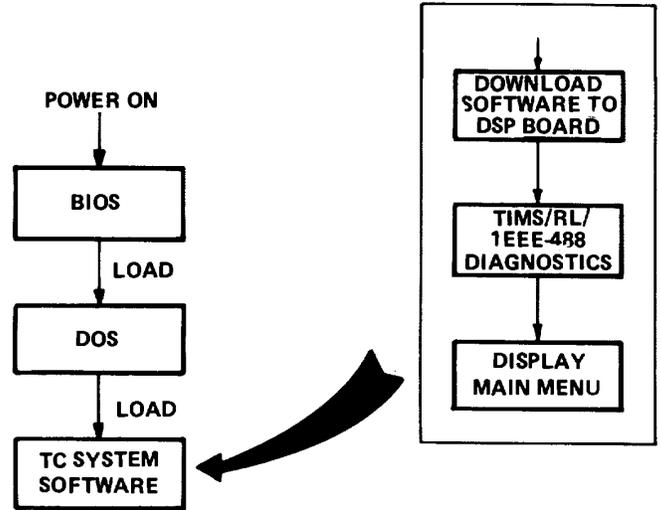
The slave microprocessor produces digital data representing the characteristics of the analog signal to be transmitted. These data are applied through opto-isolators to a digital-to-analog converter (DAC). The DAC converts the digital transmit data into analog transmit signals, which are then routed to the interface board.

- (8) INTERFACE BOARD Contains relays and various source and load impedance circuits that are controlled by a control logic circuit. The control logic receives data from the microprocessor in the Faraday board and converts these data into signals that control two-wire/four-wire termination, tip/ring, connector switching, impedance selection and talk battery relays. Additional signals from the control logic select the signal to be applied to the speaker.
- (9) ASSEMBLY Converts keystrokes into serial digital data which are applied to the I/O ports in the Faraday board. These I/O ports convert the serial data into parallel data and send the data to the microprocessor. The timing signals necessary for operation of the keyboard is provided by Faraday board.

*b. Test Set Software.* When power is first turned on, the BIOS (located in the PROM on the Faraday board) performs a power-on self test (POST), which checks the main circuits on the Faraday board as well as the

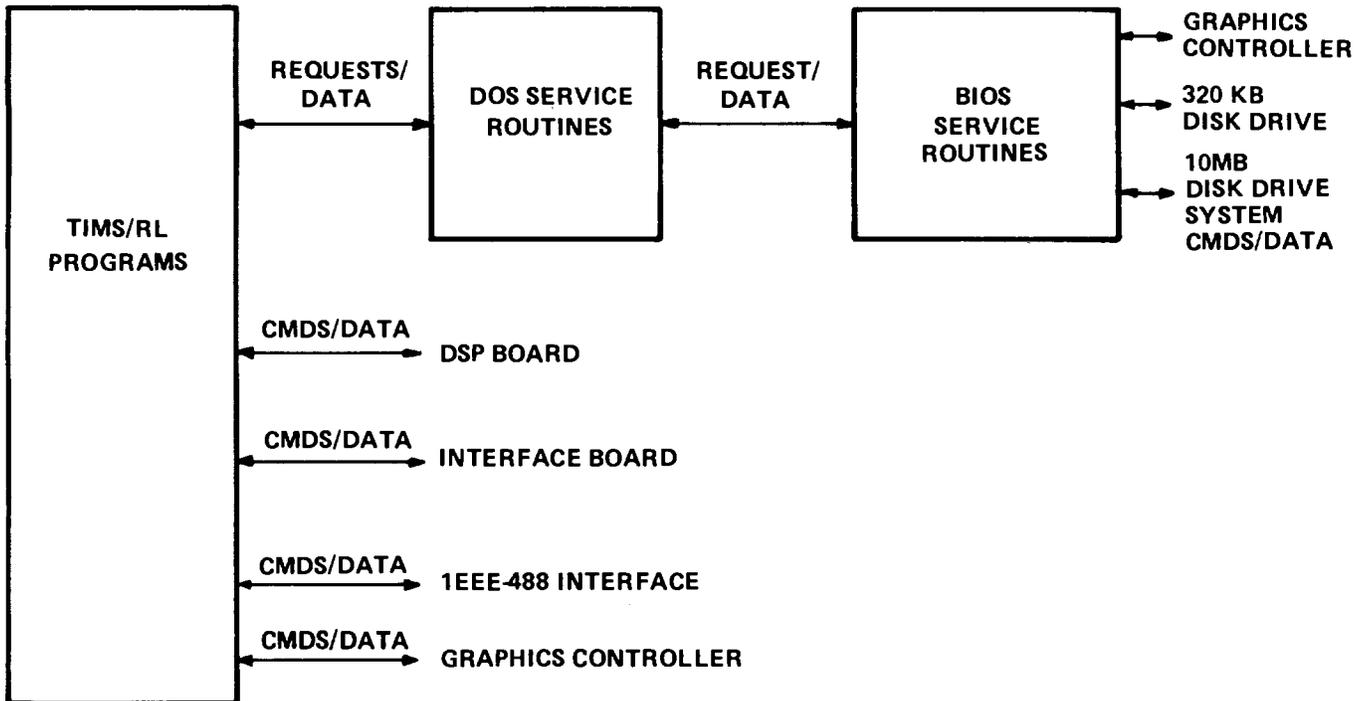
fixed disk system, the graphics controller and the 360 kB disk drive. If POST is successful, the operator is notified with a single long beep using the speaker. If a problem is found during POST, the operator is notified, if possible, using an error message on the CRT display monitor.

If the POST is successful, then the BIOS looks for the disk operating system (DOS). First, the 360 kB disk drive is checked. If there is no disk in the drive, it then checks the 10 MB fixed disk. If DOS cannot be found, the test set stops operation and displays a message. The DOS program must be on one of these disks or the test set cannot be operated. Normally, DOS is present on the fixed disk drive and the 360 kB disk drive is disabled with a door lock device. When DOS is found, BIOS loads DOS into RAM. After that, the BIOS transfers control of the test set to DOS.



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The DOS program manages the overall operation of the test set and automatically loads and executes the telecommunications (TC) system software located on the fixed disk drive. As soon as the TC system software is loaded, it takes control of the test set and loads a set of specialized programs into the DSP board master and slave processor memories. These specialized programs then control the operation of the DSP board. The TC system software controls the test set during normal operation until the test set is turned off again. The TC system software consists



CE1DV039

of a set of programs that display messages, accept operator keyboard inputs, interface with the programs in the DSP board, controls the TIMS interface board and communicates with the IEEE-488 interface controller. Thus, the operator never has occasion to interface directly with DOS. During maintenance of the test set, it may become necessary for the technician to interface with DOS.

When disk data needs to be read or written from disk, the TC system software programs use software service routines that are a part of DOS. These routines determine how the data on the disk drives are organized and where to read or write the data. The DOS service routines, in turn, use hardware access routines that are contained in the BIOS. These are the routines that actually communicate with the disk controllers. After initialization, the TC system software controls the DSP board, the TIMS interface board, the IEEE-488 interface controller and the graphics controller directly, without using DOS or BIOS routines.



## CHAPTER 2 UNIT MAINTENANCE PROCEDURES

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Common Tools And Equipment .....	2-1	2-1
Inspection .....	2-9	2-7
Installation Instructions.....	2-7	2-4
Introduction.....	2-8	2-7
Preliminary Servicing And Adjustment Of Equipment.....	2-6	2-2
Preparation For Storage Or Shipment .....	2-12	2-10
Repair Parts.....	2-3	2-1
Replace Fuse .....	2-11	2-9
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Troubleshooting Procedures .....	2-10	2-7
Types Of Storage .....	2-13	2-10
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### Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

#### 2-1. COMMON TOOLS AND EQUIPMENT.

Common tools and equipment required for unit maintenance of the test set are listed in the Maintenance Allocation Chart (MAC). See Appendix B.

#### 2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

No special tools or support equipment are required.

#### 2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 11-6625-3187-24P.

### Section II. SERVICE UPON RECEIPT

#### 2-4. UNPACKING.

The test set is shipped assembled in its original packing container. Unpack carefully and do not damage the container while unpacking. Save the container for use in reshipment.

#### 2-5. CHECKING UNPACKED EQUIPMENT

**a.** Inspect for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy (ROD) for use.

**b.** Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 750-8.

**c.** Check to see whether the equipment has been modified.

## 2-6. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT

This procedure covers:

- a. Checking Ac Voltage Setting
- b. Checking Ac Voltage Setting
- c. Installing Correct Fuse

### INITIAL SETUP:

#### Tools:

Tool Kit, TK-101/G

#### Parts:

SLO-BLO Fuse, 4 A (120 Volt operation) or SLO-BLO Fuse, 2 A (220 Volt operation)

#### Equipment Conditions:

Para. 2-4 test set. unpacked

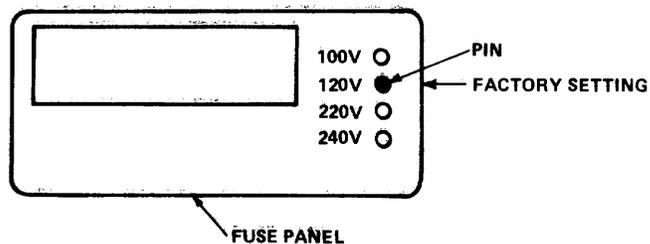
#### General Precautions:

### CAUTION

**Make sure that the AC voltage setting on the back of the test set matches the AC source voltage to be used. If this is not done, the test will be damaged.**

### CHECKING AC VOLTAGE SETTING

At the rear of the test set, observe the four holes in the fuse panel. The hole with the pin in it identifies the AC voltage Input setting. Verify that the setting is correct. If it is not, change the AC voltage setting.



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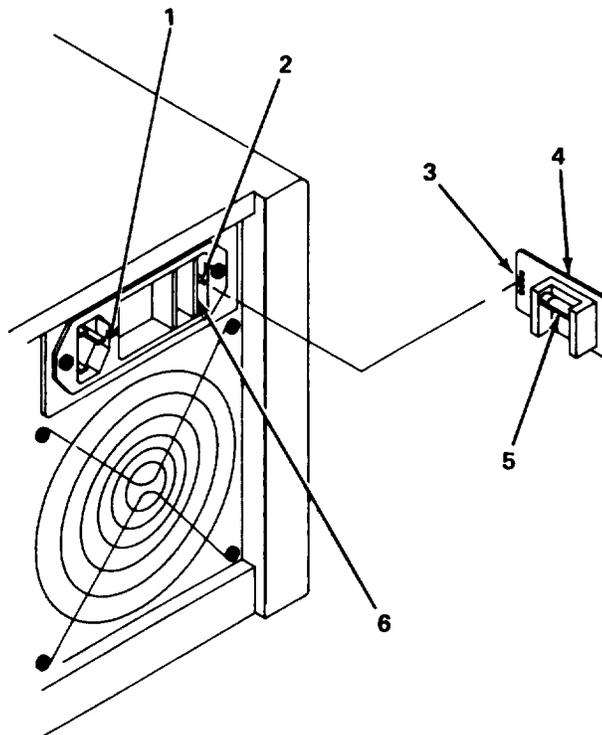
### CHANGING AC VOLTAGE SETTING

1. At the rear of the test set, remove the fuse panel (4) by Inserting a small flat-blade screwdriver into the slot (1) and carefully prying the panel out.
2. Using a pair of needle-nose pliers, remove the AC voltage programming circuit card (6).
3. Position the programming pin (2) on the AC voltage programming circuit card to select the required AC input voltage.
4. Re-install the AC voltage programming circuit card in its receptacle with the pin facing out.

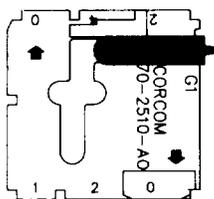
### INSTALLING CORRECT FUSE

1. If the selected AC input voltage is 100 or 120 VAC, make sure that the fuse (5) in the fuse panel (4) is a 4 Ampere, SLO-BLO. If the AC input voltage is 220 or 240 VAC, make sure that the fuse is a 2 Ampere, SLO-BLO.

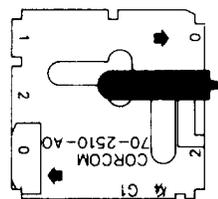
2-6. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT (CONTINUED)



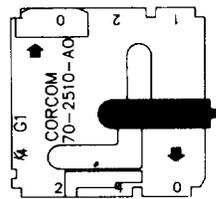
PROGRAMMING PIN POSITION AC VOLTAGE PROGRAMMING CIRCUIT CARD



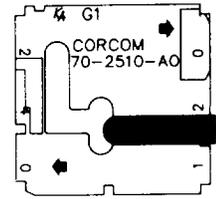
100 VAC



115 VAC  
(FACTORY SETTING)



220 VAC



240 VAC

CE1DV005

2. Re-install the fuse panel, making sure that the correct hole in the panel (3) mates with the pin (2) on the AC voltage programming circuit card. If it does not, remove the programming circuit card, turn it over and reinstall the circuit card.

**2-7. INSTALLATION INSTRUCTIONS**

This procedure covers:

- a. Desk Top Installation
- b. Installation
- c. Connections
- d. Installation Test

**INITIAL SETUP:**

**Tools:**

Tool Kit, TK-101/G

**General Precautions:**

**Parts (for Rack Mount Installation):**

Rack mounting screws, 6 ea. (supplied with rack)

**WARNING**

**The test set weighs 39 pounds. Two persons are required to lift it.**

**Equipment Conditions:**

Para 2-7, Preliminary Servicing and Adjustment of Equipment

**DESK TOP INSTALLATION**

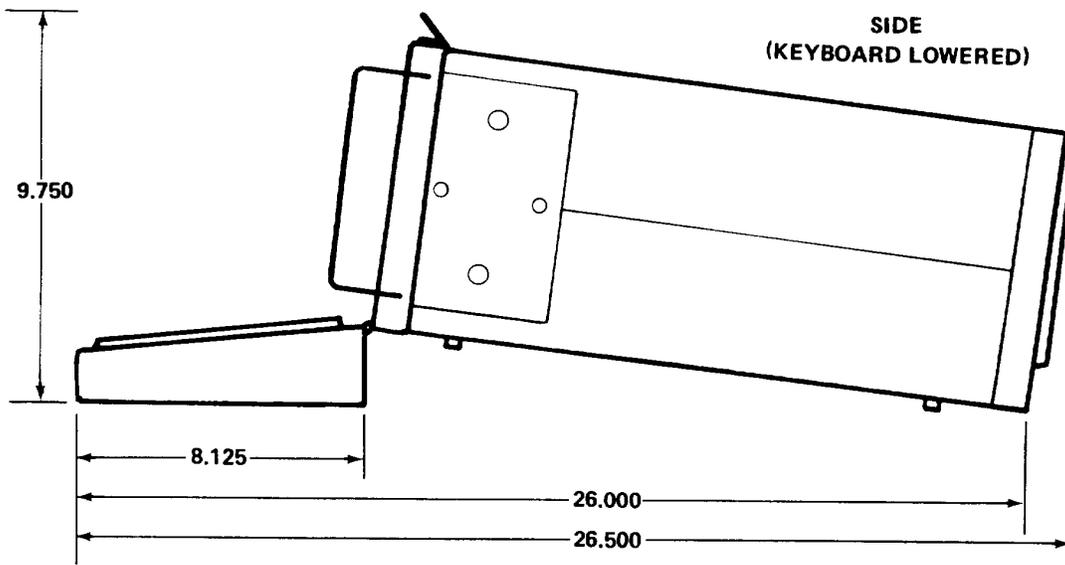
1. Place test set on a surface measuring at least 20 inches wide by 30 inches deep.
2. Unlatch keyboard. Lift front of test set slightly and lower keyboard. The front of the test set will rest on the rear of the keyboard.

**RACK INSTALLATION**

1. Prepare rack to accept test set using the following test set dimensions as a guide. Make sure to leave enough room to lower the keyboard without impacting other equipment.
2. Install test set into rack and secure with six rack mounting screws.

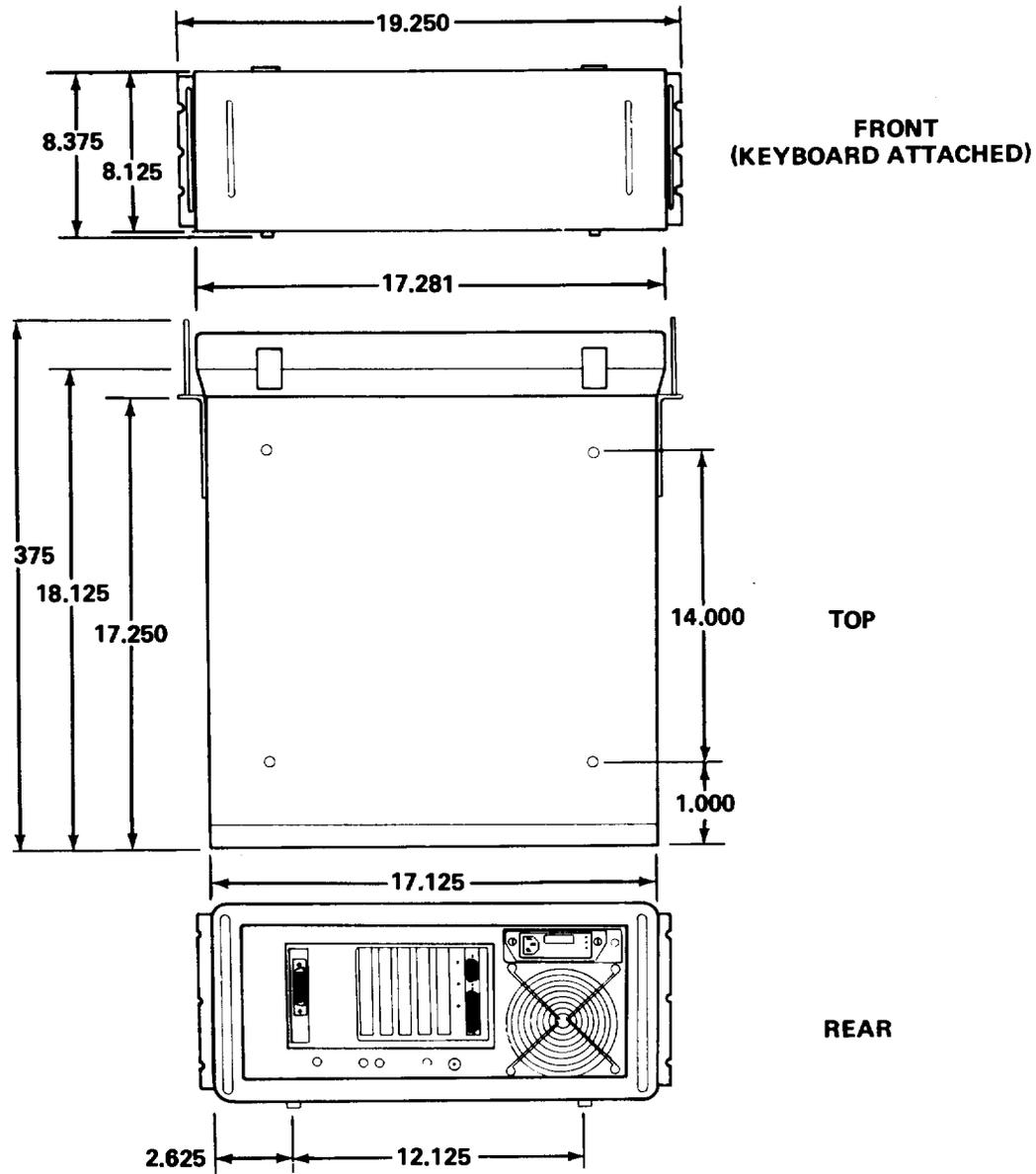
**CONNECTIONS**

1. Connect the rear panel grounding lug (1) to station ground.



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2-7. INSTALLATION INSTRUCTIONS (CONTINUED)



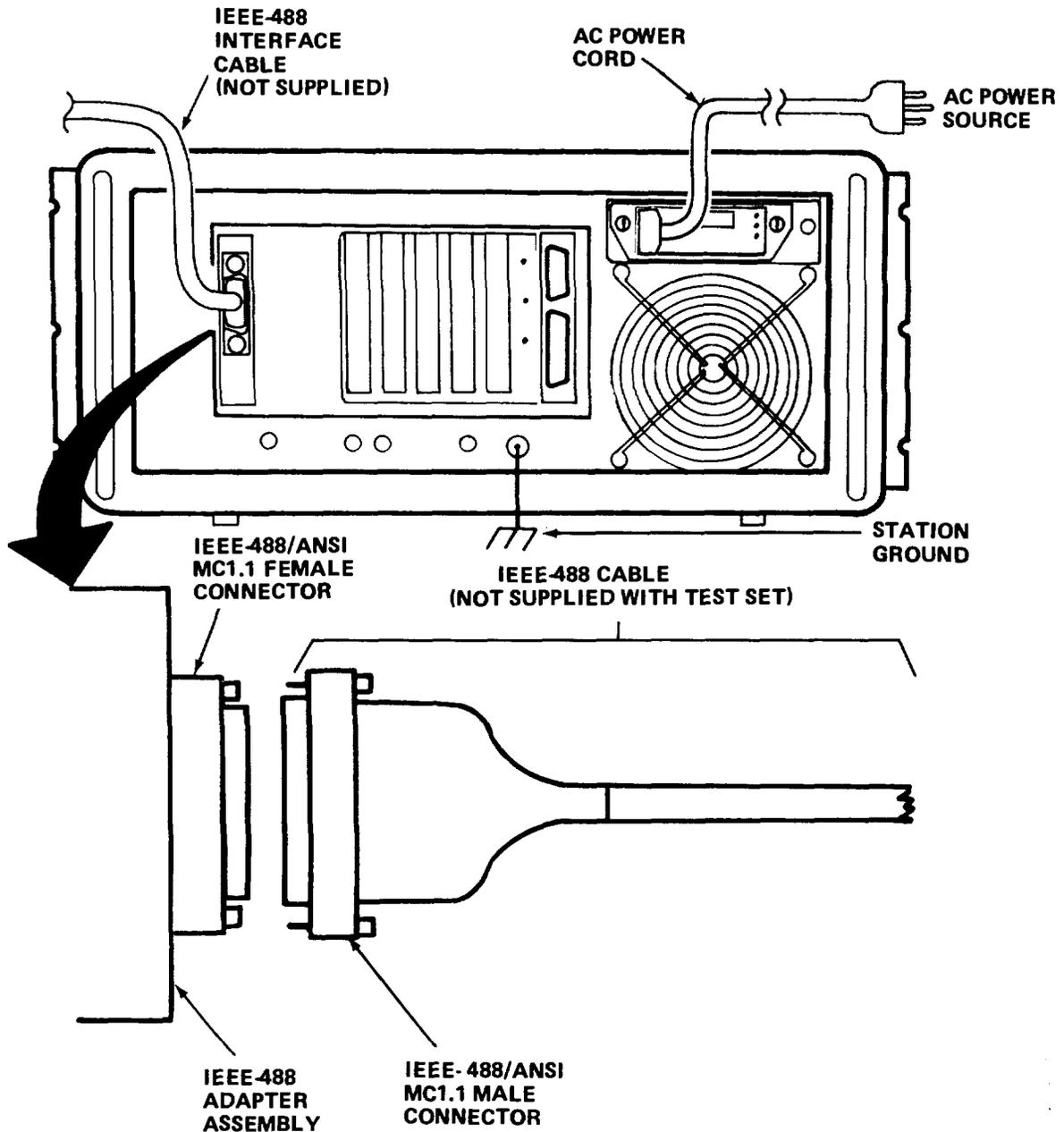
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**2-7. INSTALLATION INSTRUCTIONS (CONTINUED)**

2. If the test set is to be controlled remotely, connect IEEE-488 cable (part of the station equipment) to the IEEE-488 interface connector (2) on the test set.
3. Connect one end of the AC power cord to the test set power connector (3) and the other end to the correct AC power source (para 2-6).

**INSTALLATION TEST**

Power up the test set and perform self test (TM 11-6625-3187-10).



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**Section III. TROUBLESHOOTING**

**SYMPTOM INDEX**

<b>Symptom</b>	<b>Page</b>
1. FAN IS NOT OPERATING .....	2-8
2. TEST SET DOES NOT POWER UP PROPERLY.....	2-8
3. IEEE488 COMMUNICATIONS DOES NOT WORK .....	2-8

**2-8. INTRODUCTION**

Troubleshooting at the unit maintenance level requires that all troubles be located as quickly as possible. The amount of troubleshooting permitted is based on the Maintenance Allocation Chart (MAC) allowance for your activity. Because of this, the only trouble symptoms contained here are those that could be caused by defects that you can repair. If other trouble symptoms appear or if you can not repair the test set, record the symptoms on a tag, affix the tag to the test set and return the test set to the intermediate general support maintenance facility.

**NOTE**

**Before using this troubleshooting section, check the equipment work order and talk to the operator, if possible, for a description of symptoms.**

**2-9. INSPECTION**

- a. Make sure that the test set is connected to the AC power source. Check AC power cord for split or damaged insulation and make sure that no wires are exposed. Replace AC power cord if damaged.
- b. Make sure that the keyboard is firmly connected to the keyboard connector on the front panel of the test set next to the power switch.
- c. Check keyboard cable for signs of split insulation, damaged connector or broken connector lock. Verify that keys with legends move freely and spring up when released. Check keyboard for missing key caps or broken case.

**2-10. TROUBLESHOOTING PROCEDURE**

The symptom index lists troubleshooting symptoms and the page where the appropriate troubleshooting procedure is located. If the exact symptom is not known when you receive the test set, power up the test set and do the self test (TM 11-6625-3187-10) first. After troubleshooting has been completed and the test set has been repaired, power up the test set and do the self test again.

**2-10. TROUBLESHOOTING PROCEDURES (CONTINUED)****MALFUNCTION****TEST OR INSPECTION****CORRECTIVE ACTION****1. FAN IS NOT OPERATING.**

Step 1. Check that test set is receiving AC power

- Connect AC power cord to active AC power source.

Step 2. Check fuse on rear panel.

- Replace fuse (para 2-11) and make sure that fuse does not blow again when power is applied to the test set.

**2. TEST SET DOES NOT POWER UP PROPERLY.**

Check to see if the message "KEYBOARD ERROR" is displayed on the CRT display monitor during power up.

- Make sure that keyboard is connected to keyboard connector on main chassis (next to power switch).

**3. IEEE-488 REMOTE CONTROL CAPABILITY DOES NOT WORK.**

Turn off test set, wait about 10 seconds and turn on test set. Set up test set for remote communications (TM 11 -6625-3187-10) and re-try remote control.

- Make sure that IEEE-488 cable (from other station equipment) is connected to IEEE-488 adapter assembly connector at rear of main chassis and secured with screws.

## Section IV. MAINTENANCE PROCEDURES

### 2-11. REPLACE FUSE

This procedure covers:      a. Removal                      b. Installation

#### INITIAL SETUP

##### Tools:

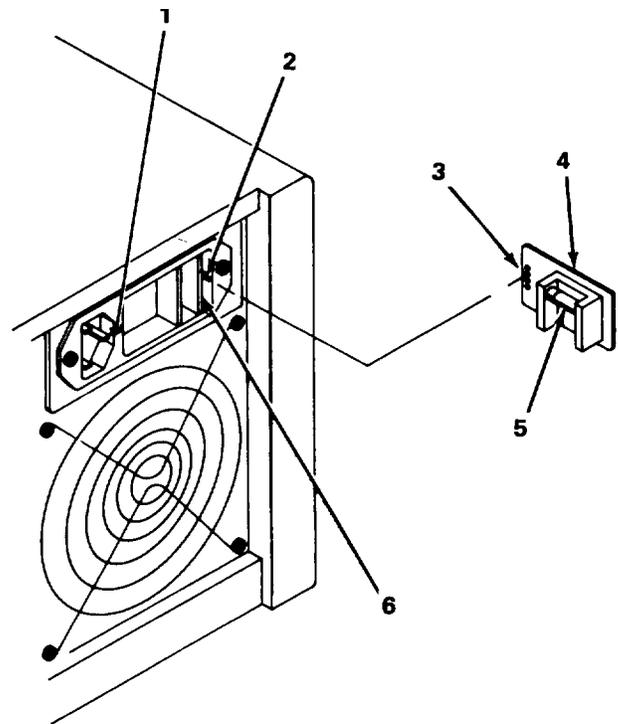
Tool Kit, TK-101/G

##### Parts:

SLO-BLO Fuse, 4 A (120 Volt operation) or SLO-BLO Fuse, 2 A (220 Volt operation)

#### REMOVAL

1. Disconnect all cables from back of test set. If test set is installed in a rack and the back of the test set cannot be accessed, remove the test set from the rack.
  - a. Remove screws securing test set to rack.
  - b. Pull test set straight out until the back can be accessed.
  - c. Disconnect cables from back of test set.
  - d. Place test set on work surface.
2. Remove the fuse panel (4) by inserting a small flatblade screwdriver into the slot (1) and carefully prying the panel out.



#### INSTALLATION

1. If the fuse (5) is bad, replace it with a SLO-BLO fuse that has the same current rating (2 A or 4 A) as the old fuse.
2. Re-install the fuse panel, making sure that the correct hole in the panel (3) mates with the pin (2) on the AC voltage programming circuit card (6).
3. Connect the AC power cord and IEEE-488 interface cable (if applicable) to the back of the test set. Install test set in rack, if applicable (para. 2-7).
4. Turn on test set and perform self test (TM 11-6625-3187-10) to verify proper operation.

## 2-12. PREPARATION FOR STORAGE OR SHIPMENT

If the original packing material was saved, pack the test set in the same manner as it was received. When using packing materials other than the original, use the following procedure.

- a. Wrap the test set in treated anti-static polyethylene sheeting before placing it in the container.
- b. Select a corrugated cardboard container having inside dimensions at least 6 inches greater than the test set and having a carton test strength of at least 75 pounds.
- c. Use plenty of shock-absorbing material all around the test set to protect against damage.
- d. Seal the carton with shipping tape or an Industrial stapler.
- e. Mark the carton "FRAGILE - DEUCATE INSTRUMENT" to ensure proper handling.

## 2-13. TYPES OF STORAGE

- a. *Short-Term (Administrative)* = 1 to 45 days. The storage site should provide protection from extreme weather conditions and allow you to reach it for inspections or exercises if needed.
- b. *Intermediate* = 46 to 180 days.
- c. *Long-Term* = over 180 days.

**CHAPTER 3  
INTERMEDIATE DIRECT SUPPORT MAINTENANCE  
PROCEDURES**

**3-1. INTERMEDIATE DIRECT SUPPORT MAINTENANCE**

There is no intermediate direct support maintenance authorized for the test set.



**CHAPTER 4  
INTERMEDIATE GENERAL SUPPORT MAINTENANCE  
PROCEDURES**

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Replace Power Switch .....	4-17.	4-25
Replace Speaker .....	4-16.	4-25
Replace 10 MB Fixed Disk System.....	4-22.	4-38
Replace 360 KB Disk Drive .....	4-23.	4-41
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Troubleshooting Setup And Inspection.....	4-5.	43

**Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT**

**4-1. COMMON TOOLS AND EQUIPMENT**

Common tools and equipment required for intermediate general support maintenance of the test set are listed in the Maintenance Allocation Chart (MAC) in Appendix B.

**4-2. SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT**

No special tools or support equipment are required.

**4-3. REPAIR PARTS**

Repair parts are listed and Illustrated in the Repair Parts and Special Tools List (TM 11-6625-3187-24P).

**Section II. TROUBLESHOOTING**

**SYMPTOM INDEX**

<b>Symptom</b>	<b>Page</b>
1. FAN IS NOT OPERATING .....	4-4
2. CRT DISPLAY MONITOR REMAINS TOTALLY BLANK .....	4-5
3. CRT DISPLAY MONITOR REMAINS BLANK EXCEPT FOR BLINKING CURSOR .....	4-7
4. CRT DISPLAY MONITOR DISPLAYS ERROR MESSAGE DURING POWER UP .....	4-7
5. TC 2000 SYSTEM CONFIGURATION DISPLAY INDICATES "SYSTEM FAILED" .....	4-7
6. DURING NORMAL OPERATION (NOT USING 360 KB DISK DRIVE), CRT DISPLAYS ERROR MESSAGE .....	4-7
7. ONE OR MORE SELF TESTS FAIL .....	4-8
8. TRANSMIT OUTPUT SIGNAL LEVEL INCORRECT .....	4-8
9. TRANSMIT OUTPUT SIGNAL FREQUENCY INCORRECT .....	4-8
10. RECEIVE LEVEL MEASUREMENTS INCORRECT .....	4-8
11. IEEE-488 COMMUNICATIONS DOES NOT WORK .....	4-8
12. WHILE USING 360 KB DISK DRIVE, CRT DISPLAYS AN ERROR MESSAGE .....	4-9
13. SPEAKER NEVER PRODUCES SOUND .....	4-9
14. AUDIO VOLUME CANNOT BE CHANGED .....	4-10
15. SPEAKER DOES NOT PRODUCE TONES DURING OPERATION .....	4-10

**4-4. INTRODUCTION TO TROUBLESHOOTING**

Troubleshooting at the Intermediate general support maintenance level requires that all troubles be located as quickly as possible. The amount of troubleshooting permitted is based on the Maintenance Allocation Chart (MAC) allowance for your activity (Appendix B). Because of this, the only trouble symptoms contained here are those that could be caused by defects that you can repair.

**NOTE**

**Before using this troubleshooting section, check equipment work order and talk to unit maintenance personnel, if possible, for a description of symptoms and steps taken to correct them. Check all forms and tags attached to, or accompanying equipment to determine reason for removal from service.**

4-5. TROUBLESHOOTING SETUP AND INSPECTION

a. Inspect keyboard assembly for broken or missing keycaps. Inspect keyboard cable for damaged insulation and for damaged connector lock (plastic tab on top of connector).

b. Remove top and bottom covers (para. 4-8).

c. Make sure that all cables and wires are connected (fig. FO-2).

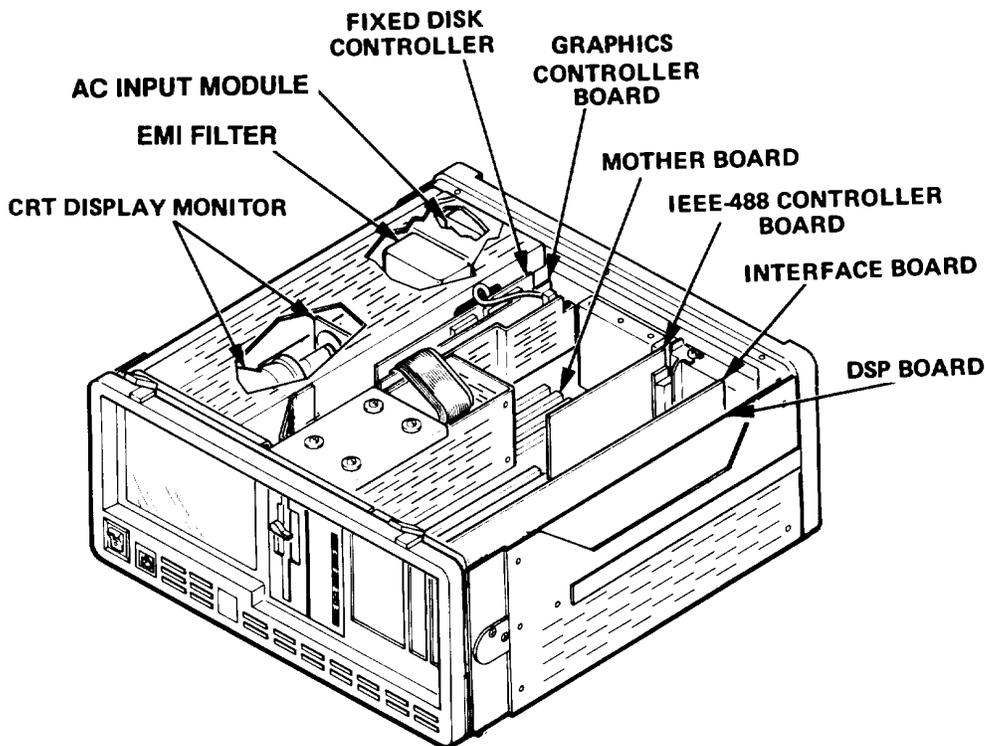
d. Make sure that all assemblies are present. Inspect each assembly for loose or damaged parts. Replace damaged assemblies.

e. Check mother board for damaged connectors. Replace mother board if damaged.

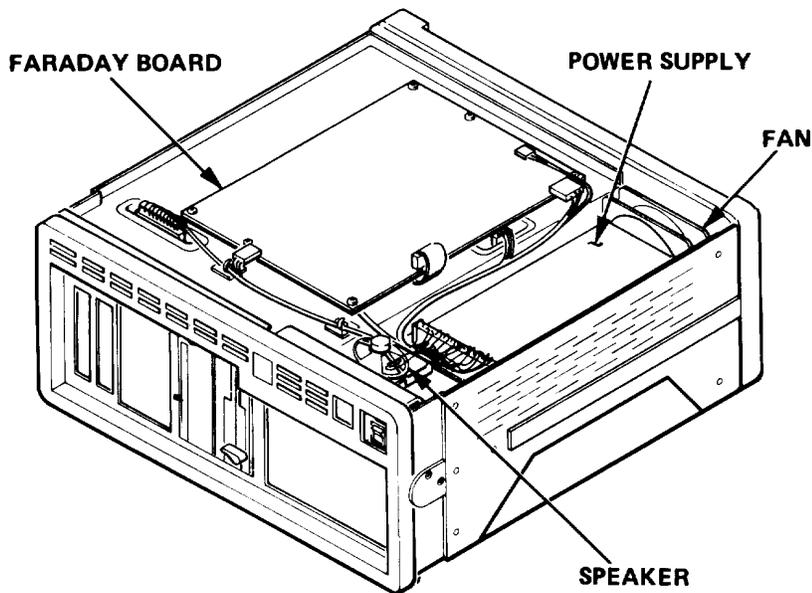
f. Check all wiring, harnesses and ribbon cables for loose connections or damaged insulation. Replace as required.

g. Do the performance tests (para. 4-31).

h. Refer to the symptom index and go to the troubleshooting procedures (next paragraph).



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CE1DV004

**4-6. TROUBLESHOOTING PROCEDURE**

The power distribution and wiring in the test set is shown on fig. FO-2. The performance test (para. 4-31) can be used to determine what part of the instrument has a malfunction. If any indication is out of tolerance during performance test, go to the alignment procedure (para. 432) and align the test set. The symptom index lists troubleshooting symptoms and the page where the appropriate troubleshooting procedure is located. After troubleshooting has been completed and the test set has been repaired, do both the performance test and the alignment procedure.

**WARNING**

**With power on and the covers removed, several dangerous voltage points may be exposed. Contact with these points could cause serious injury or death.**

**NOTES**

- Use DM 501A multimeter for all measurements.
- All measurements are made with respect to chassis ground.

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
--------------------	---------------------------	--------------------------

**1. FAN IS NOT OPERATING.**

Step 1. Check that test set is receiving AC power.

- Check AC voltage setting of AC input module (para. 2-6).
- Connect power cord to active AC power source.

Step 2. Check continuity of fuse on rear panel.

- Replace fuse if open (para. 2-11).
- If fuse blows a second time, replace power supply (para. 4-24).

Step 3. Measure AC source voltage across the L (line) and N (neutral) terminals of TB101 on power supply. If  $115 \pm 7$  volts is present, go to step 5.  
If voltage is not present, go to step 4.

Step 4. Remove high voltage cover (para. 4-9). Refer to figure FO-2 and check for  $115 \pm 7$  volts at input and output of EMI filter to troubleshoot power switch, EMI filter and AC input module.

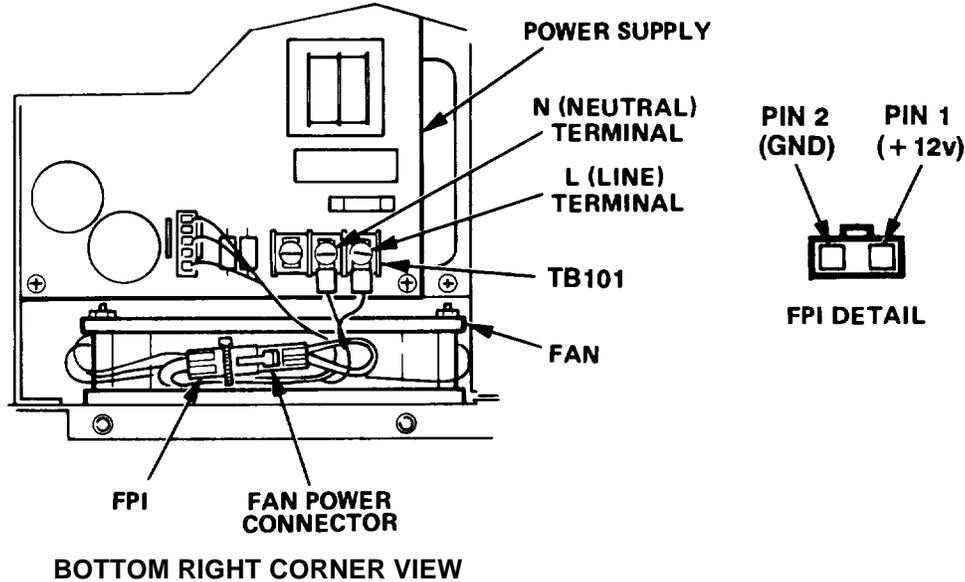
- Replace power switch if defective (para. 4-17).
- Replace EMI filter if defective (para. 4-18).
- Replace AC input module if defective (para. 4-26).

Step 5. Disconnect connector FP1 from the fan power connector. Check for  $+ 12 \pm 0.4$  Vdc at connector FP1 (fig FO-2).

- If voltage is present, replace fan.
- If voltage is not present and wiring is good, replace power supply (para. 4-24).

4-6. TROUBLESHOOTING PROCEDURE (CONTINUED)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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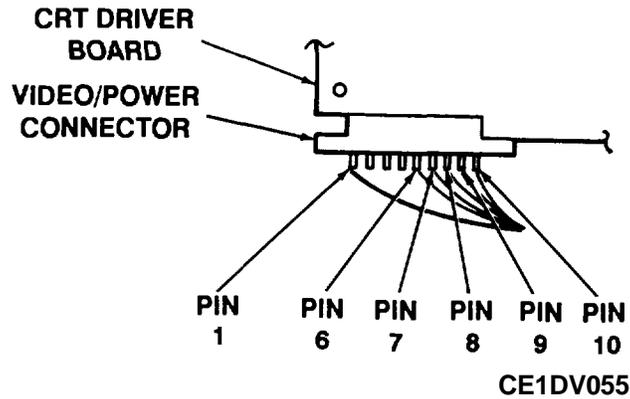
CE1 DV041

2. CRT DISPLAY MONITOR REMAINS TOTALLY BLANK.

- Step 1. Turn off power and remove high voltage cover (para. 4-9).
- Step 2. Connect multimeter between pin 7 (positive) and pin 1 (negative) of video/power connector. Set multimeter to read dc voltage.
- Step 3. Turn on test set and verify that multimeter indicates + 12 +0.6 Vdc.
  - If voltage is incorrect, replace power supply (para. 4-24).
- Step 4. Turn off test set.
- Step 5. Set multimeter to read ac voltage. Connect multimeter between pins 6 and 10 of video/power connector.
- Step 6. Turn on test set and verify that multimeter indicates more than 0 VAC.
  - If multimeter indicates no ac voltage, replace graphics controller board (para. 4-15).
- Step 7. Turn off test set.

4-6. TROUBLESHOOTING PROCEDURE (CONTINUED)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------



- Step 8. Connect multimeter between pins 8 and 10 of video/power connector.
- Step 9. Turn on test set and verify that multimeter indicates more than 0 Vac.
  - If multimeter indicates no ac voltage, replace graphics controller board (para. 4-15).
- Step 10. Turn off test set.
- Step 11. Connect multimeter between pins 9 and 10 of video/power connector.
- Step 12. Turn on test set and verify that multimeter indicates more than 0 Vac.
  - If multimeter indicates no ac voltage, replace graphics controller board (para. 4-15).
  - If multimeter indicated an ac voltage in steps 6, 9 and 12 above, replace CRT display monitor (para. 4-19).

**4-6. TROUBLESHOOTING PROCEDURE (CONTINUED)**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

3. CRT DISPLAY MONITOR REMAINS BLANK EXCEPT FOR BLINKING CURSOR
  - If power Indicator on 10 MB fixed disk drive is not on, replace 10 MB fixed disk drive system.
  - If power indicator on 10 MB fixed disk drive is on, format 10 MB fixed disk drive system (para. 4-29) and load software (para. 4-30).
  - If you cannot format the disk or if software cannot be loaded, replace 10 MB fixed disk drive system.
  
4. CRT DISPLAY MONITOR DISPLAYS ERROR MESSAGE DURING POWER UP 4-5
  - If one of the following error codes is displayed, replace Faraday board (para. 4-21).
    - RAM ERROR
    - PARITY ERROR
  - If the following error code is displayed, repair keyboard assembly (para. 4-11).
    - KEYBOARD ERROR
  - If error code 1701 is displayed, replace 10 MB fixed disk drive system (para. 4-22).
  
5. TC 2000 SYSTEM CONFIGURATION DISPLAY INDICATES "SYSTEM FAILED".
 

Turn off test set, wait about 10 seconds and turn on test set. Write down the malfunction Indication displayed on the final TC 2000 SYSTEM CONFIGURATION display

  - If "DSP failure" is indicated, replace DSP board (para. 4-14).
  - If "Interface failure" is indicated, replace interface board (para. 4-13).
  - If "IEEE-488 failure" is indicated, replace IEEE-488 controller board (para. 4-12).
  
6. DURING NORMAL OPERATION (NOT USING 360 KB DISK DRIVE), CRT DISPLAYS AN ERROR MESSAGE.
 

Make a note of the message that was displayed.

  - If one of the following messages was displayed, format 10 MB disk drive system (para. 4-29) and load software (para. 4-30). If message appears again, replace the 10 Mb disk drive system (para. 4-22).
    - Read fault error reading drive c:  
Abort, Retry, Ignore \_
  
    - Write fault error writing drive c:  
Abort, Retry, Ignore \_

**4-6. TROUBLESHOOTING PROCEDURE (CONTINUED)**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

Seek error reading drive c:  
Abort, Retry, Ignore \_

Data fault error reading drive c:  
Abort, Retry, Ignore \_

- If one of the following messages was displayed, turn off test set, wait 10 seconds and turn on test set. If message occurs again, replace DSP board (para. 4-14).

Bad return value = xx (where each x is a digit)

The TIMS instrument is not available.

DSP OVERRUN

TIMEOUT (1)

TIMEOUT (2)

Timeout

**7. ONE OR MORE SELF TESTS FAIL**

- Replace DSP board (para. 4-14).
- Replace Interface board (para. 4-13).

**8. TRANSMIT OUTPUT SIGNAL LEVEL INCORRECT.**

Do alignment procedure (para. 4-32).

- Replace DSP board (para. 4-14).
- Replace interface board (para. 4-13).

**9. TRANSMIT OUTPUT SIGNAL FREQUENCY INCORRECT.**

- Replace DSP board (para. 4-14).

**10. RECEIVE LEVEL MEASUREMENTS INCORRECT.**

- Replace DSP board (para. 4-14).
- Replace interface board (para. 4-13).

**11. IEEE-488 COMMUNICATIONS DOES NOT WORK.**

Verify that IEEE-488 cable from external system is connected to IEEE-488 interface connector on rear panel.

## 4-6. TROUBLESHOOTING PROCEDURE (CONTINUED)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

- If cable is present, remove IEEE-488 controller and check IEEE-488 bus address and system controller/device switch settings (para. 4-12).
- If switch settings are correct, replace IEEE-488 controller board (para. 4-12).

## 12. WHILE USING 360 KB DISK DRIVE, CRT DISPLAYS AN ERROR MESSAGE.

**NOTE**

**The alignment keyboard (P/N 93000002) must be connected while using the 360 kB disk drive.**

- Step 1. If the following message has been displayed, make sure that diskette is inserted with its label facing left and that drive lever is turned to the horizontal position. Then, press "R" for retry.

Not ready error reading drive a:  
Abort, Retry, Ignore \_

- Step 2. If one of the following messages occurs, make sure that diskette is inserted with its label facing left. If it is, the flexible diskette being used may be faulty. Obtain a new copy of the diskette.

Read fault error reading drive a:  
Abort, Retry, Ignore

Write fault error writing drive a:  
Abort, Retry, Ignore \_

Seek error reading drive a:  
Abort, Retry, Ignore \_

Data fault error reading drive a:  
Abort, Retry, Ignore \_

- If error message still occurs, replace 360 kB disk drive (para. 4-23).

## 13. SPEAKER NEVER PRODUCES SOUND.

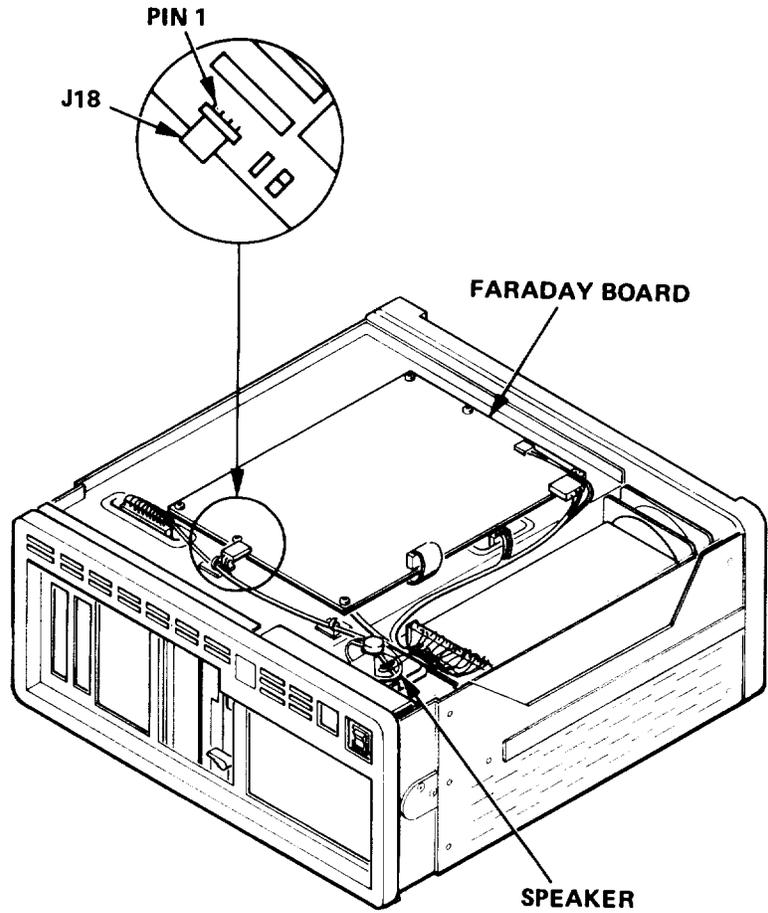
- Step 1. Turn off test set. Connect multimeter to Faraday board connector J 18, pin 1 and chassis ground. Turn on test set and observe multimeter. Multimeter indication should go to between 4.5 and 5 Vdc for about 10 seconds, then drop to between 0 and 0.5 Vdc for about 1 second, and then return to between 4.5 and 5 Vdc.

- Replace Faraday board (para. 4-21).

- Step 2. Turn off test set. Unsolder red wire from speaker. Connect multimeter between end of red wire and chassis. Turn on test set and observe multimeter. Multimeter should momentarily indicate about 0.30 VAC.

4-6. TROUBLESHOOTING PROCEDURE (CONTINUED)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------



CE1 DV042

- If no voltage indication occurs, resolder red wire to speaker and replace interface board (para. 4-13).
- If voltage indication does occur, replace speaker (para. 4-16).

14. AUDIO VOLUME CANNOT BE CHANGED.

- Replace interface board (para. 4-13).

15. TEST SET BEEPS WHEN POWER IS APPLIED BUT NO TONES ARE PRODUCED DURING OPERATION.

- Increase volume with VOL keys.
- Replace interface board (para. 4-13).

## Section III. MAINTENANCE PROCEDURES

**4-7. REMOVE AND INSTALL DISK DRIVE COVER**


---

This procedure covers:

a. Removal

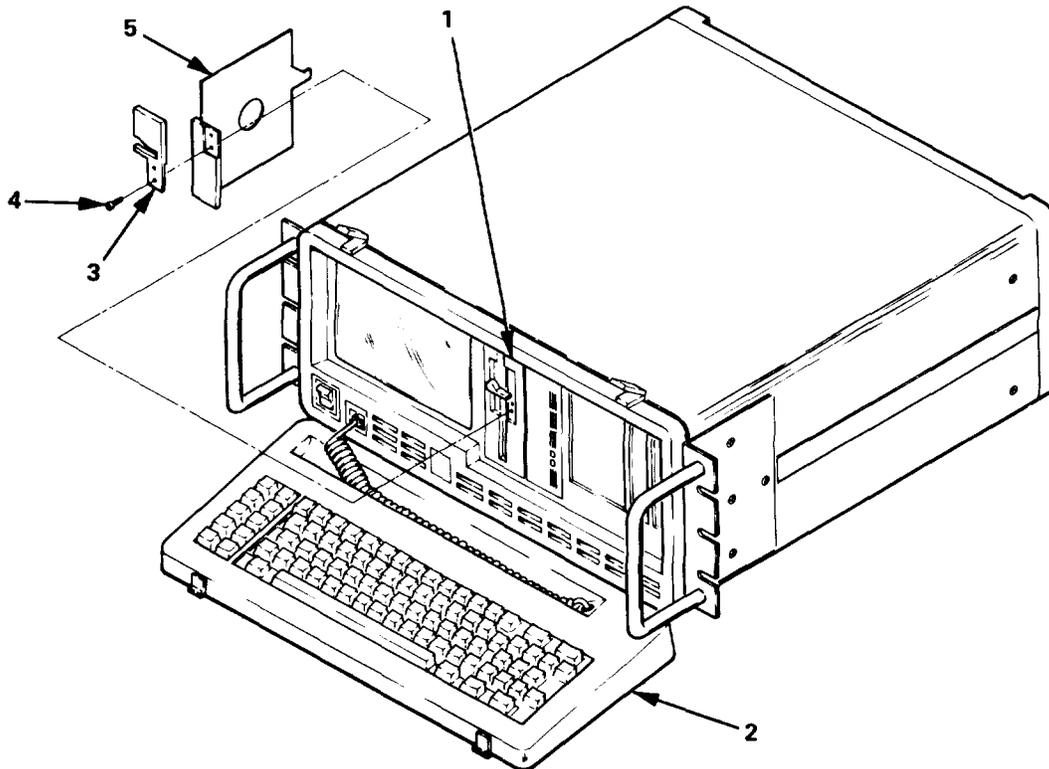
b. Installation

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**REMOVAL**

1. Unlatch and lower keyboard (2).
2. Remove two screws (4) and remove disk drive lever lock (3).
3. Twist drive lever to the vertical position and carefully pull disk drive insert assembly (5) all the way out.



CE1DVO10

**INSTALLATION**

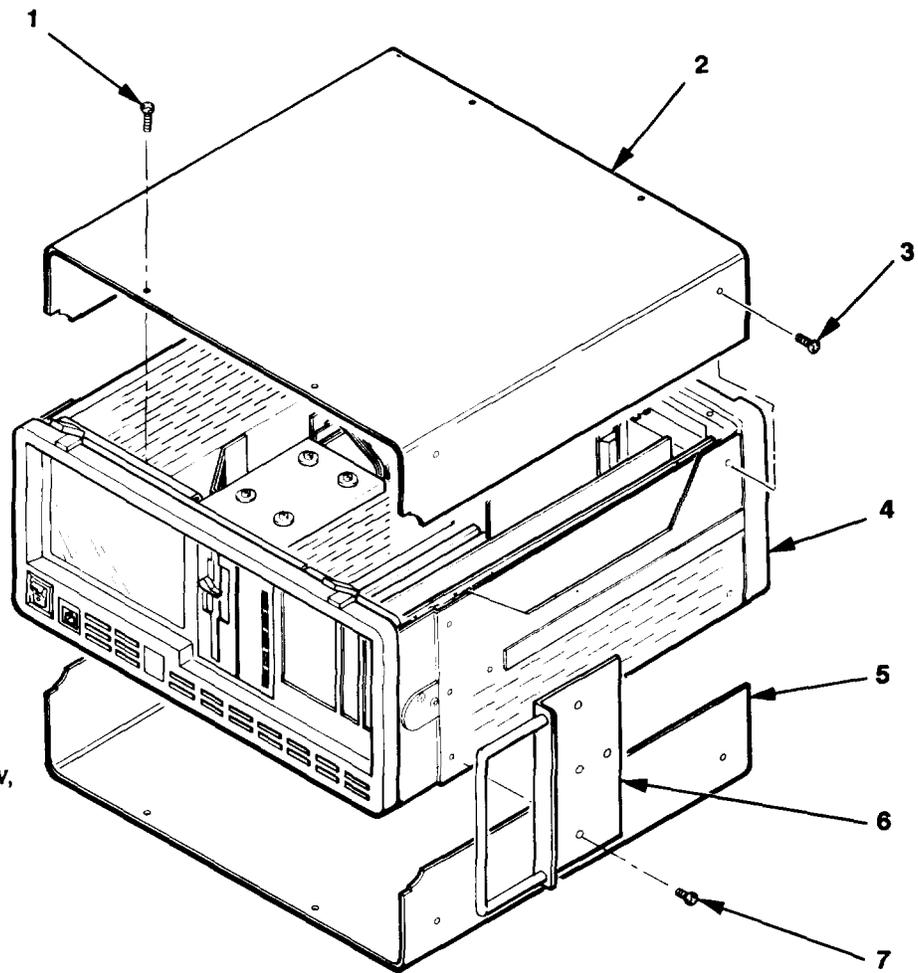
1. Twist drive lever to the vertical position. Remove disk, if present.
  2. Insert disk drive insert assembly (5) into drive (1) until the cover is flush with the drive surface and twist drive lever to the horizontal position.
  4. Position disk drive lever lock (3) over lever and secure with two screws (4).
-



**4-8. REMOVE AND INSTALL TOP AND BOTTOM COVERS (CONTINUED)**

head screws (7) and remove rack adapter (6). Mark left and right rack adapters for later installation.

- b. On top cover (2), remove four flat head screws on top (1).
- c. Remove two flat head screws (3) on each side.
- d. Lift rear of top cover up, pull cover back about one inch to clear keyboard latches, and then lift cover straight up.
- e. Turn test set over and repeat substeps b, c and d to remove bottom cover (5).



TEST SET S/N 061 AND ABOVE

CE1DV043

**INSTALLATION**

1. On test set, S/N 60 and below, install covers as follows:

- a. Position forward part of top cover under keyboard latches and lower cover in place.
- b. Install four 3/8-inch screws (1) on top of cover but do not tighten.
- c. Install two 1/4-inch pan-head screws (4) on each side of cover but do not tighten.
- d. Install one 1/4-inch flat-head screw (5) on each side of cover. Tighten all screws.
- e. Install bottom cover, if required, by repeating substeps a through d.
- f. Install rack adapter (7) on each side using six 3/8-inch flat-head screws (8).

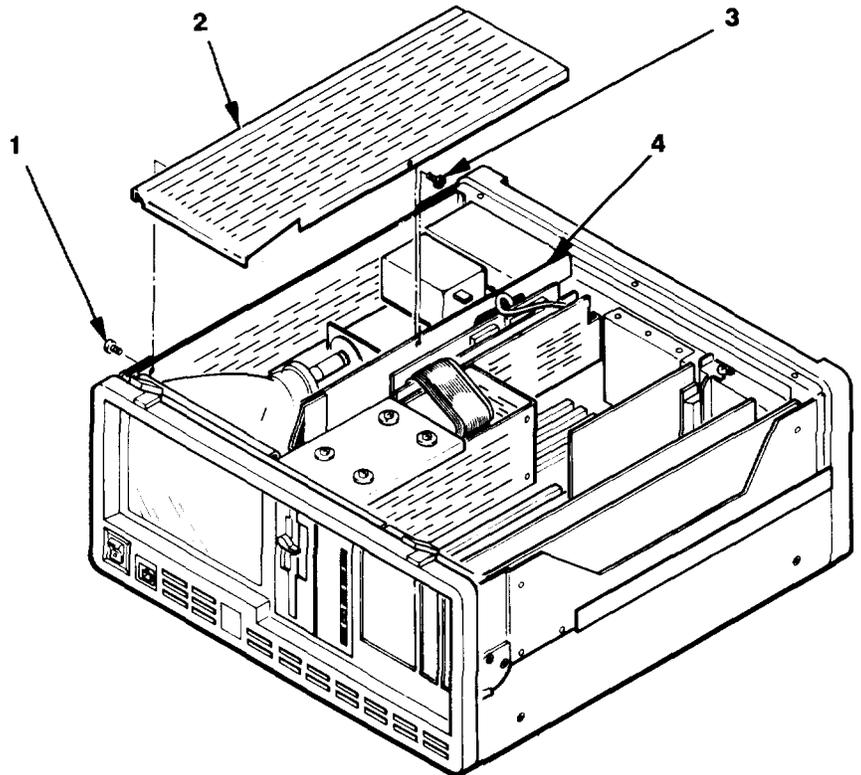
2. On test set, S/N 61 and above, install covers as follows:

- a. Position forward part of top cover under keyboard latches and lower cover in place.
- b. Secure cover with four screws (1) on top of cover and two screws (3) on each side.
- e. Install bottom cover, if required, by repeating substeps a and b.
- f. Install rack adapter (6) on each side using four screws (7).



**4-9. REMOVE AND INSTALL HIGH VOLTAGE COVER (CONTINUED)****INSTALLATION**

1. Turn power off and unplug power cord at rear of test set.
2. On test set serial number 061 or above:
  - a. Engage holes in right side of cover (2) with guide pins (4) and lower cover into place.
  - b. Secure left side of cover with three flat head screws (1).
  - c. Secure right side of cover with one screw (3).
3. On test set serial number 060 or below:
  - a. Lower cover (2) into place.
  - b. Secure left side of cover with four flat head screws (1).
  - c. Secure right side of cover with three screws (3).
4. Install top cover (para. 4-8).



TEST SET S/N 061 AND ABOVE

CE1DV057

**4-10. REMOVE AND INSTALL FRONT BEZEL**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**REMOVAL**

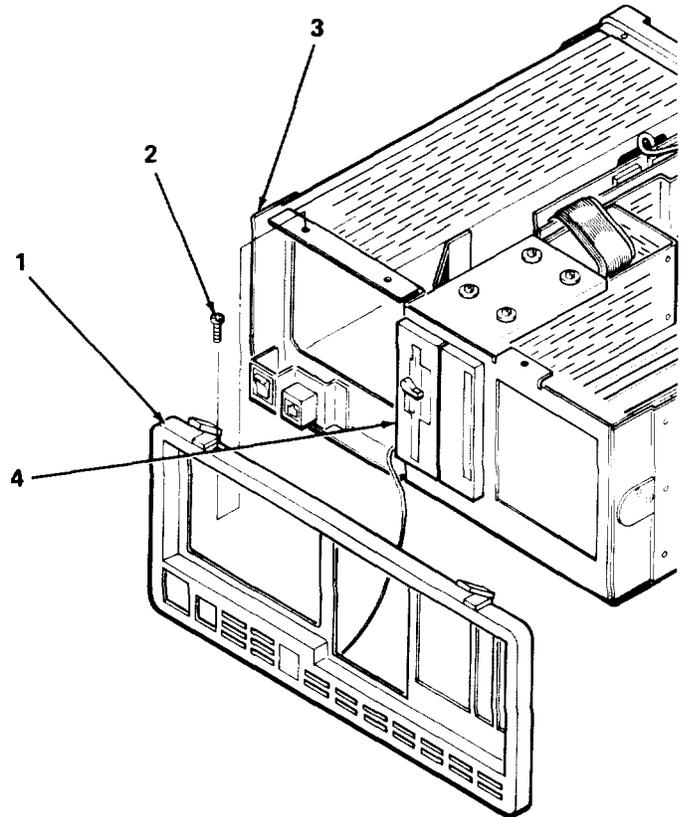
1. Remove keyboard.
2. Remove top and bottom covers (para. 4-8).
3. Remove two top, three bottom, and one right side screws (2).

**4-10. REMOVE AND INSTALL FRONT BEZEL (CONTINUED)**

4. Move bezel (1) away from chassis (3) to access ground wire connection (4).
5. Loosen screw that secures ground wire and disconnect wire (4).

**INSTALLATION**

1. Using low pressure compressed air, blow dust and dirt from anti-glare screen mesh.
2. Clean CRT face with paper towel moistened with mild detergent and water solution. Dry with dry paper towels.
3. Connect grounding wire to chassis using the lower right 1/4-inch screw (4) that secures CRT to the chassis.
4. Position bezel (1) on chassis and secure using two screws on top, three screws on bottom and one screw on right side (2).
5. Install top and bottom covers (para. 4-8).
6. Install keyboard (para. 4-12).



CE1DV018

**4-11. REPAIR OF KEYBOARD ASSEMBLY**

- This procedure covers:
- |                             |                         |
|-----------------------------|-------------------------|
| a. Disassembly              | d. Cable Replacement    |
| b. Inspection               | e. Keyboard Replacement |
| c. Keyboard Assembly Checks | f. Reassembly           |

**INITIAL SETUP**

**Tools:**

- Tool Kit, JTK-17
- Soft bristle brush

**General Precautions:**

**Parts:**

- Keyboard, P/N 93000004
- Keyboard Cable, P/N 93000003

**CAUTION**

The keyboard assembly contains CMOS integrated circuits that can be damaged by static electrical discharges. During keyboard repair, work on a conductive work surface and make sure that you and the work surface are grounded.

**DISASSEMBLY**

1. Remove keyboard.

**4-11. REPAIR OF KEYBOARD ASSEMBLY (CONTINUED)**

2. Remove six screws (8, 9 and 10) from underside of keyboard and separate top (1) and bottom (7) covers.
3. Disconnect keyboard cable connector (5) and ground lug (4) from keyboard assembly (6).

**INSPECTION**

1. Inspect cable for damaged insulation, broken or loose wires or cracked connectors. Replace if damaged.
2. Inspect keyboard for cracks or damaged components. Replace if damaged.

**KEYBOARD ASSEMBLY CHECKS**

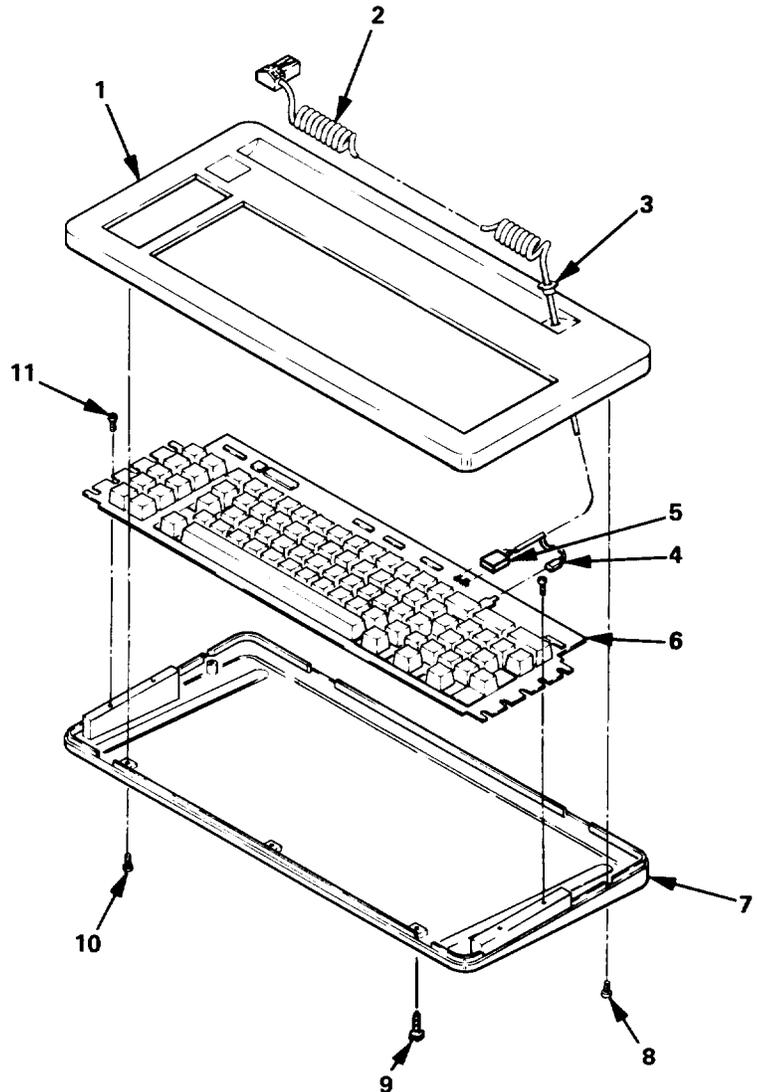
1. Refer to fig. FO-2 and check continuity of keyboard cable. Replace if faulty.
2. If cable is not faulty but troubleshooting (para. 4-6) indicates that keyboard assembly is faulty, replace keyboard.

**CABLE REPLACEMENT**

1. Note position of strain relief bushing (3) on cable (2). Then, push strain relief bushing out through hole in cover and remove bushing.
2. Remove each pin from 6-pin female connector housing (5) by depressing contact spring using a small flat-blade screwdriver while pulling on wire.
3. Remove defective cable from top cover.
4. Feed ground lug and wires of new keyboard cable through hole in cavity on top cover.
5. Insert contact pins in 6-pin connector housing as follows:  
 Pin 1: White      Pin 2: Red      Pin 4: Green  
 Pin 5: Yellow      Pin 6: Black
7. Pull each wire slightly to make sure that contact pins are seated in connector. The blue, orange and brown wires are not used.
8. Place strain relief bushing on cable at the same position as it was on the old cable with the large diameter of the bushing facing away from keyboard cable hole.
9. Seat bushing in hole.

**KEYBOARD REPLACEMENT**

1. Remove four screws (11) and remove keyboard assembly (6) from bottom cover.



CE1 DVO11

**4-11. REPAIR OF KEYBOARD ASSEMBLY (CONTINUED)**

2. Use a soft bristle brush to remove dirt and debris from the bottom cover.
3. Remove metallized tape from back of new keyboard assembly.
4. Center keyboard assembly on bottom cover and attach with four 3/8-inch screws (11).

**REASSEMBLY**

1. Connect keyboard cable connector (5) and grounding tab to keyboard (6).
2. Position top cover (1) on bottom cover (7). Make sure that cutouts in top cover are not touching keys.
3. From the bottom of the keyboard, place one 1/4-inch screw (9) in single hole in front and tighten. Place two 1 - inch screws (8) in the two middle holes and tighten. Place three 5/8-inch screws (10) in the three rear holes of the keyboard and tighten.
4. Install keyboard. Turn on test set and perform self test to verify proper operation (TM 11 -6625-3187-10).

**4-12. REPLACE IEEE-488 CONTROLLER**

This procedure covers:

a. Removal

b. Switch settings

c. Installation

**INITIAL SETUP:****INITIAL SETUP****Tools:**

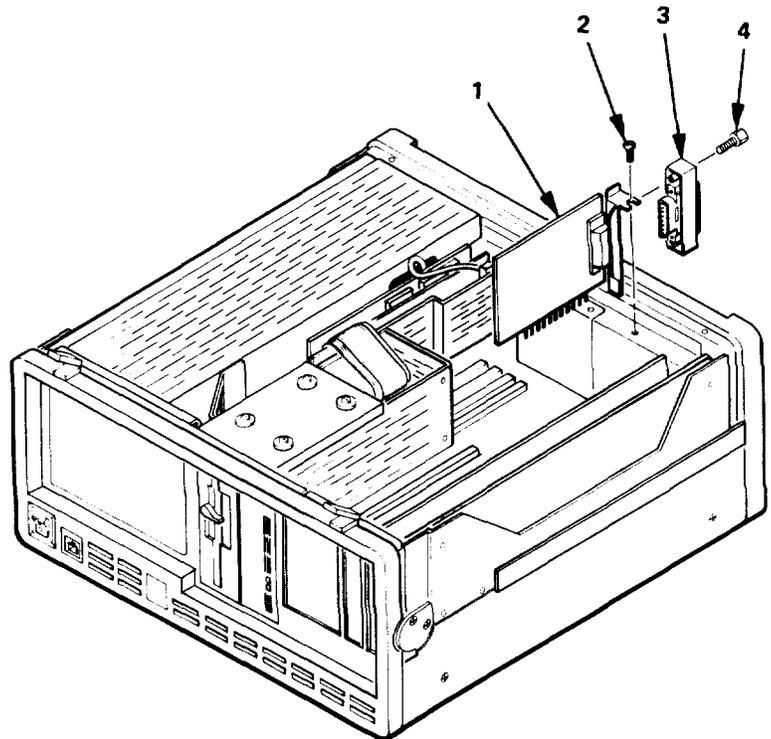
Tool Kit, JTK-17

**Parts:**

IEEE-488 Controller, P/N 92000010A

**REMOVAL**

1. Remove top cover (para. 4-8).
2. Remove two screws (4). Unplug IEEE connector adapter (3).
3. Remove screw (2). Lift IEEE-488 controller (1) straight up until it is disconnected from the mother board and remove controller. cutout and then remove the assembly.

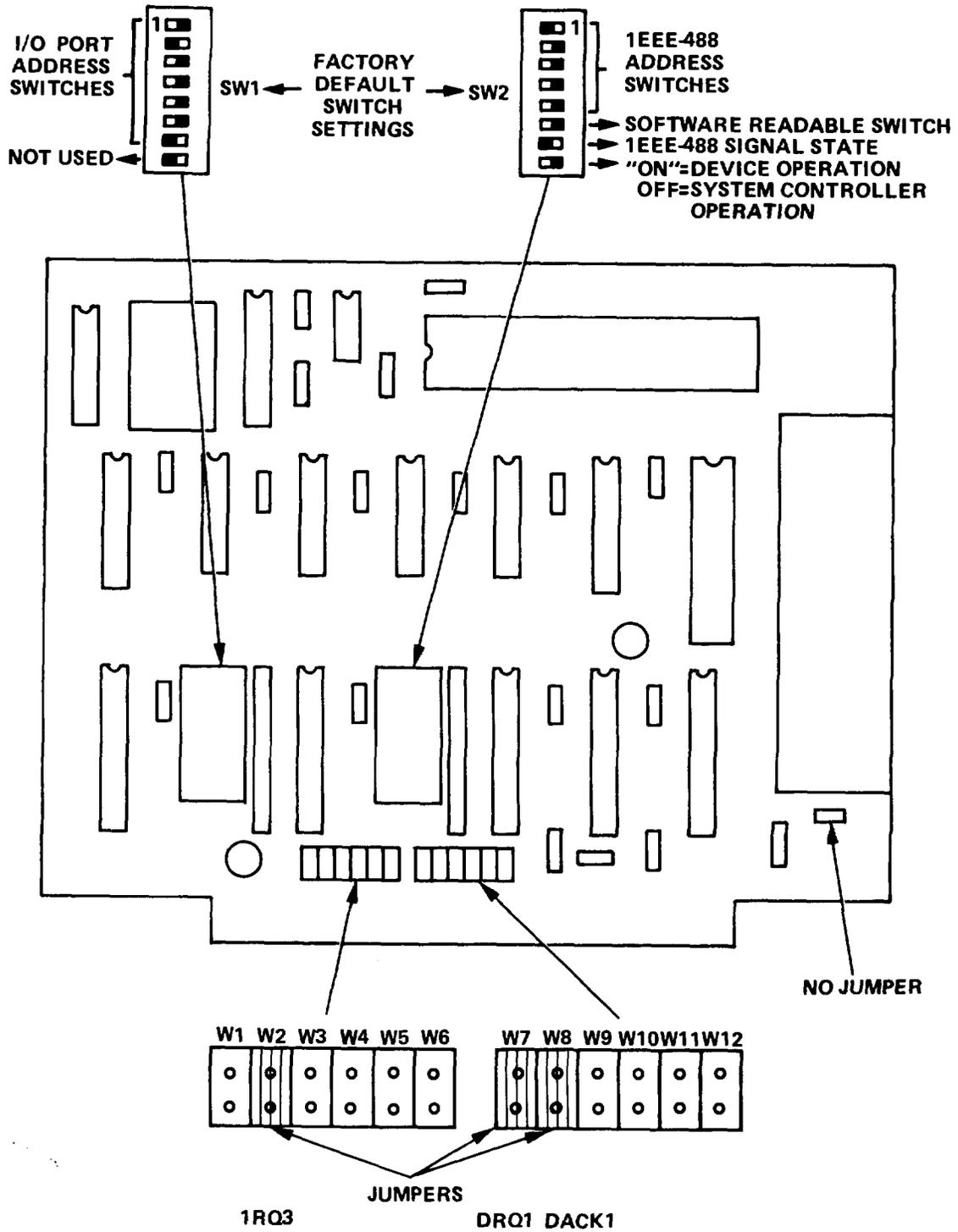


CE1 DV013

### 4-12. REPLACE IEEE-488 CONTROLLER (CONTINUED)

#### JUMPER AND SWITCH SETTINGS

1. Place jumpers as shown below:



CE1DV044

**4-12. REPLACE IEEE-488 CONTROLLER (CONTINUED)**

2. Make sure that the following switches are set to their default settings, as defined above:
  - I/O Port Address, Switch SW1, Positions 1 through 7.
  - Software Readable Switch, Switch SW2, Position 6.
  - IEEE-488 Signal State, Switch SW2, Position 7.

**NOTE**

**If the test set is to be a part of an IEEE-488 bus-controlled system, perform steps 3 and 4 below. Otherwise, set switch SW2, positions 1 through 5 and 8 to their default positions.**

3. Determine whether or not the test set will operate as the system controller. If the test set is to operate as the IEEE-488 system controller, set switch SW2, position 8 to ON. Otherwise, set switch SW2, position 8 to off.
4. Determine the IEEE-488 address. Set switch SW2, positions 1 through 5:

IEEE-488 Address	SW2 Position					IEEE-488 Address	SW2 Position				
	1	2	3	4	5		1	2	3	4	5
0	Off	Off	Off	Off	Off	16	Off	Off	Off	Off	On
1	On	Off	Off	Off	Off	17	On	Off	Off	Off	On
2	Off	On	Off	Off	Off	18	Off	On	Off	Off	On
3	On	On	Off	Off	Off	19	On	On	Off	Off	On
4	Off	Off	On	Off	Off	20	Off	Off	On	Off	On
5	On	Off	On	Off	Off	21	On	Off	On	Off	On
6	Off	On	On	Off	Off	22	Off	On	On	Off	On
7	On	On	On	Off	Off	23	On	On	On	Off	On
8	Off	Off	Off	On	Off	24	Off	Off	Off	On	On
9	On	Off	Off	On	Off	25	On	Off	Off	On	On
10	Off	On	Off	On	Off	26	Off	On	Off	On	On
11	On	On	Off	On	Off	27	On	On	Off	On	On
12	Off	Off	On	On	Off	28	Off	Off	On	On	On
13	On	Off	On	On	Off	29	On	Off	On	On	On
14	Off	On	On	On	Off	30	Off	On	On	On	On
15	On	On	On	On	Off	31	On	On	On	On	On

**INSTALLATION**

1. Carefully align IEEE-488 controller edge connector over mother board connector J13 and push down with steady pressure until edge connector "snaps" into place. Rock the card gently to make sure it is fully seated.
2. Secure with screw (2).
3. Plug IEEE connector adapter (3) into controller rear connector and secure with two screws (4).
4. Turn on test set and verify that MAIN MENU is displayed (TM 11-6625-3187-10).
5. Install top cover (para. 4-8).

**4-13. REPLACE INTERFACE BOARD**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

Tools: Kit, JTK-17

**Parts:**

Interface Board, P/N 92000009A

**NOTE**

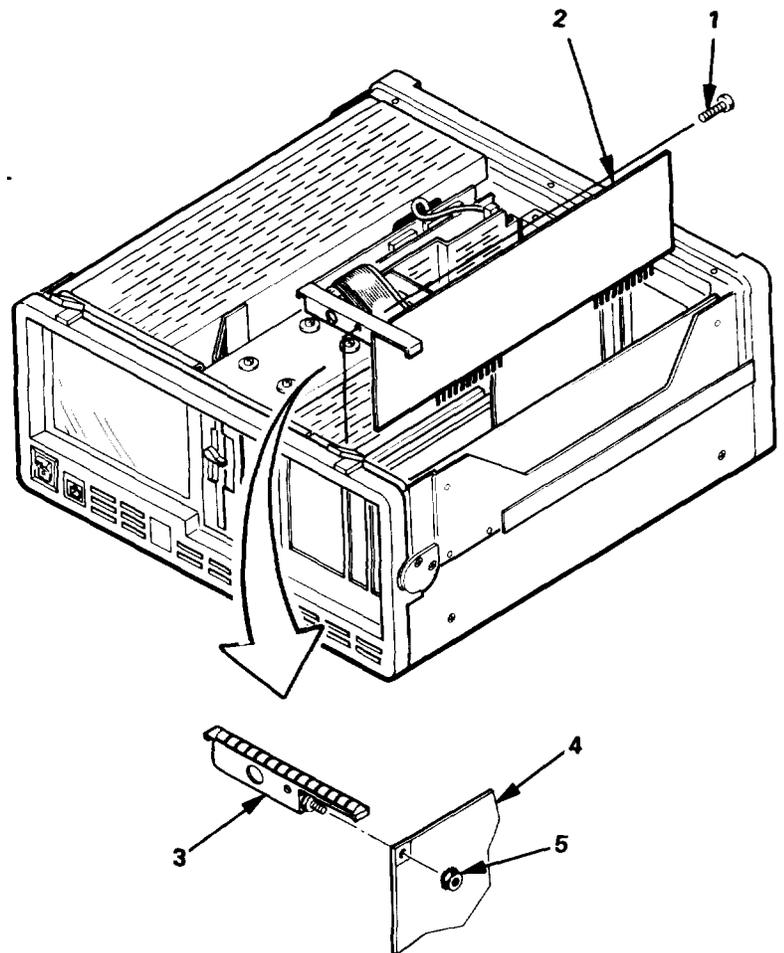
Perform alignment (para. 4-32) after replacing interface board.

**REMOVAL**

1. Remove top cover (para. 4-8).
2. Remove screw (1).
3. Carefully pull Interface board (2) straight up and out.
4. Remove one pemnut (5) and separate interface ground shield (3) from Interface board (4).

**INSTALLATION**

1. Position interface ground shield (3) on interface board (4) and secure with one pemnut (5).
2. Position Interface board (2) with interface ground shield facing front and male edge connectors aligned with mother board connectors J14 (rear) and J22 (front).
3. Push Interface board down with steady pressure over each end until both edge connectors "snap" into place and are firmly seated in motherboard connectors. The top edge of the interface ground shield should be aligned with the top edge of the I/O panel.
4. Secure interface ground shield to I/O panel with screw (1).
5. Do alignment (para. 4-32).
6. Turn on test set and perform self test to verify proper operation (TM 11-6625-3187-10). Then, do the performance tests (para. 4-31).
7. Install top cover (para. 4-8).



CE1DV014



## 4-15. REPLACE GRAPHICS CONTROLLER BOARD

This procedure covers:

- a. Removal
- b. Jumper Placement and Switch Setting
- c. Installation

### INITIAL SETUP:

#### Tools:

Tool Kit, JTK-1 7

#### Materials

Mending Tape, 3M PIN 021200-07567

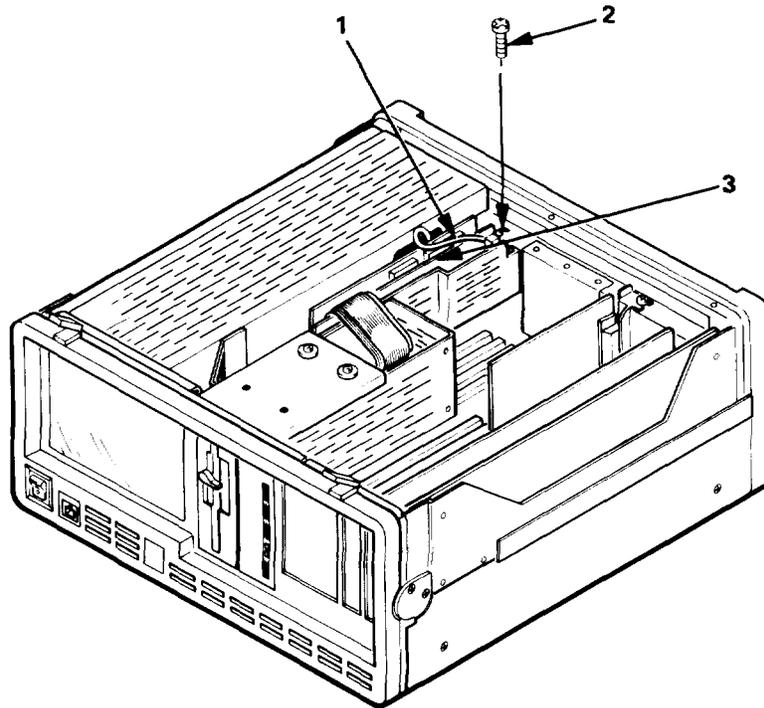
#### Parts:

Graphics Controller Board, P/N 92000010A

Mylar Insulator, P/N 16000051

### REMOVAL

1. Remove top cover (para. 4-8).
2. Disconnect cable (1) from graphics controller board (3).
3. Remove screw (2).
4. Lift graphics controller board straight up until it is disconnected from the mother board. Move graphics controller board away from rear panel until its connectors clear the cutout and then remove the board.
5. Detach mylar insulating sheet from non-component side of graphics controller board.



CE1DVO16

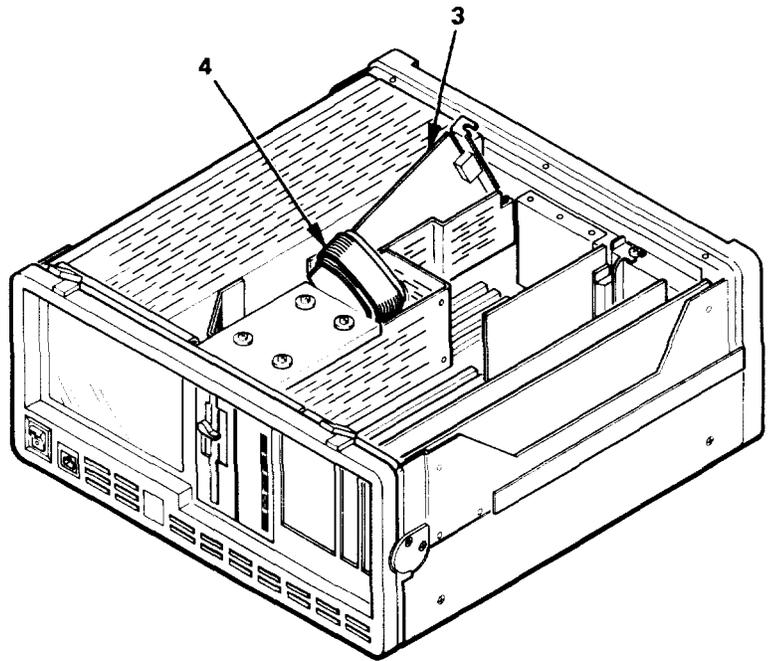
**4-15. REPLACE GRAPHICS CONTROLLER BOARD (CONTINUED)**

**JUMPER PLACEMENT AND SWITCH SETTINGS**

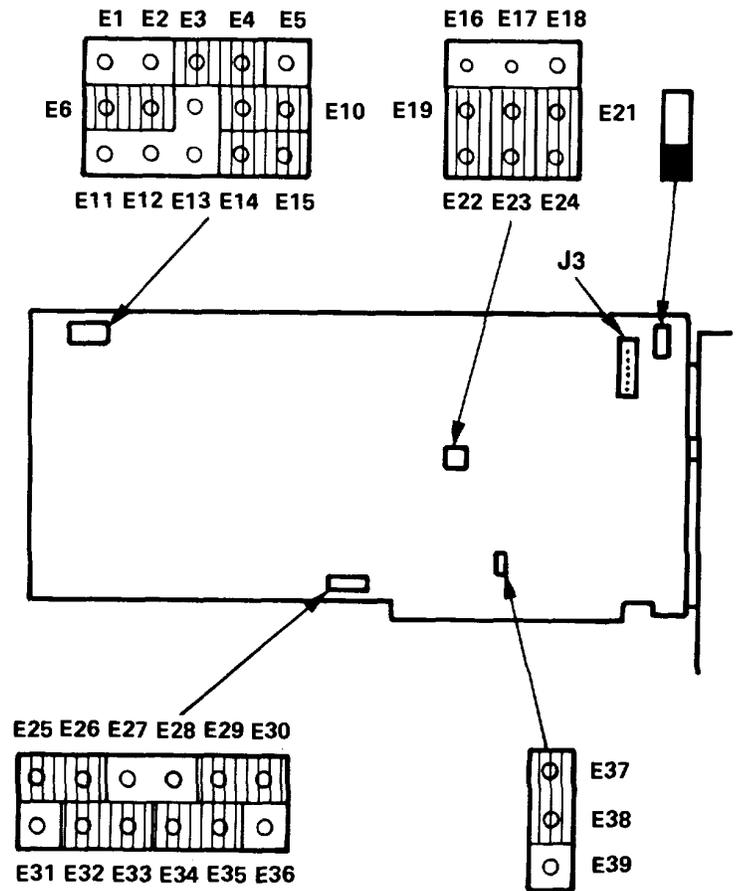
Place jumpers and set the switch as shown below

**INSTALLATION**

1. Using tape, attach mylar insulating sheet to non-component side of graphics controller board (3).
2. Position graphics controller board beneath disk controller cables (4) so that its connectors protrude through the rear panel slot and so that its male edge connector is aligned with mother board connector J2. Make sure that mylar insulating sheet covers the non component side of the graphics controller board.
3. Push graphics controller board down until it is firmly seated in the mother board connector.
4. Connect cable (1) to connector J3 so that pin 1 of J3 (top pin) mates with pin 1 of cable connector (black wire).
5. Secure with screw (1).
6. Install top cover (para. 4-8).
7. Turn on test set and verify that MAIN MENU is displayed (TM 11-6625-3187-10).



CE1DV053



CE1 DV045

**4-16. REPLACE SPEAKER**


---

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Parts:**

Speaker, P/N 68000115

**REMOVAL**

1. Remove bottom cover (para. 4-8).
2. Unsolder wires from speaker.
3. Remove four screws and remove speaker.

**INSTALLATION**

1. On test set S/N 060 and below, position speaker with terminals facing away from side of test set. On test set S/N 061 and above, position speaker with terminals facing toward side of test set. Secure with four screws.
  2. Solder green wire to positive (+) terminal and black wire to negative (-) terminal.
  3. Install bottom cover (para. 4-8).
- 

**4-17. REPLACE POWER SWITCH**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Materials**

Cable Tie

**Parts:**

Power switch, P/N 62100000

**General Precautions:****WARNING**

**To avoid electrical shock, disconnect test set from ac power source before removing or replacing components or assemblies.**

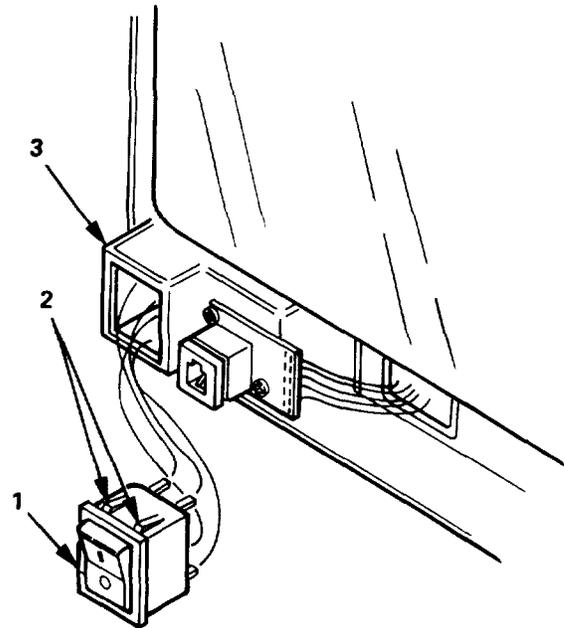
---

**REMOVAL**

1. Remove front bezel (para. 4-10).
2. Remove high voltage cover (para. 4-9).
3. Locate wires leading to power switch (1). Cut cable tie closest to switch that binds switch wires.
4. Locate four plastic tabs (2) on switch (1) that hold switch in bracket (3).
5. Alternately push top two tabs and bottom two while pushing switch out of its cutout with a rocking motion until switch clears cutout.
4. Note location of wires and then disconnect wires from switch.

**4-17. REPLACE POWER SWITCH (CONTINUED)****INSTALLATION**

1. Connect wires to new switch (1).
2. Position switch so that I portion faces up and push switch through cutout on bracket (3) until tabs (2) snap out and switch is secure.
3. Bind power switch wires to cable tie down with new cable tie.
4. Install high voltage cover (para. 4-9).
5. Install front bezel (para. 4-10).
6. Turn on test set and verify that MAIN MENU is displayed (TM 11-6625-3187-10). Then, turn off test set and verify that test set power is removed.



CE1DVO19

**4-18. REPLACE EMI FILTER**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**General Precautions:****Parts:**

EMI filter, P/N 68000105

**WARNING**

With the high voltage cover removed, the CRT is exposed. The CRT anode and high-voltage multiplier output leads retain a high-voltage charge after test set is turned off. Do not touch any part of the CRT or the driver board. Death or injury may otherwise result.

**REMOVAL**

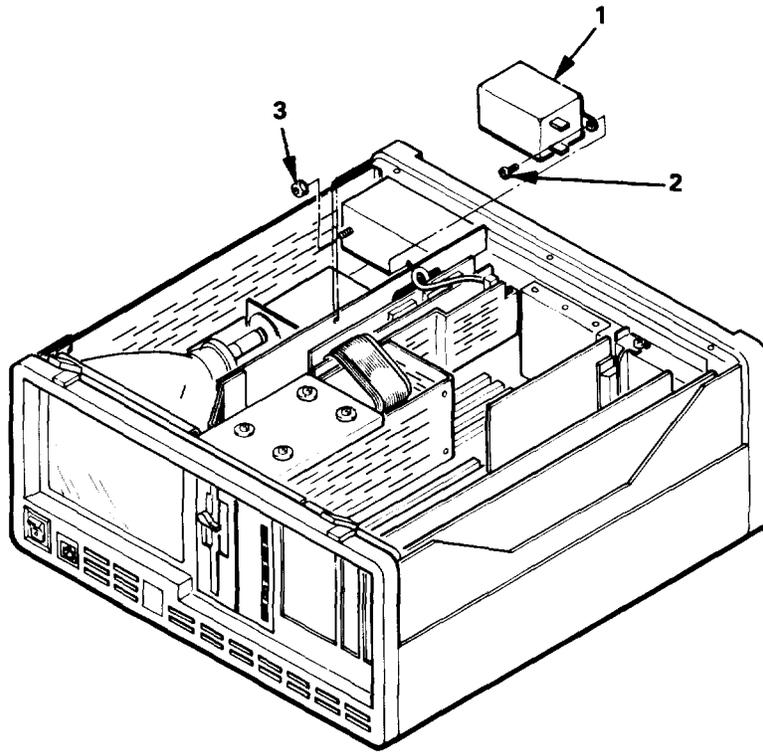
1. Remove high voltage cover (para. 4-9). Make sure that AC power cord is disconnected.
2. Note wire connections and disconnect wires from EMI filter (3).
3. Remove one kee nut (4) and one screw (5) and remove EMI filter.

**INSTALLATION**

1. Position EMI filter (3) so that the side with three connectors is facing left side of test set and secure with one kee nut (4) and one screw (5).
2. Connect wires to EMI filter as noted above (black wire on top, white wire on bottom).

**4-18. REPLACE EMI FILTER (CONTINUED)**

3. Install high voltage cover (para. 4-9).
4. Turn on test set and verify that MAIN MENU is displayed (TM 11-6625-3187-10).



CE1DV020

**4-19. REPLACE CRT DISPLAY MONITOR**

---

This procedure covers: a. Access and High Voltage Discharge  
 b. Removal c. Installation

The CRT display monitor consists of a CRT and a driver board. They are replaced together.

---

**INITIAL SETUP****Tools:**

Tool Kit, JTK-1 7

**Parts:**

CRT display monitor, P/N 70000100A

**General Precautions:****Materials:**

26 AWG insulated wire, 12 inches

Alligator clip

Electrical Tape

**WARNING**

- The CRT anode and high-voltage multiplier output leads retain a high-voltage charge after test set is turned off. Do not touch any part of the CRT display monitor until all high voltages have been discharged according to the procedure provided below. Death or injury may result.
  - The CRT encloses a vacuum and is extremely fragile. Handle the CRT with care to avoid implosion and subsequent injury.
- 

**ACCESS AND HIGH VOLTAGE DISCHARGE**

1. Make sure that the AC power cord is disconnected from the rear of the test set.
2. Remove front bezel (para. 4-10).

**WARNING**

**Do not allow high voltage cover to touch CRT display monitor components and do not touch these components with your hands. Death or injury may otherwise result.**

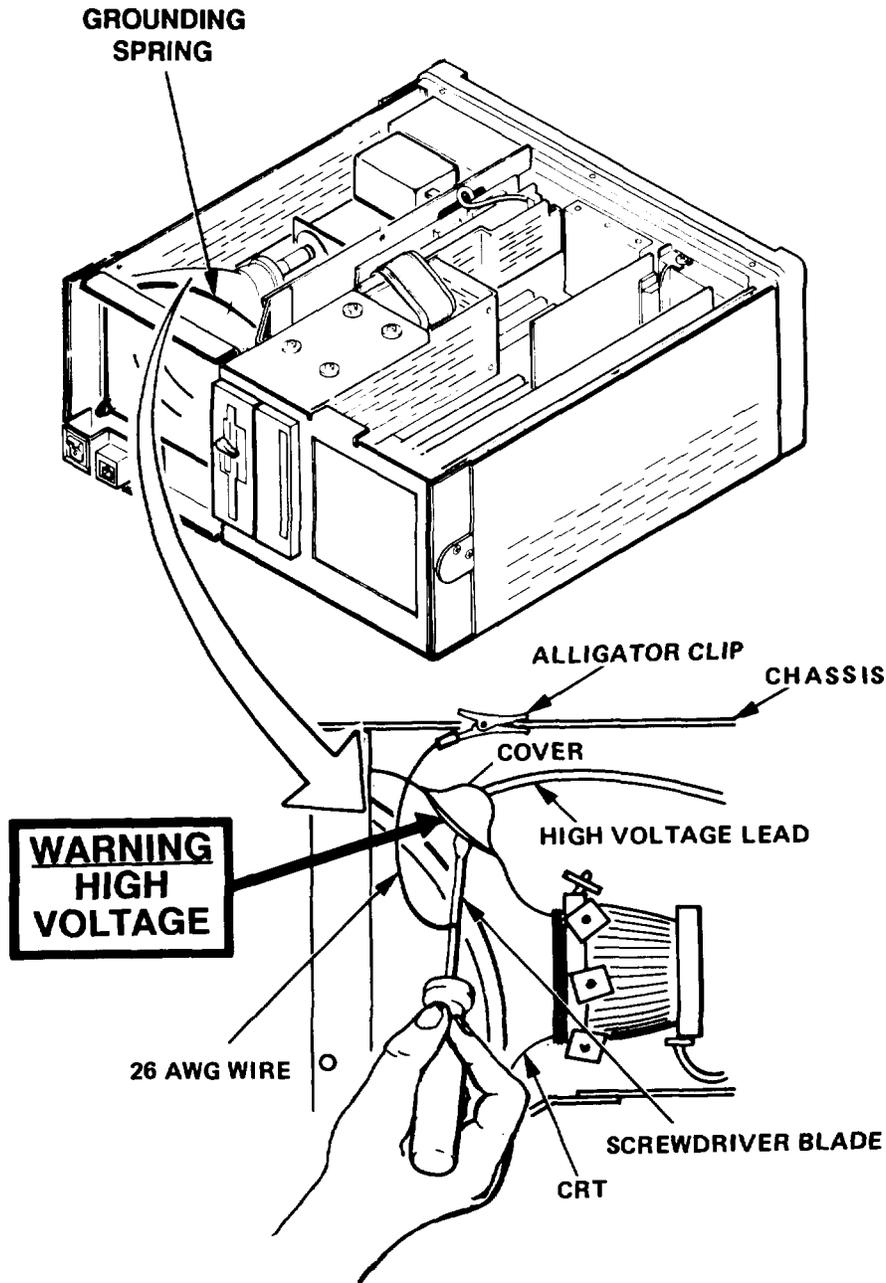
3. Remove high voltage cover (para. 4-9).
4. Construct a discharge device using a flat-blade screwdriver with a plastic or rubber handle, a 12-inch length of Insulated wire and an alligator clip.
  - a. Strip one end of the wire and solder it to the alligator clip.
  - b. Strip about 2 1/2 inches of insulation off the other end of the wire and tightly wrap the stripped end around the shaft of the screwdriver about five times so that good electrical contact is made. Secure by wrapping electrical tape around wire and screwdriver shaft.
5. Attach the alligator clip to the side of the chassis.

**WARNING**

**When discharging the CRT, hold the screwdriver only by the plastic or rubber handle. Touching the blade of the screwdriver may cause death or injury due to electrocution.**

**4-19. REPLACE CRT DISPLAY MONITOR (CONTINUED)**

6. Holding the screwdriver by the plastic or rubber handle, carefully slide the blade of the screwdriver under the CRT anode wire cover until you touch the anode. This will discharge the CRT.



CE1DV050

**REMOVAL (ONLY FOR TEST SET S/N 060 AND BELOW WITH DOTRONIX CRT DISPLAY MONITOR)**

1. Disconnect high voltage lead (12) from CRT anode terminal by carefully prying the cover up, pinching the anode clips together using insulated needlenose pliers and slowly lifting out.

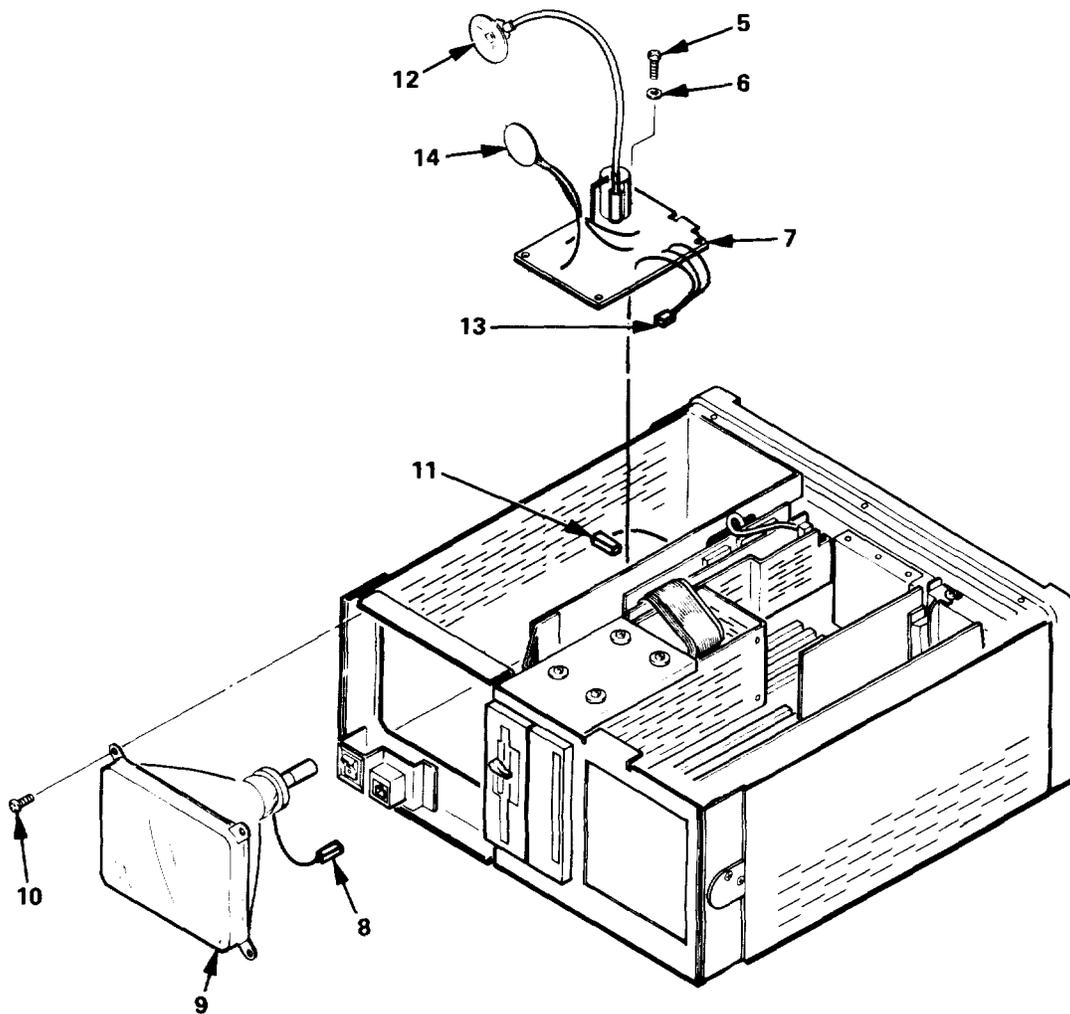
**4-19. REPLACE CRT DISPLAY MONITOR (CONTINUED)**

2. Disconnect neck connector (14) from CRT (9).
3. Disconnect magnet cable (8) from connector (13).
4. Remove four sets of screws, lock washers and flat washers (10) securing CRT flanges to chassis.

**WARNING**

**The CRT encloses a vacuum and is extremely fragile. Handle the CRT with care to avoid implosion and subsequent injury.**

5. Carefully pull CRT out from the front of the chassis.
6. Remove grounding spring.
7. Remove four screws (5) and nylon inserts (6).
8. Disconnect video/power connector (11) from CRT driver board (7) and remove board.



CEIDV051

**4-19. REPLACE CRT DISPLAY MONITOR (CONTINUED)**

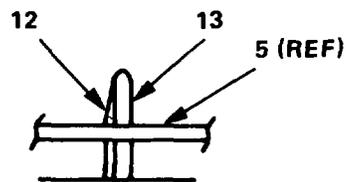
**REMOVAL (TEST SET S/N 061 AND ABOVE ONLY)**

1. Disconnect high voltage lead (12) from CRT anode terminal by carefully prying the cover up, pinching the anode clips together using insulated needlenose pliers and slowly lifting out.
2. Cut cable tie binding magnet cable to high voltage lead. Disconnect magnet cable (14) from connector (4).
3. Disconnect tube socket circuit card (19) from CRT.
4. Remove four sets of screws, lock washers and flat washers (16) securing CRT flanges to chassis.

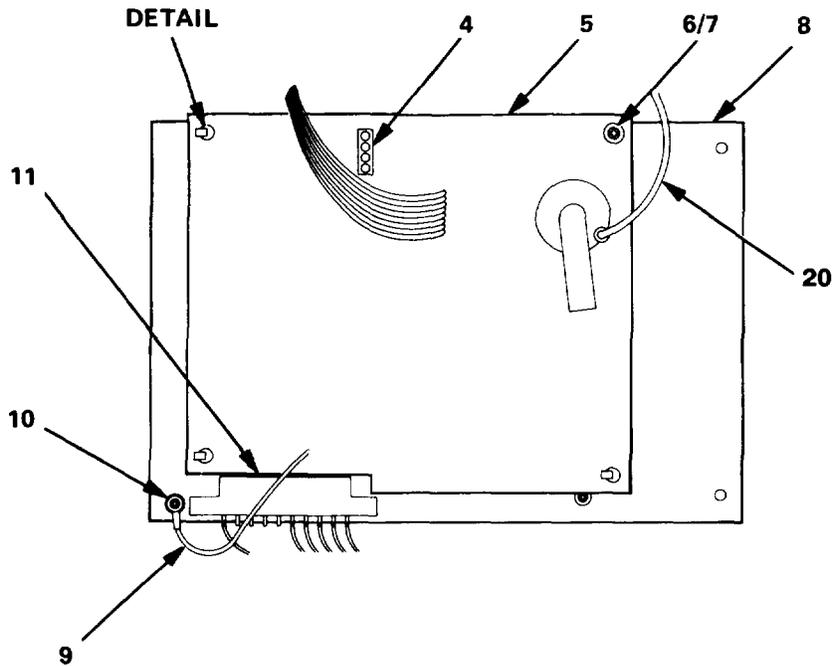
**WARNING**

**The CRT encloses a vacuum and is extremely fragile. Handle the CRT with care to avoid implosion and subsequent injury.**

5. Carefully pull CRT out from the front of the chassis.
6. Remove screw (10) securing ground lead (9).



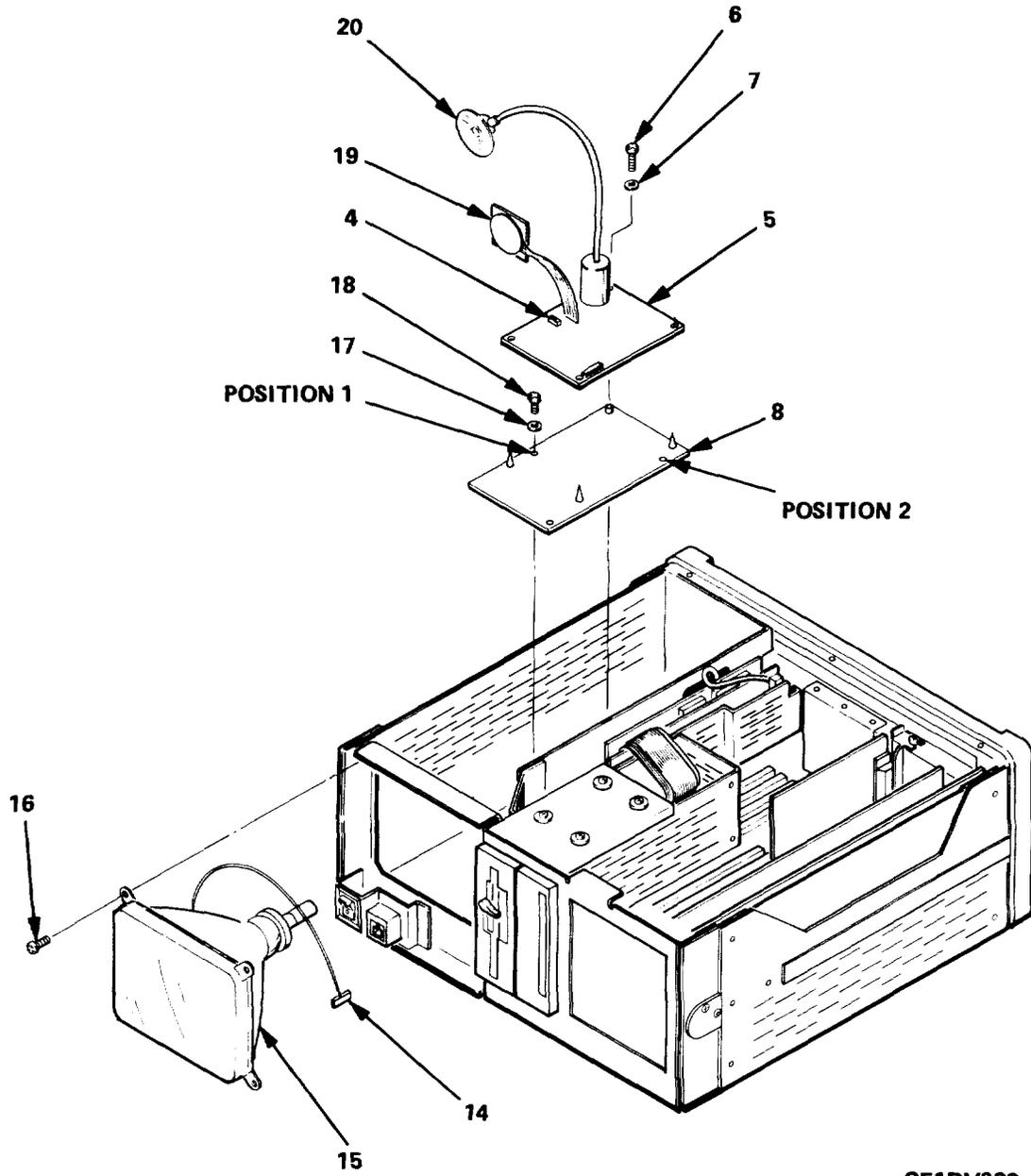
**DETAIL**



**CEI1DV049**

**4-19. REPLACE CRT DISPLAY MONITOR (CONTINUED)**

7. Remove screw (6) and washer (7).
8. At each nylon post (13), use a flat blade screwdriver to push in the tab (12) and lift the driver board (5) slightly to clear tab.
9. Disconnect video/power connector (11) from CRT driver board (5) and remove board.



CE1DV022

**4-19. REPLACE CRT DISPLAY MONITOR (CONTINUED)**

---

**INSTALLATION****NOTE**

For test set S/N 061 and above, skip step 1 and proceed to step 2. On test set S/N 060 and below where a Dotronix CRT display monitor was removed, a Computron CRT display monitor will be installed in its place. Adapter board, LPCOM part number 70000100, must be installed first before installing the new display monitor.

1. Position Mater board (8) over standoffs and secure with two screws (18) and washers (17) In positions 1 and 2.
2. Connect video/power connector (11) to driver board (5).
3. Position driver board (5) over adapter board (8) with high voltage lead (20) toward the rear of the test set. Align holes in driver board with nylon posts (13) and gently push down until tabs (12) engage and hold the driver board in place.
4. Secure left rear of driver board with screw (6) and washer (7).
5. Secure ground lead (9) with screw (10).

**WARNING**

**The CRT encloses a vacuum and is extremely fragile. Handle the CRT with care to avoid implosion and subsequent injury.**

6. Carefully position CRT (15) in chassis so that the high voltage anode terminal is on the upper left (as seen from the front) and secure CRT flanges to chassis with four sets of screws, lock washers and flat washers (16).
  7. Connect magnet cable (14) to connector J1 (4) on driver board.
  8. Connect tube socket circuit card (19) to CRT socket.
  9. Connect high voltage lead (20) to CRT anode terminal. Use cable tie to bind high voltage lead to magnet cable.
  10. Install high voltage cover (para. 4-9).
  11. Install front bezel (para. 4-10).
  12. Turn on test set and verify that MAIN MENU is displayed (TM 11-6625-3187-10).
-

**4-20. REPLACE KEYBOARD CONNECTOR ASSEMBLY**

---

This procedure covers:

a. Removal

b. Installation

---

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Parts:**

Keyboard connector assembly, P/N 10000016

**Materials:**

Tie down

Cable Tie

---

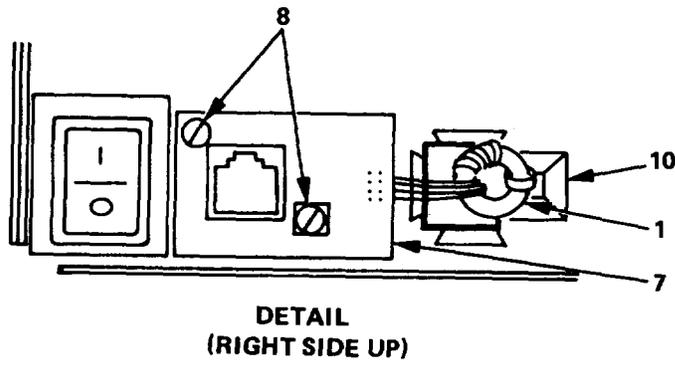
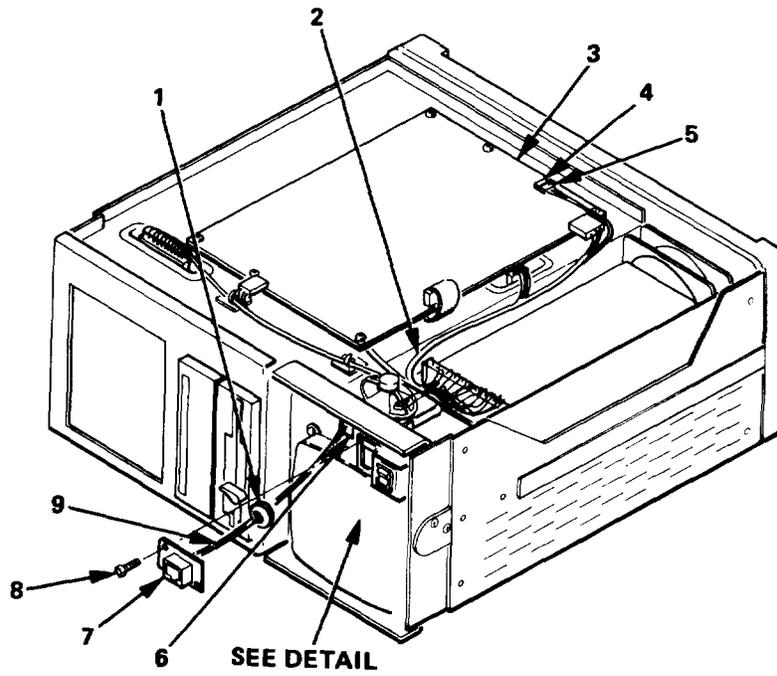
**REMOVAL**

1. Remove front bezel (para. 4-10).
2. Remove two screws (8) securing keyboard connector assembly (7).
3. Cut tie wrap (8).
4. Trace the five-wire cable (9) from the keyboard connector assembly to Faraday board connector J13 (4). Disconnect the cable.
5. Cut any cable ties that bind the cable, feed cable through hole (6) and remove keyboard connector assembly and cable.

**INSTALLATION**

1. Feed the connector (5) and cable (9) through the hole (6) in the front panel, route the cable along the harness to Faraday board connector J13 (4), and connect the cable to J13.
2. Position keyboard connector assembly (7) and secure with two screws (8).
3. Bind cable to the harness (2) using cable ties where appropriate.
4. Bind ferrite ring (1) to tie down (10) using cable tie.
5. Install front bezel (para. 4-10).

4-20. REPLACE KEYBOARD CONNECTOR ASSEMBLY (CONTINUED)



**4-21. REPLACE FARADAY BOARD**

This procedure covers:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>a. Removal</li> <li>b. Installation</li> </ul> | <ul style="list-style-type: none"> <li>c. Jumper Placement and Switch Settings</li> </ul> |
|---|---|

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Parts:**

Faraday board, P/N 92000009A

**REMOVAL**

1. Remove bottom cover (para. 4-8).
2. Disconnect cables from Faraday board connectors J18 (17), J15 (7), J10 (6) and J13 (5).
3. Remove nine screws (2).
4. Lift Faraday board and carefully disconnect motherboard/CPU cable (8) from Faraday board by gently rocking cable out. Remove Faraday board.

**INSTALLATION**

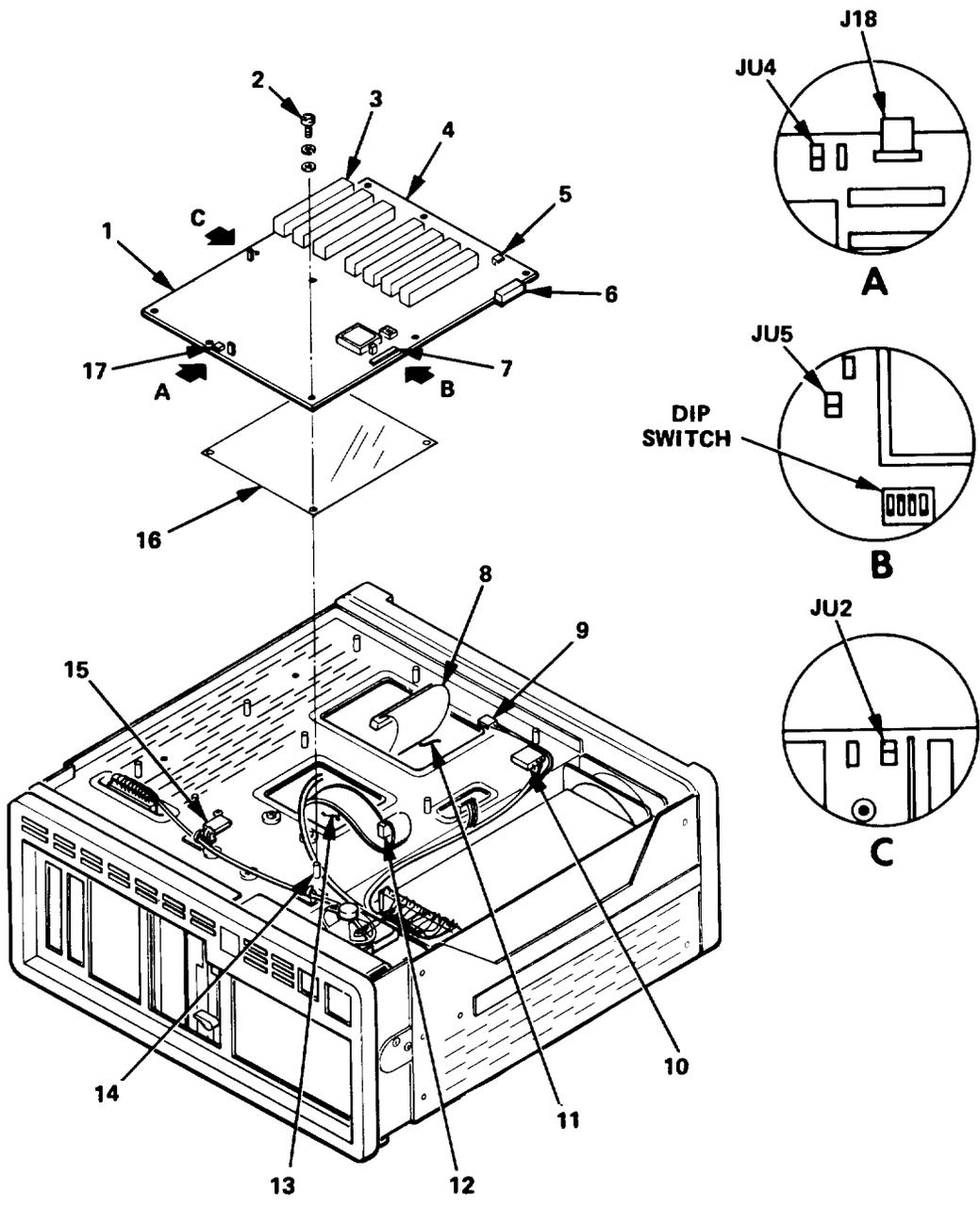
1. Place mylar insulator (16) over disk cable access hole (13) so that studs (14) protrude through holes in insulator. Make sure that disk/controller cable (12) extends to the side and clears the edge of the insulator.
2. Position Faraday board (1) component side up with 64-pin connectors (3) towards the rear and lower the assembly over the nine studs (14).
3. Connect motherboard/CPU cable (8) to connector J4 (4), located on the non-component side of the Faraday board.
4. Lower the Faraday board and secure it to the studs with nine screws (2).
5. Make connections to Faraday board connectors as follows:
 

Speaker cable (15):	J18 (17)	Power cable (10):	J10 (6)
Disk/Controller cable (12):	J15 (7)	Keyboard cable (9):	J13 (5)

**JUMPER PLACEMENT AND SWITCH SETTINGS**

1. Make sure that jumpers are in place at JU4 (view A), JU5 (view B) and JU2 (view C). No other jumpers should be present.
2. On the DIP switch (view B), make sure that switches 1 and 4 are set to on and switches 2 and 3 are set to off.
3. Install bottom cover (para. 4-8).

4-21. REPLACE FARADAY BOARD (CONTINUED)



CE1DV024

**4-22. REPLACE 10 MB FIXED DISK SYSTEM**

This procedure covers:

- |                                  |                                       |
|----------------------------------|---------------------------------------|
| a. Fixed Disk Controller Removal | c. Fixed Disk Drive Installation      |
| b. Fixed Disk Drive Removal      | d. Fixed Disk Controller Installation |

**INITIAL SETUP:**

**Tools:**

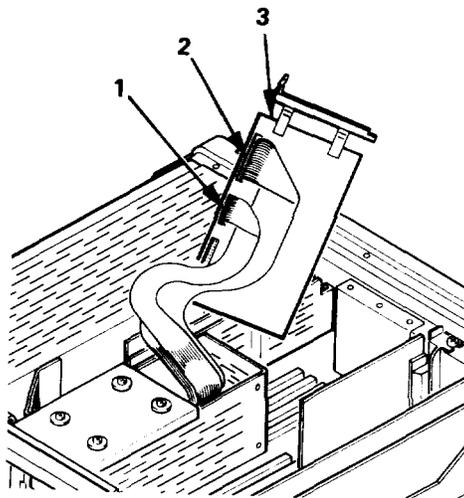
Tool Kit, JTK-1 7

**Parts:**

10 MB fixed disk drive system, P/N 70000009

**FIXED DISK CONTROLLER REMOVAL**

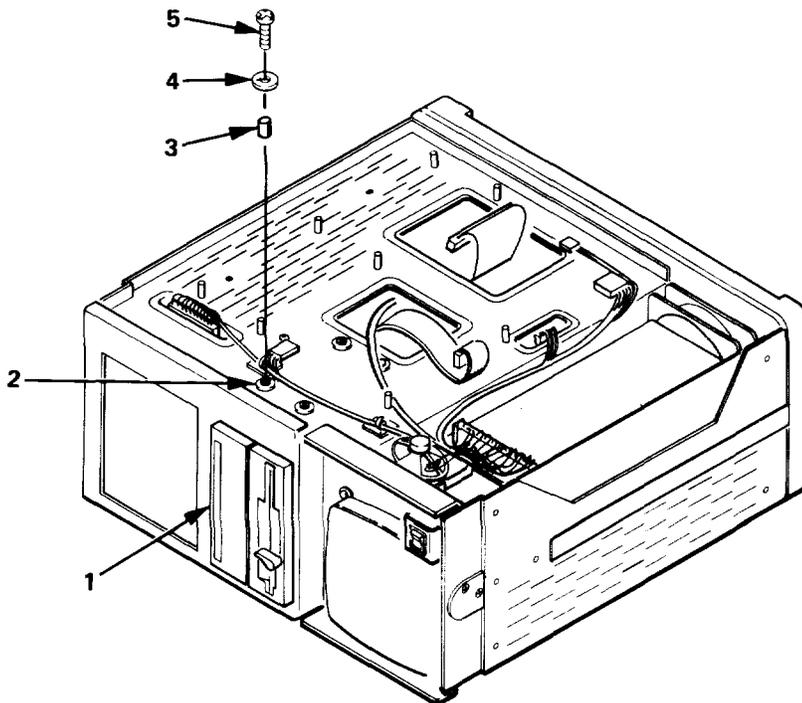
1. Disconnect grey video cable from graphics controller board connector J3.
2. Remove screw securing fixed disk controller board (3).
3. Pull fixed disk controller (3) straight up until its edge connector is disconnected from the mother board connector.
4. Disconnect disk controller cables (1 and 2) from fixed disk controller.



CE1DV017

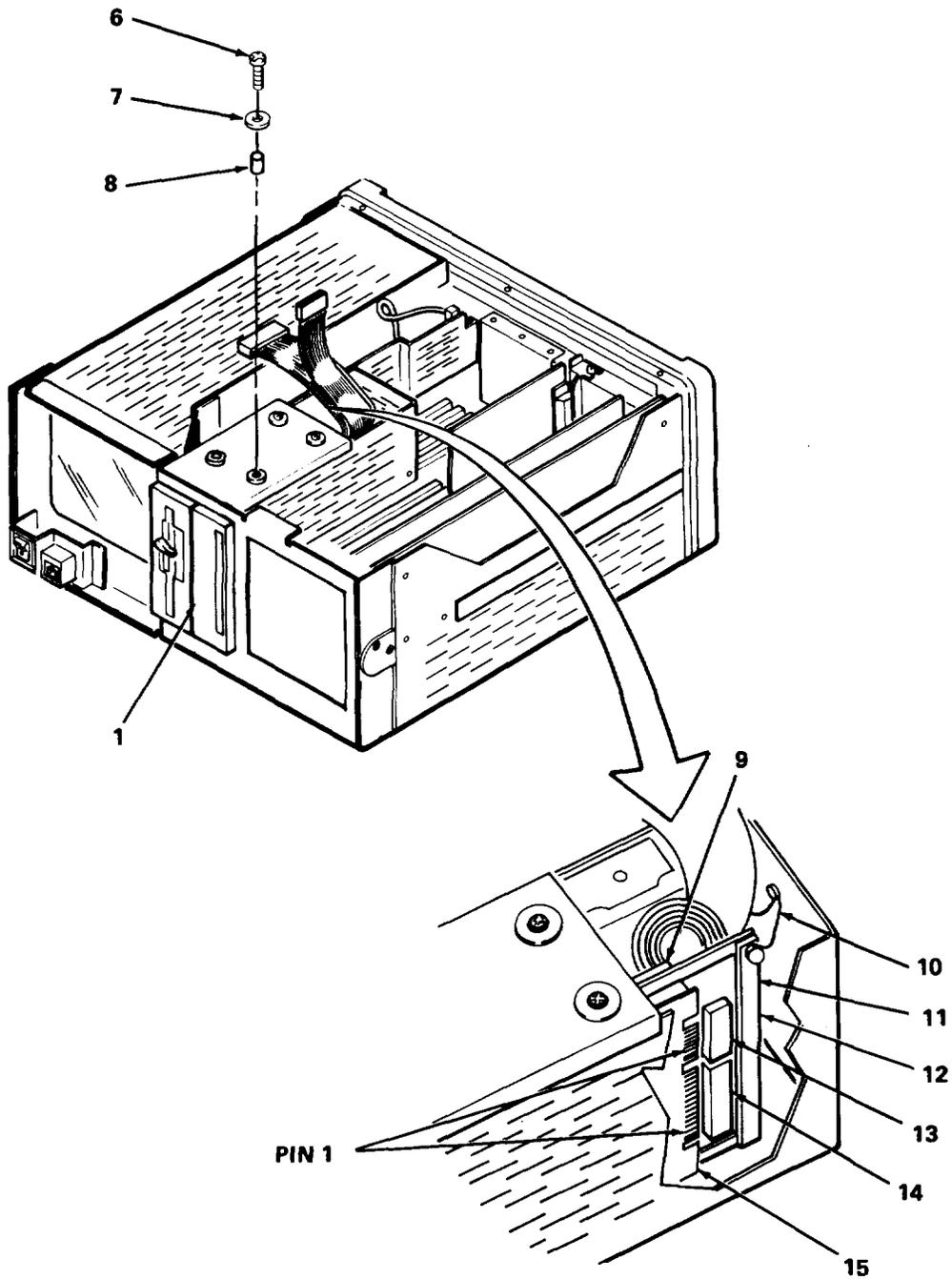
**FIXED DISK DRIVE REMOVAL**

1. Remove front bezel (para. 4-10).
2. Remove Faraday board (para. 4-21).



CE1DV025

4-22. REPLACE 10 MB FIXED DISK SYSTEM



3. Remove two bottom screws (5), washers (4) and nylon sleeves (3). Leave grommets (2) in place.
4. Turn test set over and remove two top screws (6), washers (7) and nylon sleeves (8).
5. Disconnect ground wire (10).

CE1DV026

**4-22. REPLACE 10 MB FIXED DISK SYSTEM (CONTINUED)**

---

6. Disconnect power cable (9).
7. Place test set on end with CRT facing up. Carefully pull 10-Mb hard disk drive (1) out from front.
8. Disconnect 34-conductor interface cable (14).
9. Disconnect 20-conductor interface cable (13).

**FIXED DISK DRIVE INSTALLATION**

1. Position 34-conductor interface cable (14) with red wire facing towards bottom of disk drive and connect to lower connector of disk drive circuit board.
2. Position 20-conductor Interface cable (13) with red wire facing towards bottom of disk drive and connect to upper connector of disk drive circuit board.
3. With test set on end and CRT facing up, Insert cables and 10-Mb hard disk drive (1) into left-hand portion of disk drive cage with the indicators toward the bottom of the test set.
4. Connect power cable (9) to power connector on disk drive circuit card (15).
5. Connect green ground wire (10) to bracing bar (12) and secure with knurled screw (11).
6. Insert nylon sleeves (8) into top two blue grommets.
7. Secure top of 10-Mb disk drive using two screws (6) and washers (7).
8. Turn test set over and insert nylon sleeves (3) into bottom two blue grommets (2).
9. Secure bottom of 10-Mb disk drive using two screws (5) and washers (4).
10. Install Faraday board (para. 4-21).
11. Install front bezel (para. 4-10).

**FIXED DISK CONTROLLER INSTALLATION**

1. Connect disk controller cables (1 and 2) to fixed disk controller (3). Make sure that pin 1 on each cable connector (red wire) is aligned with pin 1 of appropriate circuit board connector.
  2. Position circuit card assembly so that its male edge connector is aligned with mother board connector J1.
  3. Push fixed disk controller down until it is firmly seated.
  4. Secure with screw.
  5. Neatly fold cables (1 and 2) between disk controller board and graphics controller board.
  6. Connect grey video cable to connector J3 on graphics controller board so that pin 1 of J3 (top pin) mates with pin 1 of cable connector (black wire).
  7. Format 10 MB fixed disk drive (para. 4-29) and load software (para. 4-30).
-

**4-23. REPLACE 360 KB DISK DRIVE**

This procedure covers:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>a. Removal</li> <li>b. Installation</li> </ul> | <ul style="list-style-type: none"> <li>c. Disk Drive Check</li> </ul> |
|---|---|

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Parts:**

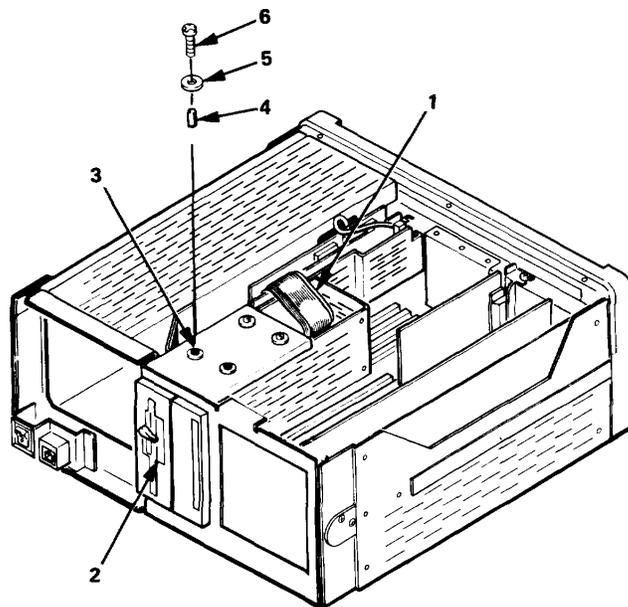
360 kB disk drive, P/N 70000200

**Software:**

MS®-DOS Diskette P/N 03000001

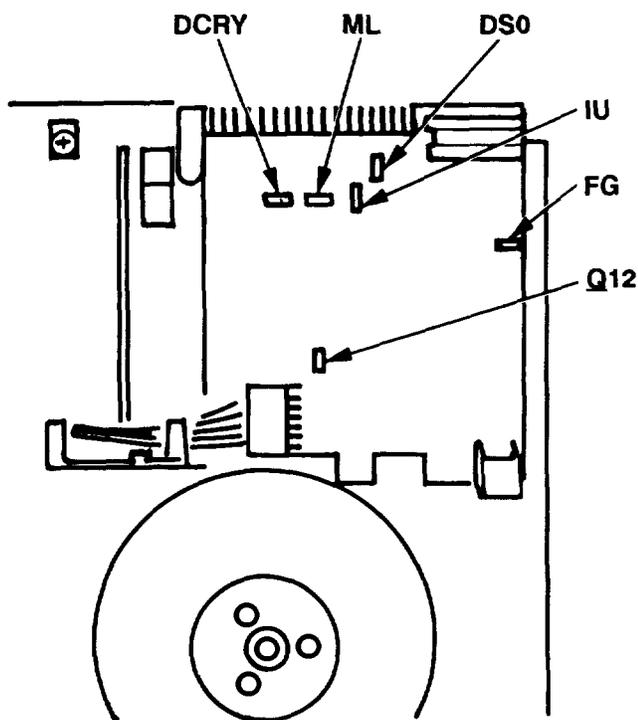
**REMOVAL**

1. Remove disk drive cover (para. 4-7).
2. Remove front bezel (para. 4-10).
3. Remove two top screws (6), washers (5) and nylon sleeves (4).
4. Disconnect ground wire (1).
5. Remove Faraday board (para. 4-21).
6. Remove two bottom screws (11), washers (10) and nylon sleeves (9).
7. Disconnect power cable (7).
8. Pull disk drive (2) straight out along with disk controller interface cable (8).
9. Disconnect disk controller interface cable from 360 kb disk drive.

**INSTALLATION**

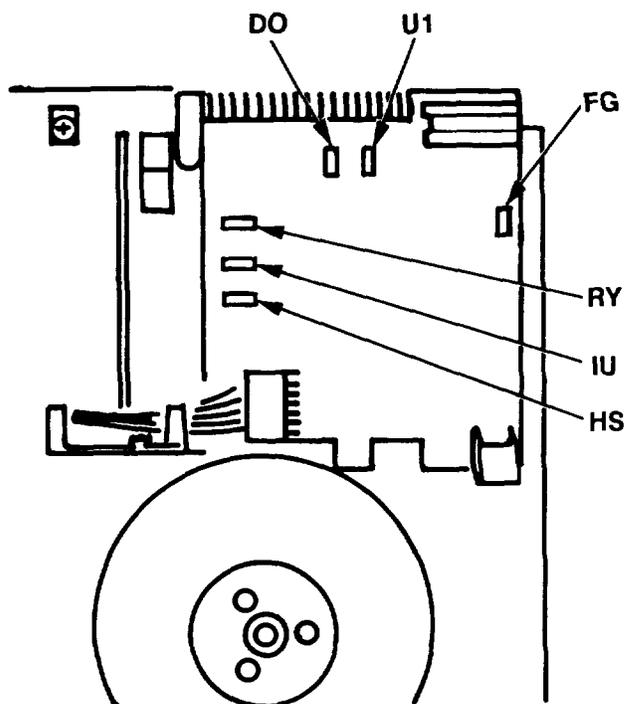
1. Observe rear of replacement disk drive and note its model number (either FD-55BV or FD-55BR).
2. If the model number is FD-55BV, make sure that jumpers are present at Q12, DCRY, ML, IU, DSO, and FG. No other jumpers should be present.
3. If the model number is FD-55BR, make sure that jumpers are present at DO, U1, RY, IU, HS and FG. No other jumpers should be present.
4. Connect disk controller interface cable (8) to 360 kb disk drive circuit board with red wire aligned with pin 1 of edge connector (pin 1 is next to the power connector).
5. Insert 360 kb disk drive (2) into left-hand portion of disk drive cage with the indicator toward the bottom of the test set. Fold disk controller interface cable (8) so that it feeds through access hole in bottom of test set.
6. Connect power cable power connector (7) on disk drive circuit card.

4-23. REPLACE 360 KB DISK DRIVE(CONTINUED)



DRIVE NO. FD-55BV

CE1DV029



DRIVE NO. FD-55BR

CE1DV054

7. Turn test set over and connect green ground wire (1) to ground tab on disk drive.
8. Insert nylon sleeves (4) into top two blue grommets (3).
9. Secure top of 360 kb disk drive using two screws (6) and washers (5).
10. Turn test set over and Insert nylon sleeves (9) into bottom two blue grommets.
11. Secure bottom of 360 kb disk drive using two screws (11) and washers (10).
12. Install Faraday board (para. 4-21).
13. Install front bezel and covers and install keyboard (para. 4-10).

**DISK DRIVE CHECK**

1. Connect test set to AC power source.
2. Place disk drive lever in vertical position and place the MS<sup>®</sup>-DOS diskette into the disk drive with the label facing left and turn the drive lever to the horizontal position.
3. Turn on the test set. The test set should perform a short power-up self-diagnostic and then display the following: Current date is Tue 1-01-1980 Enter new date: 4. Press the ENTER key. The test set will then display the following:

**4-23. REPLACE 360 KB DISK DRIVE(CONTINUED)**

Current time is 0:01:30.00

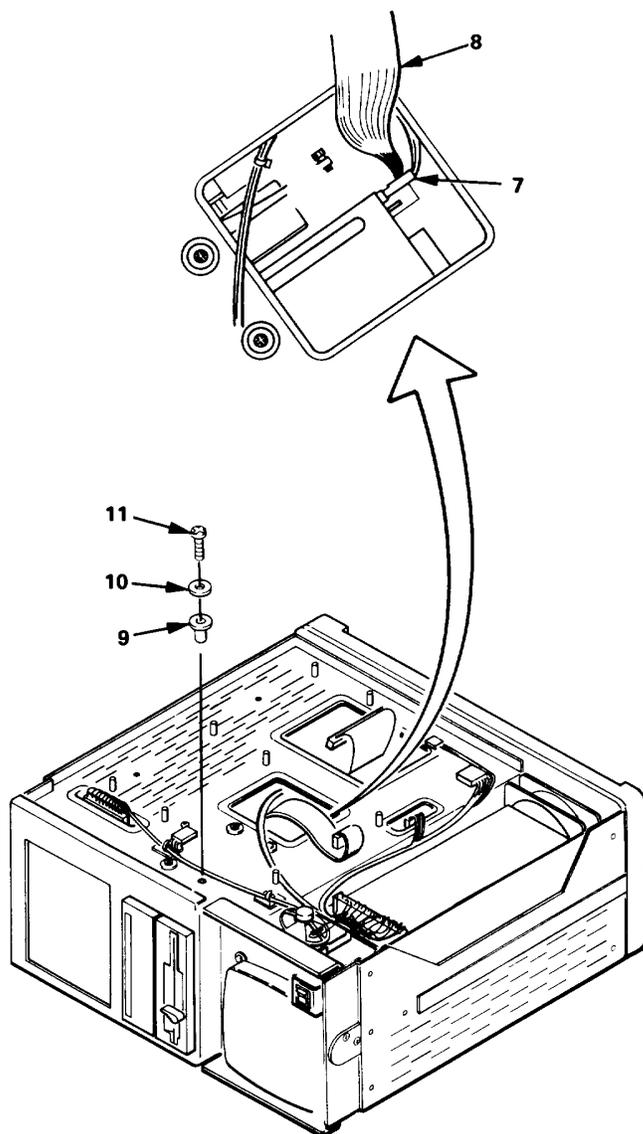
Enter new time:

Note that the current time displayed by the test set depends on how long the test set has been on.

5. Press the ENTER key. The test set will then display the following:

A>\_

6. Turn drive lever to the horizontal position and remove the MS-DOS diskette.
7. Turn off the test set, wait about 10 seconds, and then turn on the test set. Verify that the test set displays the MAIN MENU, as specified in TM 11-66253187-10.
8. Press the F1 key, turn off the test set and install the disk drive cover (para. 4-7).



CE1DV028

**4-24. REPLACE POWER SUPPLY**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Parts:**

Power supply, P/N 70000020

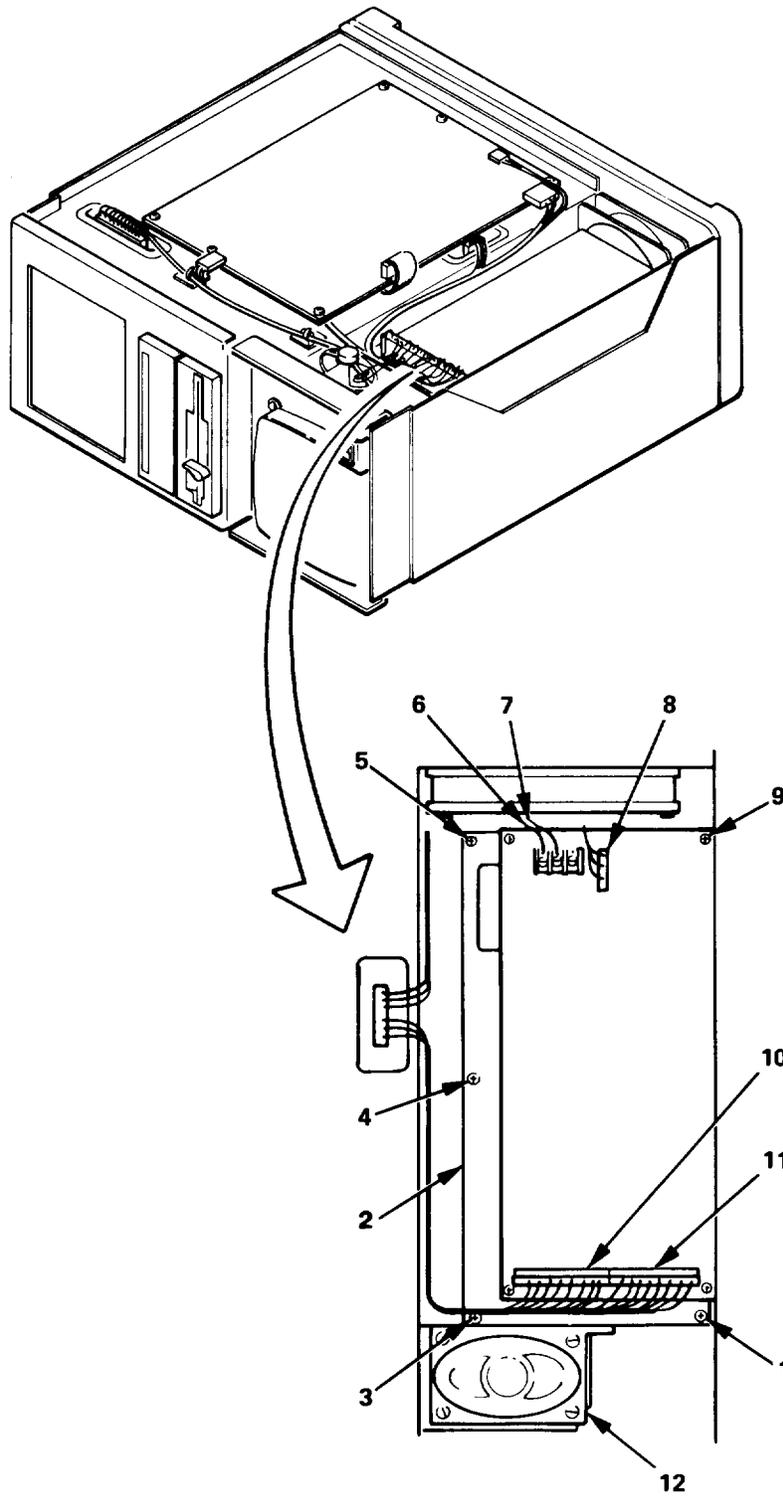
**REMOVAL**

1. Remove bottom cover (para. 4-8).
2. Disconnect harness connectors from power supply connectors J101 (11) and J102 (10).
3. Disconnect white and black AC power input wires (6 and 7).
4. Disconnect harness connector from power supply connector J103 (8).
5. Remove screw (9).
6. Remove 4 screws and washers (1, 3, 4 and 5) from power supply heat sink (2).
7. Remove power supply (heat sink and circuit board).

**INSTALLATION**

1. On new power supply (2), remove right rear screw (9) on circuit board and discard screw.
2. Position power supply with connectors J101 (11) and J102 (10) facing speaker.
3. Secure heat sink to chassis with four screws and washers (1, 3, 4 and 5).
4. Secure circuit board to heat sink and chassis with one screw (9).
5. Connect black and white AC input wires (6 and 7) using screw and internal-tooth lock washers.
6. Connect harness connector to J103 (8) on power supply.
7. Connect harness connectors to J101 and J102 on power supply.
8. Install bottom cover (para. 4-8).

4-24. REPLACE POWER SUPPLY(CONTINUED)



CE1DV030

**4-25. REPLACE FAN****This procedure covers:****a. Removal****b. Installation****INITIAL SETUP:****Tools:**

Tool Kit, JTK-17

**Parts:**

Fan, P/N 65000006

**Materials:**Tie down  
Cable ties**Shop Equipment**

Dry, low pressure (9 psi) air source

**REMOVAL**

1. Remove top and bottom covers (para. 4-8).
2. Cut cable ties that binds fan power connector (2) and disconnect fan connector from harness connector (3).
3. Remove four screws, keep nuts, (1).
4. Remove fan screen (4) and fan (5).
5. Using shop air source and soft brush, remove dust and dirt from fan and from fan screen.

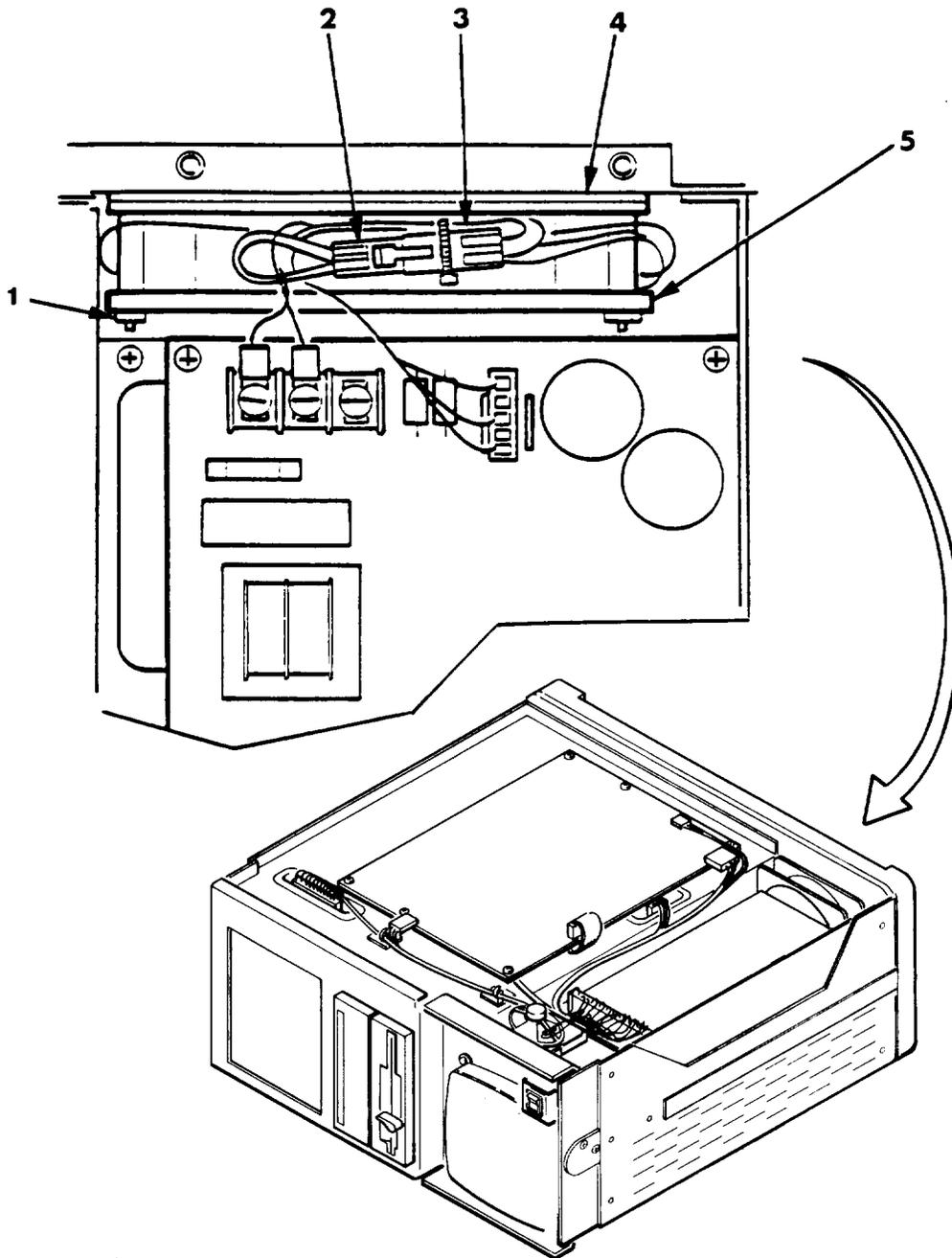
**INSTALLATION**

1. Install tie down on new fan (5) in the same position as that on the old fan.
2. Position fan in unit so that tie down faces bottom of test set.

**CAUTION****Do not over-tighten keep nuts when securing fan. This will break the plastic edges of the fan.**

3. Position fan screen (4) between fan and rear panel and secure fan screen and fan to rear panel with screws and four keep nuts (1).
4. Connect fan power connector (2) to harness connector (3).
5. Bind fan and harness connectors and AC power wiring to tie down using cable tie.
6. Turn on test set and verify that fan is operating.
7. Install top and bottom covers (para. 4-8).

4-25. REPLACE FAN(CONTINUED)



CE1DV031

**4-26. REPLACE AC INPUT MODULE**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:**

**Tools:**

Tool Kit, JTK-17

**Parts:**

AC input module, P/N 68000101

**Materials:**

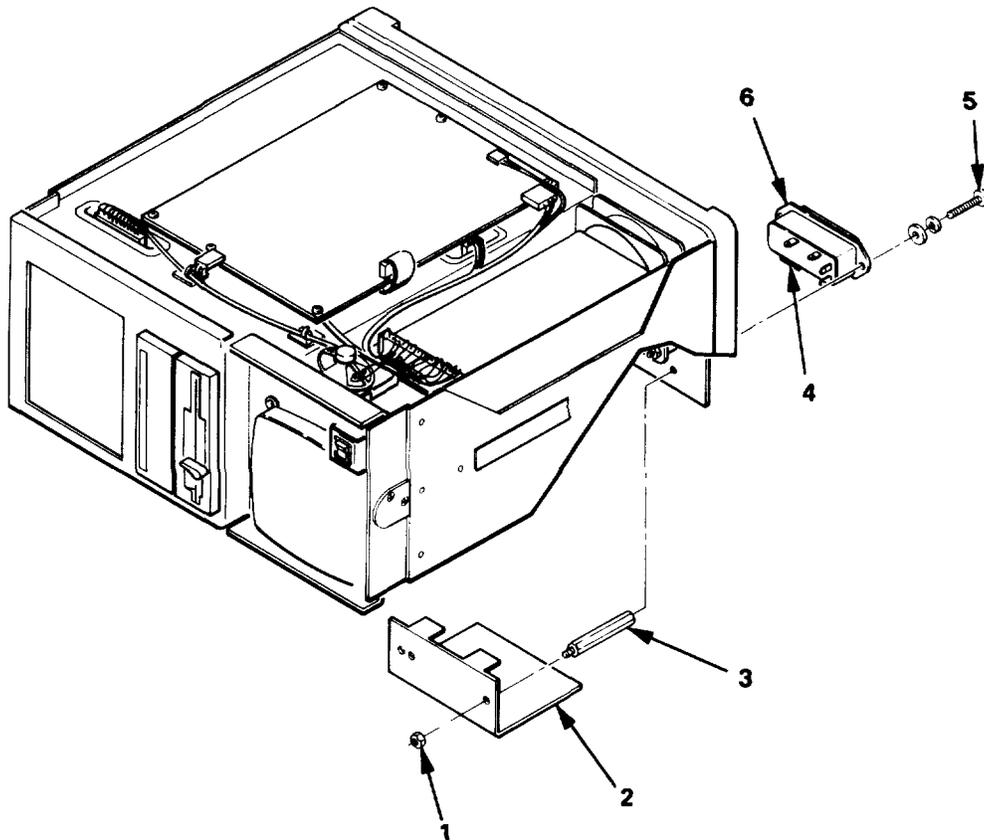
Tie down

Cable ties

Solder, type SN-60

**REMOVAL**

1. Remove EMI filter (para. 4-18).
2. Remove one keep nut (1) and remove filter bracket (2).
3. Remove two standoffs (6).
4. Note wires bound by cable tie. Cut cable tie and detach tie down (3) from AC input module.
5. Note wire connections on AC input module and then disconnect wires.
6. Remove two screws and washers (4) and remove AC input module.
7. Unsolder green wire from ground terminal on AC input module.



**4-26. REPLACE AC INPUT MODULE (CONTINUED)**

---

**INSTALLATION**

1. Position AC Input module (5) and secure with two screws and washers (4).
  2. Connect wires to AC Input module as noted during removal.
  3. Solder green wire to ground terminal on AC input module
  4. Install tie down (3) on AC Input module.
  5. Bind wires to tie down as noted during removal using cable tie.
  6. Install two standoffs (6) on end of screws used to secure AC Input module.
  7. Position filter bracket (2) on standoffs. Secure Inside end of bracket to standoff using keep nut (1).
  8. Install EMI filter (para. 4-18).
-

**4-27. REPLACE MOTHER BOARD**

This procedure covers:

a. Removal

b. Installation

**INITIAL SETUP:****Tools:**

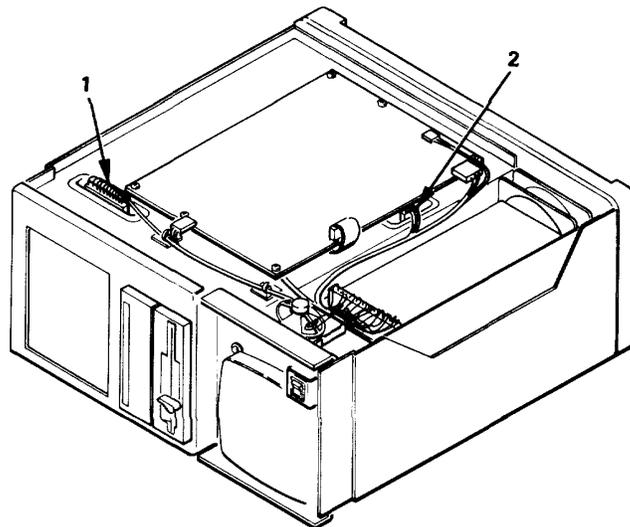
Tool Kit, JTK-17

**Parts:**

Mother board, P/N 92000008A

**REMOVAL**

1. Remove IEEE-488 controller board (para. 4-12).
2. Remove DSP board and interface board (para. 4-14).
3. Remove 10 MB Fixed disk controller board (para. 4-22).
4. Remove graphics controller board (para. 4-15).
5. Remove bottom cover (para. 4-8).
6. Disconnect 12-pin (1) and 6-pin (2) power connectors.
7. Turn test set over.
8. Remove three screws and nylon washers (4).
9. Remove seven screws and washers (3).
10. Lift mother board (5) enough to access CPU/motherboard cable (6) and disconnect cable from Faraday board connector J4 (7). Carefully remove mother board.

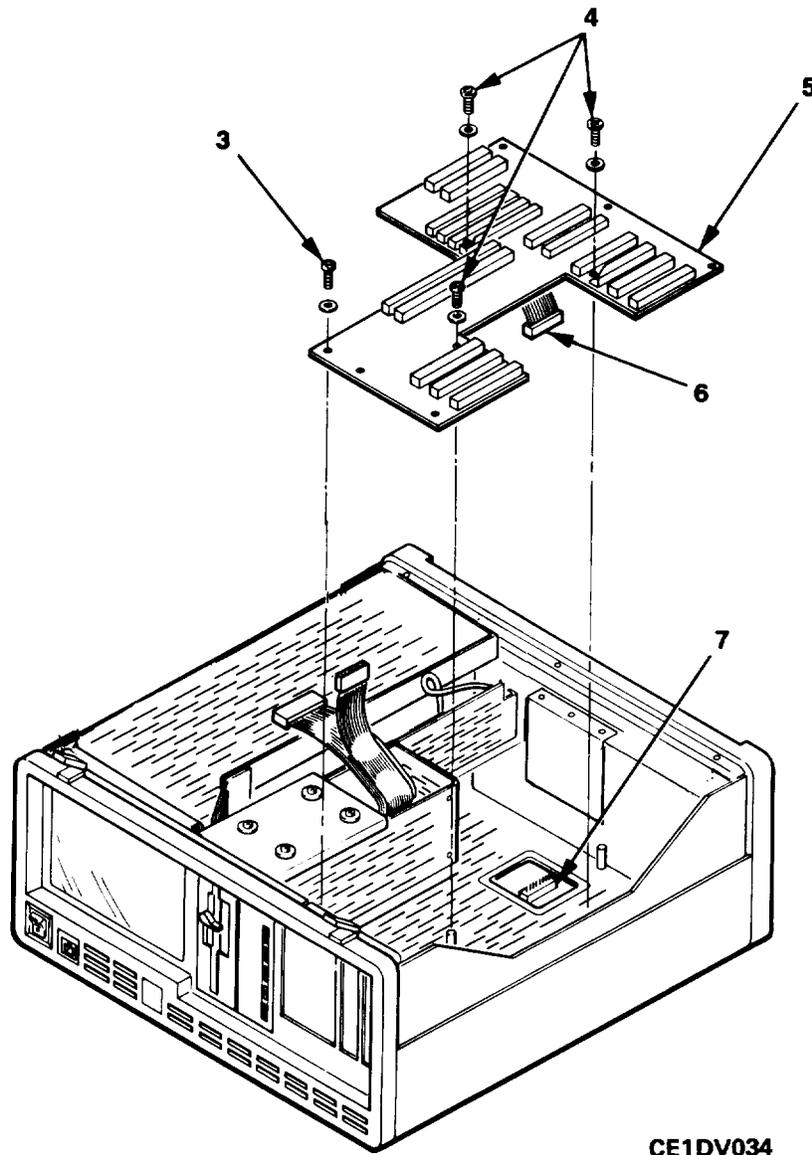


CE1DV033

**INSTALLATION**

1. Position mother board (5) in chassis.
2. Locate CPU/motherboard cable underside of mother board and connect CPU/motherboard cable to Faraday board connector J4 (7).
3. Install eight screws and washers (3).
4. Install three screws and nylon washers (4).
5. Turn test set over and connect 6-pin (2) and 12-pin (1) connectors to mother board.
6. Install bottom cover (para. 4-8).
7. Install disk controller board (para. 4-22).
8. Install graphics controller board (para. 4-15).
9. Install interface board and DSP board (para. 4-14).
10. Install IEEE-488 controller board (para. 4-12).

4-27. REPLACE MOTHER BOARD (CONTINUED)



CE1DV034

**4-28. CLEANING**

This procedure covers:

- |                      |                                |
|----------------------|--------------------------------|
| a. CRT Face          | c. Chassis, Fan and Fan Screen |
| b. Keyboard Assembly |                                |

**INITIAL SETUP:****Tools:**

Tool Kit, JTK-17  
Soft-bristled brush

**Shop Equipment**

Dry, low-pressure (9 psi) air source

**General Safety Instructions****WARNING**

Use approved protective goggles to protect your eyes from flying particles when using compressed air. Do not direct airstream toward self or other personnel, as injury may result.

**CRT FACE****NOTE**

A fine screen attached to the inside of the front bezel covers the face of the CRT to reduce glare during operation. Remove the front bezel before cleaning the CRT.

1. Remove front bezel and clean glare screen (para. 4-10).
2. Clean face of CRT with paper towel moistened in mild detergent and water solution. Dry with dry paper towels.
3. Install front bezel (para. 4-10).

**KEYBOARD ASSEMBLY**

1. Disassemble keyboard (para. 4-11).
2. Use dry, low-pressure air (approximately 9 psi) to blow off dirt in the keyboard assembly and dirt accumulated in bottom cover.
3. Clean the key caps with a soft cloth dampened (not wet) with a mild detergent and water solution. Use a cotton-tipped applicator for cleaning in narrow spaces.
4. Reassembly keyboard (para. 4-11).

**CHASSIS, FAN AND FAN SCREEN**

1. Make sure that power cord is disconnected and remove top and bottom covers and high voltage cover (para. 4-9).
2. Use dry, low pressure air (approximately 9 psi) to blow dirt out of chassis.
3. Point air stream at fan from the inside and blow all dirt out of fan and fan screen. Use brush to loosen dirt clinging to fan screen.
4. Remove any remaining dirt with soft-bristle brush and blow out with air.
5. Clean glare screen and face of CRT using procedure above.
6. Install high voltage cover top and bottom covers (para. 4-9).

## 4-29. FORMAT FIXED DISK DRIVE

---

This procedure covers:

- |                                   |                           |
|-----------------------------------|---------------------------|
| a. Boot Procedure                 | c. Creating DOS Partition |
| b. Determining Controller Version | d. Formatting for DOS     |
| c. Performing Low Level Format    |                           |

Formatting a new fixed disk drive prepares it for storing programs and data (software). A new fixed disk drive must therefore always be formatted before loading software. Formatting a fixed disk that already contains data will totally erase the data.

All fixed disks contain some storage areas that are imperfect and will not store data accurately. The formatting process detects these areas and isolates them so that they will not be used. If an area of the disk is damaged during operation, resulting in errors, re-formatting the disk using this process will isolate the damaged areas so that the fixed disk need not be replaced.

---

### **INITIAL SETUP:**

**Software:**

MS®-DOS Diskette P/N 03000001

**Test Equipment:**

Alignment keyboard P/N 93000002

### **CAUTION**

**Be careful when handling diskettes to avoid damage or contamination. When diskettes are not being used, keep them in their protective envelopes. Do NOT:**

- Touch exposed media surfaces on diskettes.
- Place diskettes near magnetic devices (like telephones) or near sources of heat.
- Fold or bend diskettes.

### **NOTE**

**Formatting the fixed disk erases all data on the disk. Software must be loaded after formatting.**

---

### **BOOT PROCEDURE**

1. Remove disk drive cover (para. 4-7).
2. Remove the keyboard.
3. Install the alignment keyboard.
4. Connect test set to AC power source. Make sure that power is turned off.

### **CAUTION**

**Be careful when handling diskettes to avoid damage or contamination. When diskettes are not being used, keep them in their protective envelopes. Do NOT:**

- Touch exposed media surfaces on diskettes.
- Place diskettes near magnetic devices (like telephones) or near sources of heat.
- Fold or bend diskettes.

5. Obtain MS®-DOS diskette.

**4-29. FORMAT FIXED DISK DRIVE (CONTINUED)**

---

6. Insert MS®-DOS diskette into 360 kB disk drive with label facing to the left and turn drive lever to the horizontal position.
7. Turn on test set. The test set should perform a short power-up self-diagnostic and then display the following:  
Current date is Tue 1-01-1980  
Enter new date:
8. Press the ↵ key. The test set will then display the following:  
Current time is 0:01:30.00  
Enter new time:  
Note that the current time displayed by the test set depends on how long the test set has been on.
9. Press the ↵ key. The test set will then display the following:  
A>\_

**DETERMINING CONTROLLER VERSION**

1. Type the following:  
debug  
Then, press the ↵ key. The test set will then display the following:
2. Type the following:  
g=c800:5  
Then, press ↵. If the following message is displayed, perform low level format using procedure 1, below. If this message is not displayed, perform low4level format using procedure 2, on page 4-56.  
Super Bios Formatter Rev. x.x (C) Copyright Western Digital Corp.  
Current Drive is C:. Select new interleave or Return for current  
The x.x above will be a decimal number.

**PERFORMING LOW-LEVEL FORMAT, PROCEDURE 1**

1. Press the ↵ key. The test set will display the following:  
Current interleave is 3. Select new interleave or Return for current.
2. Type the following:  
4  
Then, press ↵. The test set will display the following:  
Are you dynamically configuring the drive - answer Y/N
3. Type the following:  
Y

**4-29. FORMAT FIXED DISK DRIVE (CONTINUED)**

---

Then, press the ↵ key

4. Type the following:  
306 4 128 128 11 5

Then, press the ↵ key. The test set will display the following:  
Are you virtually configuring the drive - answer Y/N

5. Type the following:  
N

Then, press the J key. The test set will display the following:  
Press "Y" to begin formatting drive C with interleave 04

6. Type the following:  
Y

Then, press the ↵ key. The test set will begin formatting the 10 Mb hard disk drive. This may take up to 5 minutes. When formatting is complete, the test set will display the following: Do you want to format bad tracks - answer Y/N

7. Type the following:  
N

Then, press the ↵ key. The test set will display the following message:  
Format Successful  
System will now restart  
Insert DOS diskette in drive A:  
Press any key when ready.

8. Press the CTRL, ALT and DEL keys at the same time. The test set will boot and then display the following message:

Current date is Tue 1-01-1980  
Enter new date:

9. Press the .j key. The test set will then display the following:  
Current time is 0:01:30.00  
Enter new time:

Note that the current time displayed by the test set depends on how long the test set has been on.

10. Press the ↵ key. The test set will then display the following:

A>\_

11. Create DOS partition using the procedure on page 4-57.

**4-29. FORMAT FIXED DISK DRIVE (CONTINUED)**

---

**PERFORMING LOW-LEVEL FORMAT, PROCEDURE 2**

1. Press the CTRL, ALT and DEL keys at the same time. The test set will boot and then display the following message:  
Current date is Tue 1-01-1980  
Enter new date:
2. Press the ↵ key. The test set will then display the following:  
Current time is 0:01:30.00  
Enter new time:  
Note that the current time displayed by the test set depends on how long the test set has been on.
3. Press the ↵ key. The test set will then display the following:  
A>\_
4. Type the following:  
debug  
Then, press the ↵ key. The test set will display the following:
5. Type the following:  
rax  
Then, press the ↵ key. The test set will display the following:  
AX 0000
6. Type the following:  
0004  
Then, press the ↵ key. The test set will display the following:
7. Type the following:  
g=c800:5  
Then, press the ↵ key. The test set will display the following:  
WX2 Format Revision 7.0 (C) Copyright Western Digital Corp. 1985  
(AH) = 00  
(AL) = 04  
Press "Y" to begin formatting drive 00 with interleave 04  
-

**4-29. FORMAT FIXED DISK DRIVE (CONTINUED)**

---

8. Type the following:

Y

Then, press the ↵ key. The test set will begin formatting the 10 Mb hard disk drive. This may take up to 5 minutes. Verify that the following is displayed within 5 minutes and then create DOS partition according to the following procedure:

Format Successful

A>-

**CREATING DOS PARTITION**

1. Type the following:

fdisk

Then, press the ↵ key. The test set will then display the following:

Fixed Disk Setup Program Version 0.01

(c) Copyright Microsoft, 1985, 1986.

FDISK Options

Choose one of the following:

1. Create DOS Partition
2. Change Active Partition
3. Delete DOS Partition
4. Display Partition Data

Enter Choice: \_

Press ESC to return to DOS

2. Type the following:

1

Then, press the ↵ key. The test set will then display the following:

Create DOS Partition

Current Fixed Disk Drive: 1

Do you wish to use the entire fixed disk  
for DOS (Y/N)..... -

**4-29. FORMAT FIXED DISK DRIVE (CONTINUED)**

---

3. Type the following:

Y

Then, press the ↵ key. The test set will then display the following:

Insert DOS diskette in drive A:

Press any key when ready...\_

4. Press the ↵ key three times. The test set will then display the following:

A>\_

**FORMATTING FOR DOS**

1. Type the following:

format c: /s /v

Make sure that there is a space between "format" and "c:". Then, press the J key. The test set will display the following:

Press any key to begin formatting drive C:

2. Press the .J key. The bottom red light on the 10 Mb hard disk drive will light and the test set will display the following:

Formatting...

After a few minutes, the test set will then display the following:

Format complete

System transferred

Volume label (11 characters, ENTER for none) ?\_

3. Type the following:

USM-608

Then, press the X\_ key. The test set will then display the following (the numbers may vary slightly):

10592256 bytes total disk space

45056 bytes used by system

36864 bytes in bad sectors

10547200 bytes available on disk

A>\_

If more 100,000 bytes are designated as being in bad sectors, replace hard disk. Otherwise, the 10 Mb hard disk drive is now ready for software loading (para. 4-30).

---

**4-30. LOAD SOFTWARE**

This procedure covers:

- a. Loading TC System Software      b. Loading DOS Utilities

**INITIAL SETUP:****Software:**

TC System Software Diskette P/N 70500001  
 Option M Diskette P/N 03000038  
 Null Data Files P/N 860905  
 MS®-DOS Diskette P/N 03000001

**Equipment Condition:**

Alignment keyboard installed  
 Para. 4-7 Disk drive cover removed  
 Para. 4-29 Fixed disk drive formatted

**General Precautions****CAUTION**

Be careful when handling diskettes to avoid damage or contamination. When diskettes are not being used, keep them in their protective envelopes. Do NOT:

- Touch exposed media surfaces on diskettes.
- Place diskettes near magnetic devices (like power supplies or telephones) or sources of heat.
- Fold or bend diskettes.

**NOTE**

- Software must be loaded only if the 10 MB fixed disk drive has been formatted (para. 4-29). If the fixed disk drive has been replaced, make sure that it has been formatted before loading software.
- If you make a mistake while typing, press the backspace (-) key to erase the mistake and retype.
- Always place diskettes in their protective envelopes after use.

**LOADING TC SYSTEM SOFTWARE**

1. If MS®-DOS diskette is not already in 360 kB disk drive, insert it with label facing to the left and turn drive lever to the horizontal position.
2. Press the CTRL, ALT and DEL keys at the same time. The test set should perform a short power-up self-diagnostic and then display the following:  
     Current date is Tue 1-01-1980  
     Enter new date:
3. Press the ↵ key. The test set will then display the following:  
     Current time is 0:01:30.00  
     Enter new time:  
     Note that the current time displayed by the test set depends on how long the test set has been on.
4. Press the ↵ key. The test set will then display the following:  
     A>-

**4-30. LOAD SOFTWARE (CONTINUED)**

---

5. Obtain TC System Software (6-disk set). Each disk in the set is numbered, beginning with 1.
6. Type the following:  

```
restore a: c:\ s
```

 Then, press the ↵ key. The test set will display the following:  
 Insert backup diskette 1 in drive A:  
 Strike any key when ready
7. Turn drive lever to the vertical position and remove the diskette from the drive. Place TC software disk (1 of 6) into disk drive with the label facing left and turn the drive lever to the horizontal position.
8. Press the ↵ key. The test set will begin transferring software program files from the diskette to the fixed disk drive. When all of the files on the diskette have been transferred, the test set will display the following:  
 Insert backup diskette 2 in drive A:  
 Strike any key when ready
9. Repeat steps 7 and 8, above, inserting the TC software disk numbers indicated. When the following display is encountered, proceed to step 10, below.  
 A>-
10. Turn drive lever to the vertical position and remove the last TC software diskette. Place the MS®-DOS diskette into the drive with the label facing left and turn the drive lever to the horizontal position. Press the F3 key and then the J\_ key. Disregard CRT display.
11. Turn drive lever to the vertical position and remove the MS®-DOS diskette. Place the diskette labeled "NULL DATA DISK" into the drive with the label facing left and turn the drive lever to the horizontal position. Press the ↵ key. The test set will display the following:  
 A>-
12. Turn drive lever to the vertical position and remove the diskette. Place the diskette labeled "Option M" into the drive with the label facing left and turn the drive lever to the horizontal position.
13. Type the following:  

```
optionm
```

 Then, press the ↵ key. The last line of the test set display will be the following:  
 A>-
14. Turn drive lever to the vertical position and remove the diskette. Then, load DOS utilities.

**LOADING DOS UTILITIES**

1. Place the MS®-DOS diskette into the disk drive with the label facing left and turn the drive lever to the horizontal position.
2. Turn off the test set, wait about 10 seconds, and turn on the test set. The test set should perform a short power-up self-diagnostic and then display the following:  
 Current date is Tue 1-01-1980  
 Enter new date:    -

**4-30. LOAD SOFTWARE (CONTINUED)**

---

3. Type today's date in numeric form, separating the numbers with hyphens or slashes. For example, October 21, 1986 would be typed as 10-21-86 or 10/21/86. After typing the date, press the J key. The test set will then display the following:

Current time is 0:01:30.00

Enter new time:

Note that the current time displayed by the test set depends on how long the test set has been on.

4. Type the current time in hours and minutes, separated by a colon, using the 24-hour format. For example, 1:15 pm would be typed as 13:15. After typing the time, press the .J key. The test set will then display the following:

A>\_

5. Type the following:

c:

Then, press the ↵ key. The test set will display the following:

C>\_

6. Type the following:

md dos

Then, press the ↵ key. The test set will display the following:

C>-

7. Type the following:

cd dos

Then, press the ↵ key. The test set will display the following:

C>\_

8. Type the following:

copy a:\*. \*

Then, press the ↵ key. The test set will display the files being transferred from the diskette in the 360 kB disk drive to the 10 Mb disk drive. When the transfer is complete, the test set will display:

27 FILES COPIED

C>-

The number of files may vary.

9. Type the following:

copy backup.exe \tc\admin

Then, press the ↵ key. The test set will display the following:

1 FILE COPIED

C>\_

**4-30. LOAD SOFTWARE (CONTINUED)**

---

10. Type the following:  
     copy restore. exe \tcladmin  
     Then, press the ↵ key. The test set will display the following:  
         1 FILE COPIED  
         C>\_
11. Turn drive lever to the horizontal position and remove the MS<sup>®</sup>-DOS diskette.
12. Turn off the test set, wait about 10 seconds, and then turn on the test set. Verify that the test set displays the MAIN MENU, as specified in TM 11 6625-3187-10.
13. Do alignment procedure (pare. 4-32).
14. Do performance test (pare. 4-31).
15. Press the F1 key, turn off the test set and install the disk drive cover (pare. 4-7).
16. Remove the alignment keyboard.
17. Install the test set keyboard, P/N 93000002A.

---

**4-31. PERFORMANCE TESTS**

---

**This procedure covers:**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>a. Power Up, Power-On Self Test</li> <li>b. Self Test</li> </ol> | <ol style="list-style-type: none"> <li>c. Transmit Output Signal Test and Automatic Diagnostics</li> <li>d. Received Signal Measurement</li> </ol> |
|---|--|
- 

**INITIAL SETUP:****Test Equipment:**

Differential Voltmeter, JK 887 AB/AN  
 Frequency Counter, HP 5345A  
 Test Oscillator, HP 652A  
 Multimeter, DM 501A

**Cables/Adapters**

Test Cable, BNC Male to BNC Male, 3-feet  
 BNC Female to Dual Female Banana Adapter,  
 Pomona 1269 (2 each)  
 600 Ohm Load, HP 11047A  
 Dual Banana Plug to 310 Phone Plug Adapter,  
 Pomona 2112 (supplied with test set)

---

**POWER UP, POWER-ON SELF TEST AND AUTOMATIC DIAGNOSTICS**

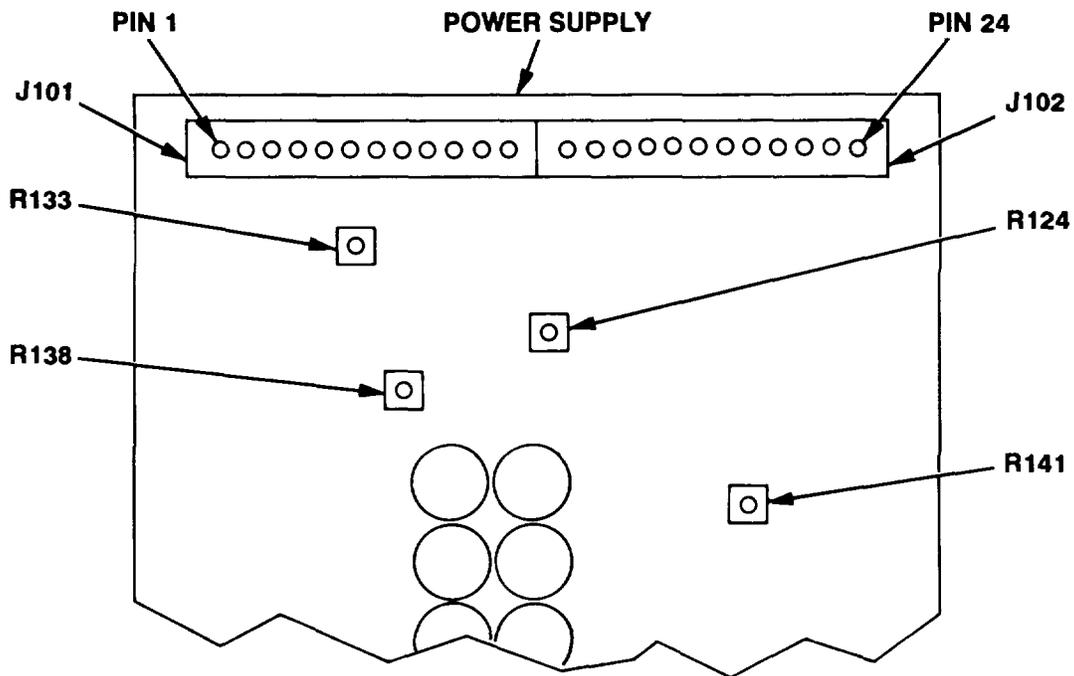
1. Power up the test set (TM 11 6625-3187-10).
2. Verify that display is optimum. If not, adjust CRT display monitor (pare. 4-32).

**POWER SUPPLY CHECKS AND ADJUSTMENTS**

1. Remove bottom cover (pare. 4-8).
2. Turn on test set.
3. Measure voltages between each of the following points and chassis ground. Verify that each voltage is within the tolerance indicated. If out of tolerance, adjust using potentiometer indicated. If all voltages can not be adjusted to tolerance, replace power supply (pare. 4-24).

4-31. PERFORMANCE TEST (CONTINUED)

MEASUREMENT VOLTAGE (VDC)ADJUSTMENT POINT	VOLTAGE (VDC)	ADJUSTMENT POTENTIOMETER
J101-1	+12.0±0.4	R133
J101-2	+12.0±0.4	R133
J101-3	+12.0±0.4	R133
J101-4	+12.0±0.4	R133
J101-5	+12.0±0.4	R133
J101-6	+12.0±0.2	R138
J101-7	+5.0±0.2	R134
J101-7	+5.0±0.2	R134
J101-8	+5.0±0.2	R134
J101-9	+5.0±0.2	R134
J101-10	+5.0±0.2	R134
J102-19	-48±3	R141
J102-20	-12.0±0.4	None
J102-21	-12.0±0.4	None
J102-23	-12.0±0.4	None



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**SELF TEST**

Perform self test (TM 11-6625-3187-10).

**TRANSMIT OUTPUT SIGNAL TEST**

1. Connect 600 Ohm load to Input of differential and connect input of 600 Ohm load to test set XMT 2W/4W connector using adapters.
2. Go to the TRANSMISSION MEASUREMENT FUNCTIONS menu. Select B. LEVEL/FREQ/ENV DELAY.
3. On the CIRCUIT INTERFACE 1 page, select 600 Ohms transmit and receive impedance, terminated. Then select absolute transmit values.
4. Go to the SWEEP CONTROL page.
5. Select SWEEP OFF.
6. Go to the MEASUREMENT page and enter a transmit value of 0.0 dBm and a transmit frequency of 1004 Hz.
7. Press the RUN/HALT key (DEL key on alignment keyboard). Verify that the differential voltmeter indicates between 0.76573 and 0.78356 Volts act 8. At voltmeter, disconnect test cable from adapter and connect cable to frequency counter. Verify that the frequency counter Indicates between 1003 and 1005 Hz.
9. Disconnect test equipment.

**RECEIVE LEVEL MEASUREMENT TEST**

1. Connect test oscillator to frequency counter and adjust test oscillator output frequency to 1004 Hz.
  2. Connect 600 Ohm load to differential voltmeter and connect 600 Ohm output of test oscillator to load using test cable and adapters.
  3. Adjust test oscillator to produce 0.7736 Volts, as indicated on voltmeter.
  4. Connect 600 Ohm output of test oscillator to RCV connector of test set using test cable and adapters.
  5. Verify that RECEIVE dBm section of display Indicates 0.00 + 0.10 dBm and that RECEIVE Hz section of display indicates between 1003 and 1005.
  6. Disconnect test equipment.
  7. Press the RUN/HALT key (DEL key on alignment keyboard). Then, press the F1 key and turn off the test set.
-

**4-32. ALIGNMENT PROCEDURES**

This procedure covers:

**a. Automatic Voice Band Alignment****b. Automatic Wide Band Alignment**

Programs contained on an alignment disk are used to automatically adjust the transmit and receive circuits in the DSP board. To do this, the program causes the DSP board to produce an output voltage and asks the technician to measure the voltage. The technician is then instructed to enter the measured voltage value. After that, the program compares the voltage that the DSP produced and the voltage that the DSP measured against the actual output voltage measured by the technician. Any difference voltages are used to correct an Internal adjustment table of voltage programming correction and measurement correction values. When this is done, the technician is instructed to turn off the write protect switch on the DSP board, allowing the board to receive and store data. After the technician has accomplished this, the program downloads the new adjustment tables into the DSP board memory. During normal operation, these new adjustment tables are used to correct transmitted voltages and received signal measurements. This alignment procedure is done separately for voice band and wide band levels.

**INITIAL SETUP:****Test Equipment:**

Differential Voltmeter, JK 887 AB/AN  
Alignment Diskette, P/N 63000055  
Alignment Keyboard, P/N 93000002

**Cables/Adapters**

Test Cable, BNC Male to BNC Male, 3-foot  
BNC Female to Dual Banana Adapter, Pomona 1269 (2 each)  
Dual Banana Plug to 310 Phone Plug Adapter, Pomona 2112 (supplied with test set)

**CAUTION**

**Be careful when handling diskettes to avoid damage or contamination. When diskettes are not being used, keep them in their protective envelopes. Do NOT:**

- **Touch exposed media surfaces on diskettes.**
- **Place diskettes near magnetic devices (like telephones) or near sources of heat.**
- **Fold or bend diskettes.**

**NOTE**

- **Make sure you use a 310 phone plug to connect to test set XMT connector. Otherwise, voltage measurements will be incorrect.**
- **If you make a mistake while typing, press the backspace (←) key to erase the mistake and retype.**

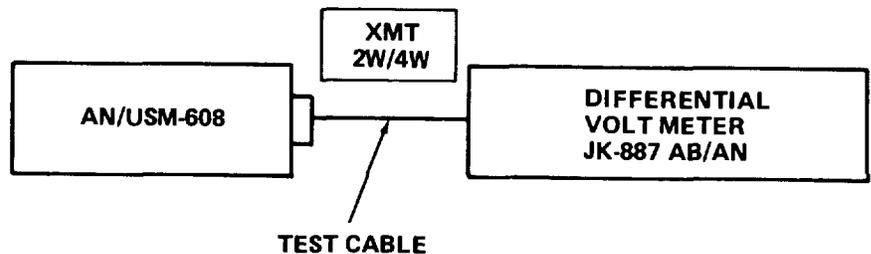
**AUTOMATIC VOICE BAND ADJUSTMENTS**

1. Remove top cover (para. 4-8).
2. Remove disk drive cover (para. 4-7).
3. Remove keyboard.
4. Install alignment keyboard.
5. Turn on the test set. Verify that the MAIN MENU is displayed after about one minute and that there are no error messages.
6. Obtain alignment diskette.

**4-32. ALIGNMENT PROCEDURES (CONTINUED)**

7. On the 360 kB disk drive, turn the drive lever to the vertical position. Insert alignment diskette into drive with the label facing to the left and turn the drive lever to the horizontal position.
8. Press the F10 key on the keyboard. The test set will display the following:  
c:\>\_
9. Type the following:  
A:  
Then, press the  $\downarrow$  key. The test set will display the following:  
A:\>\_
10. Type the following:  
DSPCAL  
Then, press the  $\downarrow$  1 key. The test set will load the DSP alignment program and begin execution. After about 2 minutes, the last line of the test set display will be the following:  
Enter transmit level in volts :

11. Connect differential voltmeter to XMT 2W/4W connector. Make sure that the voltmeter is unterminated. Record the RMS voltage indication to the nearest millivolt.



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12. Type the measured voltage on the keyboard and then press the  $\downarrow$  key. The test set will display the following (the numbers will vary):  
Voice +9.9 dBm Wide +9.9 dBm  
Please connect RMS voltmeter to transmit...  
Level should be 0.975 +/- .003 volts  
Press C to continue, X to exit
13. Verify that voltmeter indicates  $0.975 \pm 0.003$  Volts. If the voltage is not in tolerance, press "X" and  $\downarrow$  and repeat steps 10 through 12. If voltage is still out of tolerance, replace DSP board. If voltage is within tolerance, disconnect voltmeter and proceed to next step.
14. Type the following:  
C  
The test set will display calibration data. After a few minutes, the test set will then display:  
Please check that EEPROM is write enabled.  
Press C to continue, X to exit.

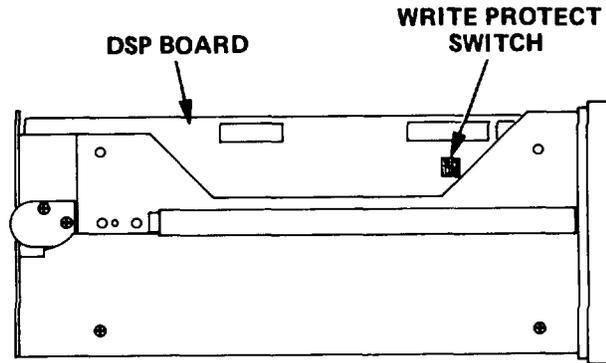
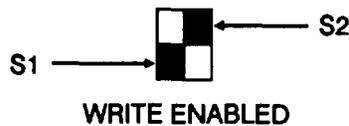
**4-32. ALIGNMENT PROCEDURES (CONTINUED)**

15. Locate the red write protect switch on the DSP board (right side of test set).

**CAUTION**

Switch numbers 1 and 2 must never be In the OFF (down) position at the same time. This will permanently alter the memory in the DSP board with random data. If this occurs, the DSP board must be replaced.

- a. Set switch number 2 to ON.
- b. Set switch number 1 to OFF.



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16. Type the following:

C

The test set will then display the following:

Writing calibration data to EEPROM  
 Calibration sequences completed. Please write protect EEPROM.  
 Dump calibration data? (Y/N):

17. Type the following:

N

The test set will display the following:

A:\>\_

18. Proceed to automatic wide band envelope delay adjustments.

**AUTOMATIC WIDE BAND ENVELOPE DELAY ADJUSTMENTS**

1. Type the following:

WBEDDCAL

Then, press the ↵ key. The test set will load the wide band alignment program and begin execution. After a few minutes, the test set will display the following:

Please check that EEPROM is write enabled.  
 Press C to continue

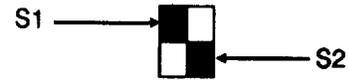
2. Press the "C" key (write protect was already turned off). The test set will record alignment data into permanent memory and will then display the following:

Writing calibration data to EEPROM  
 Calibration sequences completed. Please write protect EEPROM.  
 Dump calibration data? (Y/N):

**4-32. ALIGNMENT PROCEDURES (CONTINUED)****CAUTION**

Write protect switch numbers 1 and 2 must never be in the OFF (down) position at the same time. This will permanently alter the memory in the DSP board with random data. If this occurs, the DSP board must be replaced.

3. On the DSP board:
  - a. Set switch number 1 to ON.
  - b. Set switch number 2 to OFF.



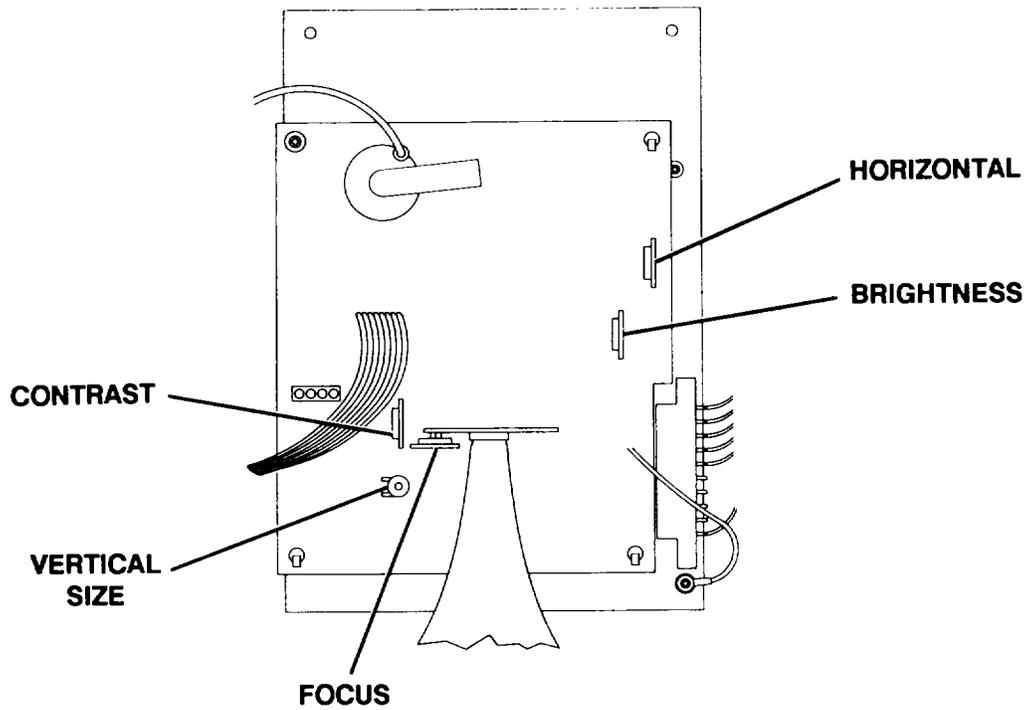
**WRITE PROTECTED**

4. Press "N". The test set will display the following:
  - A:
5. Turn off the test set.
6. On the 360 kB disk drive, turn the drive lever to the vertical position. Remove and store the alignment diskette.
7. Install the disk drive cover (para. 4-7).
8. Install the top cover (para. 4-8).
9. Remove the alignment keyboard.
10. Install the test set keyboard.

**CRT DISPLAY ADJUSTMENTS**

1. Remove high voltage cover (para. 4-9).
2. Turn on test set.
3. Adjust display monitor controls for optimum display.
4. Turn off test set and install high voltage cover (para. 4-9).

**4-32. ALIGNMENT PROCEDURES (CONTINUED)**



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**4-33. IEEE-488 COMMUNICATIONS SETUP**

Refer to paragraph 4-12, remove board, set switches and re-install board.

**Section IV. PREPARATION FOR STORAGE OR SHIPMENT**

Refer to Chapter 2, Section V for packing instructions.

4-69/(4-70 Blank)



# APPENDIX A REFERENCES

## A-1. SCOPE.

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publication references in this manual.

## A-2. FORMS.

Product Quality Deficiency Report..... Form SF 368

Recommended Changes to Publications and Blank Forms ..... DA Form 2028

Report of Discrepancy (ROD)..... Form SF 364

Transportation Discrepancy Report (TDR)..... Form SF 361

## A-3. TECHNICAL MANUALS.

Procedures for Destruction of Electronics Materiel  
to Prevent Enemy Use (Electronics Command)..... TM 750-244-2

Operator's Manual for Transmission Test Set  
AN/USM-608 (NSN 6625-01-246-8206).....TM 11-6625-3187-10

Unit, Intermediate Direct Support, and General Support  
Maintenance Repair Parts and Special Tools List for  
Transmission Test Set, AN/USM-608 (NSN 6625-246-8206)..... TM 11-6625-3187-24P

## A-4. MISCELLANEOUS PUBLICATIONS.

Common Table of Allowance, Expendable/Durable Items  
(Except Medical, Class V, Repair Parts, and Heraldic Items) ..... CTA 50-970

Consolidated Army Publications and Forms Index..... DA Pam 25-30

First Aid..... FM 4-25.11

The American Society of Mechanical Engineers,  
Abbreviations and Acronyms..... ASME Y14.38

The Army Maintenance Management System (TAMMS) Users Manual ..... DA Pam 750-8



## APPENDIX B MAINTENANCE ALLOCATION CHART (MAC)

### SECTION I. INTRODUCTION

#### B-1. GENERAL.

a. This introduction provides a general explanation of all maintenance and repair function authorized at the two maintenance levels under the Two-Level Maintenance System concept.

b. The MAC in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end-item or component. The application of the maintenance functions to the end-item or component shall be consistent with the capabilities of the designated maintenance levels, which are shown on the MAC in Column (4) as:

1. Field – includes two sub-columns, Unit (C (operator/crew) and O (unit) maintenance) and Direct Support (F) maintenance.
2. Sustainment – includes two sub-columns, general support (H) and depot (D).

c. The tools and test equipment requirements in Section III list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

d. The remarks in Section IV contain supplemental instructions and explanatory notes for a particular maintenance function.

#### B-2. MAINTENANCE FUNCTIONS.

Maintenance functions are limited to and defined as follows:

a. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g. by sight, sound, or feel). This includes scheduled inspection and gagings and evaluation of cannon tubes.

b. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

c. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:

d. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.

f. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

**g. Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

**h. Replace.** To remove an unserviceable item and install a serviceable counterpart in its place "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

**i. Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end-item or system.

**NOTE**

The following definitions are applicable to the "repair" maintenance function:

1. **Services.** Inspect, test, service adjust, align, calibrate, and/or replace.
2. **Fault location/troubleshooting.** The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).
3. **Disassembly/assembly.** The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).
4. **Actions.** Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

**j. Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

**k. Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

**B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II.**

**a. Column (1) Group Number.** Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

**b. Column (2) Component/Assembly.** Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

**c. Column (3) Maintenance Function.** Column (3) lists the functions to be performed on the item listed in Column (2). (For a detailed explanation of these functions, refer to "Maintenance Functions" outlined above.)

**d. Column (4) Maintenance Level.** Column (4) specifies each level of maintenance authorized to perform each function listed in Column (3), by indicating work-time required (expressed as man-hours in whole hours or decimals) in the appropriate sub-column. The work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or

complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work-time figures are to be shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end-item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

1. Field:
  - C Operator or Crew maintenance
  - O Unit maintenance
  - F Direct Support maintenance
  
2. Sustainment:
  - H General Support maintenance
  - D Depot maintenance

**NOTE**

The "L" maintenance level is not included in Column (4) of the MAC. Functions to this level of maintenance are identified by a work-time figure in the "H" column of Column (4), and an associated reference code is used in the REMARKS Column (6). This code is keyed to the remarks, and the SRA complete repair application is explained there.

**e. Column (5) Tools and Equipment Reference Code.** Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

**f. Column (6) Remarks Code.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

**B-4. EXPLANATION OF COLUMNS IN TOOLS AND TEST EQUIPMENT REQUIREMENTS, SECTION III.**

**a. Column (1) Tool or Test Equipment Reference Code.** The tool or test equipment reference code correlates with a code used in Column (5) of the MAC.

**b. Column (2) Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.

**c. Column (3) Nomenclature.** Name or identification of the tool or test equipment.

**d. Column (4) National Stock Number (NSN).** The NSN of the tool or test equipment.

**e. Column (5) Tool Number.** The manufacturer's part number, model number, or type number.

**B-5. EXPLANATION OF COLUMNS IN THE REMARKS, SECTION IV.**

**a. Column (1) Remarks Code.** The code recorded in Column (6) of the MAC.

**b. Column (2) Remarks.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

**SECTION II. MAINTENANCE ALLOCATION CHART (MAC)  
FOR  
TRANSMISSION TEST SET, AN/USM-608**

**TABLE 1. MAC FOR TRANSMISSION TEST SET, AN/USM-608**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL						(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS
			FIELD			SUSTAINMENT				
			UNIT		DS	GS	DEPOT			
			C	O	F	H	D			
00	TRANSMISSION TEST SET AN/USM-608	INSPECT TEST REPAIR TEST REPAIR ALIGN	0.1 0.1	0.1	0.5 1.0 1.0			1 5,6,7 2,8-12 3-5	A B C D E F	
01	KEYBOARD ASSEMBLY LPCOM P/N 93000002	INSPECT TEST REPLACE TEST REPAIR	0.1 0.1		0.1 0.5 0.5			12 2	A G H I	
02	DSP BOARD ASSEMBLY LPCOM P/N 92000001	INSPECT REPLACE REPAIR			0.1 1.1		0.4	2	A J	
03	INTERFACE BOARD ASSEMBLY LPCOM P/N 92000002A	INSPECT REPLACE REPAIR			0.1 1.1		0.3	2	A J	
04	FARADAY BOARD LPCOM P/N 92000009A	INSPECT REPLACE REPAIR			0.1 0.4		0.8	2	A J	

**SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS  
FOR  
TRANSMISSION TEST SET, AN/USM-608**

**TABLE 2. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR TRANSMISSION TEST SET,  
AN/USM-608**

(1) TOOLS/TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
1	O	Tool Kit	4180-00-064-5178	TK-101/G
2	F	Tool Kit	1931-01-073-3845	JTK-17A
3	F	Alignment Diskette		(40244) 63000055
4	F	Alignment Keyboard		(40244) 93000002
5	F	Differential Voltmeter	4931-00-407-2642	887ABAN
6	F	Frequency Counter	4931-01-039-4040	MIS-28754/1TY1
7	F	Test Oscillator	6625-00-054-3483	652A

(1) TOOLS/TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
8	F	Option M Diskette		(40244) 03000038
9	F	TC 2000 System Disk (6-disk set)		(40244) 70500001
10	F	Null Data Files		(40244) 860905
11	F	MS-DOS Diskette		(40244) 0300001
12	F	Multimeter	6625-01-298-9045	DM511OPT02

**SECTION IV. REMARKS FOR TEST SET, OPTICAL POWER: TS-4358/G**

**TABLE 3. REMARKS FOR TRANSMISSION TEST SET, AN/USM-608**

REMARKS CODE	REMARKS
A	Visual inspection for signs of damage, loose parts, cables, etc.
B	Test using power-up test and self test.
C	Repair is limited to replacement of fuse.
D	Use diagnostic tests to identify faulty module.
E	Repair by replacement of faulty module.
F	Perform required alignment after replacement of DSP or interface board.
G	Check for proper operation of each key.
H	Test requires continuity checks and the use of AN/USM-608.
J	Repair by replacement of keyboard CCA, cable or connectors.
K	Repair accomplished at the depot (contractor) level.



## APPENDIX C EXPENDABLE SUPPLIES AND MATERIALS LIST

### SECTION I. INTRODUCTION

**C-1. SCOPE.**

This appendix lists expendable supplies and materials you will need to maintain the test set. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

**C-2. EXPLANATION OF COLUMNS.**

**a. Column (1) - Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material.

**b. Column (2) - Level.** This column identifies the lowest level of maintenance that requires the listed item. Enter as applicable:

- C - Operator/Crew
- O - Organizational Maintenance
- F - Intermediate Direct Support Maintenance
- H - Intermediate General Support Maintenance
- D - Depot Maintenance (Contractor)

**c. Column (3) - National Stock Number.** This is the National stock number assigned to the item; use it to request or requisition the item.

**d. Column (4) - Description.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) (in parentheses) followed by the part number.

**e. Column (5) - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

### Section II. EXPENDABLE SUPPLIES AND MATERIALS

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	H	8305-00-267-3015	Cloth, Cheesecloth, Cotton, Type II, Class 2 (81348) CCC-C-440	YD
2	H	7930-00-279-7089	Detergent, Liquid, General Purpose, Specification No. P-D-223B, (59728), 2902N10	QT
3	H	6810-01-382-2904	Isopropyl Alcohol, Technical 1.01 Fluid Oz, Bottle (81346) ASTM D 770	BX
4	H	6515-00-905-1473	Applicator, Disposable Cotton-Tipped, (5L934) 36802	PG



**APPENDIX D  
IEEE-488 INTERFACE DESCRIPTION AND  
PROGRAMMING**

**D-1. INTRODUCTION**

When the test set is connected to an IEEE-488 interface bus, it can be operated by a remote controller as part of a larger system. This appendix defines:

- The interface function capability of the test set as part of the IEEE-488 Interface bus.
- Each command accepted by the test set and each corresponding response produced by the test set.

The information in this appendix is not required for operation or maintenance of the test set. It is intended for use by programmers for the purpose of integrating the test set into a system automated by means of the IEEE-488 bus. The programmer should be familiar with the IEEE-488/ANSI MC1.1 standards before using the information in this appendix.

**D-2. INTERFACE FUNCTION CAPABILITIES**

The test set has the following IEEE-488 standard interface function capabilities:

Identification	Description
SH1	Source Handshake Interface Function. The test set can transfer multi-line messages.
AH1	Acceptor Handshake Interface function. The test set can receive multi-line messages from the controller.
T6	Basic Talker. The test set is capable of transmitting data over the interface bus when addressed.
L4	Basic Listener. The test set is capable of receiving data over the interface when addressed.
SR1	Service Request Interface Function. The test set can asynchronously request service from the system controller.
RL1	Remote/Local Interface Function. The test set can operate in the local mode (commands entered from the keyboard) and in the remote mode (commands received from the system controller).
PP1	Parallel Poll Interface Function. The test set can uniquely identify itself if it requires service and the controller is requesting a response during a parallel poll.
DC1	Device Clear Interface Function. The test set will reset the TIMS/RL tester hardware if it receives a Device Clear command.

**D-3. INTERFACE CONSIDERATIONS**

a. *Talker/Listener Modes.* When addressed to talk, the test set will send data over the bus. If the test set has been addressed to talk, a data transfer sequence must take place before it is addressed again. A data

transfer sequence consists of a command to the test set and a response from the test set and ends with an EOI bus command. If the test set command has no response, the EOI bus command ends the sequence. When addressed to listen, the test set will process data received as commands.

If a talk or listen address, a device clear command or an unknown command is received by the test set while it is currently processing a command, a data accepted holdoff occurs. The holdoff period is approximately 10 seconds; the program in the system controller must allow at least 10 seconds before sending further commands on the bus.

b. *Polling.* After a serial poll, the test set will respond with a status byte. The status byte is defined as follows:

BIT							
7	6	5	4	3	2	1	0
UNUSED	SERVICE REQUEST	ERROR CODE					

Bits 0 through 5 form a error code which indicates the reason for the error. The coding depends upon the operating status of the test set, as follows:

CODE	INITIALIZATION ERROR	MEASUREMENT ERROR	SERIAL POLL VALUE RETURNED
0	None	None	0
1	General failure	Invalid Parameters	65
2	Master processor failure	Parameter out of range	66
3	Hardware control failure	Bad DSP response	67
4	RAM Failure	Result out of range*	4
5	Clock Failure	Attempted level set out of range.	69
6	Slave processor failure	Illegal operation	70
7	Hardware 110 failure	N/A	71
17 - 21	DSP download failure	DSP download failure	81 - 85
32	N/A	Command not understood	96
33 - 37	DSP download failure	DSP download failure	97 - 101

\* Does not generate SRQ

c. *Parallel Poll.* The test set is defaulted to respond to a parallel poll on the DIO0 and DIO1 data lines using a positive sense. The test set may be configured remotely to respond to a parallel poll on any DIO data line. This is done using the parallel poll configure bus command.

The status returned by the test set in response to a parallel poll will be the status of the SRQ bus line. If the test set is generating an SRQ, the parallel poll line will be set. If there is no SRQ, then the parallel poll status line will be clear.

d. *Local Lockout.* If the local lockout command is received, the test set keyboard will be disabled. The test set will unlock the keyboard when it receives the GTL bus command or if the REN message on the bus is de-asserted.

e. *Device Clear.* The test set will reset the TIMS/RL tester upon receipt of a device clear bus command.

**D-4. IEEE-488 COMMANDS AND RESPONSES**

a. Definition of Symbols. The symbols used during the descriptions of commands and responses have the following meanings:

- <V> a value entered by the programmer
- [v] a value or character that may be provided by the test set

b. *General Command Format.* Commands are sent to the test set as mnemonics consisting of three ASCII characters. If there is a parameter associated with the command, a space character must separate the parameter from the command mnemonic. A semicolon (;) must terminate a command. The general form of a command is:

AAA < parameter >;

where AAA is a three-character mnemonic.

c. *General Test Result Format.* The test set sends test results in groups, each consisting of one or more result strings. Each result string consists of a prefix, a space, numeric data representing a value, another space, a suffix and a line feed character. The last character of the last result string is transmitted with an EOI bus command. The general form of a result string is:

P [p][value] SSS LF

- where:
- P is the prefix, which identifies the value,
  - p is the polarity of the value (- if negative, space if positive),
  - SSS is the suffix, which identifies the unit of measure if any, and
  - LF is the line feed character (OA, hexadecimal).

**NOTE**

**In the following descriptions, the line feed (LF) character will not be shown.**

Leading zeroes in values are blanked. There are certain pre-defined values provided by the test set:

- +++++ or +++ . + indicates overrange
- or --- . - indicates underrange
- \*\*\*\*\* or \*\*\* . \* indicates unstable or unavailable results

*d. Test Set Control Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
EXC;	Causes the last measurement to be repeated. This command has the affect of issuing the previous command with identical parameters. If a RST command precedes the EXC command, then the Level/Frequency measurement will be made.	Same as the previous command.
LV6;	Turn transmitter off.	None.
OI;	Identify test set.	The test set will respond with the following: TC2000
RST;	Resets the test set to the following default parameters:  Transmitter Level: 0 dBm Transmitter Frequency: 1004 Hz Transmitter Impedance: 600 Ohms Receiver Impedance: 600 Ohms Circuit Type: 4-Wire Receiver Termination: Terminated Holding Coil (Send): Off Holding Coil (Receive): Off 60 Hz Filter: Out Voice Band/Wide Band: Voice Noise Filter: C Message Transient Test Duration: 15 Minutes Impulse Noise Threshold: 68 dBm Impulse Noise Threshold Step: 2 dB Phase Hit Threshold: 15 Degrees Gain Hit Threshold: 3 dB	None.

*e. Circuit Interface 1 Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TRANSMITTER</b>		
TRO;	Set transmitter impedance to 135 Ohms.	None.
TR1;	Set transmitter Impedance to 600 Ohms.	None.
TR2;	Set transmitter impedance to 900 Ohms.	None.
TR3;	Set transmitter impedance to 1200 Ohms.	None.
<b>RECEIVER</b>		
TR4;	Set receiver impedance to 135 Ohms.	None.

COMMAND	DESCRIPTION	RESULTS RETURNED
TR5;	Set receiver Impedance to 600 Ohms.	None.
TR6;	Set receiver impedance to 900 Ohms.	None.
TR7;	Set receiver Impedance to 1200 Ohms.	None.
<b>TERMINATION</b>		
TR8;	Sets receiver termination to terminated.	None.
TR9;	Sets receiver termination to bridged.	None.
<b>CIRCUIT</b>		
TW0;	Sets circuit to 2-wire.	None.
TW1;	Sets circuit to 4-wire.	None.

*f. Circuit Interface 2 Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>HOLDING COIL</b>		
DH0;	Turn off send holding coil.	None.
DH1;	Turn on send holding coil.	None.
DH2;	Turn off receive holding coil.	None.
DH3;	Turn on receive holding coil.	None.
<b>TALK BATTERY</b>		
DH6;	Turn off talk battery.	None.
DH7;	Turn on talk battery.	None.

*g. P/AR Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
LVO < - > < pp.p >;	Set or change transmitter level to pp.p, where pp.p is the level in dBm. For levels below 0 dBm, precede the level with a minus sign (-).	If the level is out of range, an SRQ will be generated.
<b>TEST EXECUTION</b>		
PAR;	Start P/AR Measurement	P/AR Units: PAR XXX Receive Level: AVGLVL [-]pp.p DBM

*h. Level Versus Frequency Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
LF1;	Set 60 Hz filter out.	None.
LF2;	Set 60 Hz filter in.	None.
LF3;	Set for voice band (20 Hz to 5 kHz).	None.
LF4;	Set for wide band (200 Hz to 110 kHz).	None.
<b>TEST EXECUTION</b>		
LFO < ffff >;	Start level versus frequency measurement at a frequency of ffff Hz.	Receive Level: AVGLVL [-]pp.p DBM Receive Frequency: FRQCY ffff HZ Transmit Frequency: XMTRFRQ XXXXXX HZ Transmit Level: XMTRLVL [-]pp.p DBM

*i. Envelope Delay Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
LVO < - > < pp.p >;	Set or change transmitter level to pp.p, where pp.p is the level in dBm. For levels below 0 dBm, precede the level with a minus sign (-).	If the level is out of range, an SRQ will be generated.
<b>TEST EXECUTION</b>		
EDO < fffff >;	Start envelope delay measurement in voice band normal mode using a transmit frequency of fffff Hz.	Delay: DLAY dddd USEC Receive Level: AVGLVL [-]pp.p DBM Receive Frequency: FRQCY fffff HZ Transmit Frequency: XMTRFRQ fffff HZ Transmit Level: XMTRLVL pp.p DBM
ED1 < fffff >;	Start envelope delay measurement in voice band repeat mode using a transmit frequency of fffff Hz.	Delay: DLAY **** USEC Receive Level: AVGLVL [-]lpp.p DBM Receive Frequency: FROCY fffff HZ Transmit Frequency: XMTRFRQ fffff HZ Transmit Level: XMTRLVL pp.p DBM
		Note that delay is not reported; asterisks fill the value field.
ED2 < fffff >;	Start envelope delay measurement in wide band normal mode using a transmit frequency of fffff Hz.	Delay: DLAY dddd USEC Receive Level: AVGLVL [-]pp.p DBM Receive Frequency: FROCY fffff HZ Transmit Frequency: XMTRFRQ ;fffff HZ Transmit Level: XMTRLVL pp.p DBM

COMMAND	DESCRIPTION	RESULTS RETURNED
ED3 <ffff >;	Start envelope delay measurement in wide band repeat mode using a transmit frequency of ffff Hz.	Delay: DLAY **** USEC Receive Level: AVGLVL [-]**.* DBM Receive Frequency: FRQCY ***** HZ Transmit Frequency: XMTRFQ ffff; HZ Transmit Level: XMTLVL pp.p DBM  Note that delay, receive level and receive frequency values are not reported; asterisks fill the respective value fields.

*j. Intermodulation Distortion Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
LVO <- > < pp.p >;	Set or change transmitter level to pp.p, where pp.p is the level in dBm. For levels below 0 dBm, precede the level with a minus sign (-). Use only for measurements with tone.	If the level is out of range, an SRQ will be generated.
<b>TEST EXECUTION</b>		
IMO;	Start 4-tone intermodulation distortion measurement.	Received Signal: RCVST X (4-tone signal: X = 2) (2-tone signal: X = 3) Total Received Power: AVGLVL [-]pp.p DBM Second Order Level: SCDPR [-]pp.p DBM Third Order Level: THDPR [-]pp.p DBM Spurious Level: SPUPR [-]pp.p DBM Transmit Level: XMTLVL [-] pp.p DBM
IM1;	Transmit a 2-tone signal for noise correction cycle at receiving end.	None.
IM2;	Measure intermodulation distortion measurement without sending tone.	Same as for the IMO command.

*k. Phase and Amplitude Jitter Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
LVO <- > < pp.p>;	Set or change transmitter level to pp.p, where pp.p is the level in dBm. For levels below 0 dBm, precede the level with a minus sign (-).	If the level is out of range, an SRQ will be generated.

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST EXECUTION</b>		
JT4;	Measure jitter with standard weighting.	Receive Level: AVGLVL [-]pp.p DBM Receive Frequency: FRQCY ffff HZ Amplitude Jitter: AMPJT XX.X % PK Phase Jitter: PHJT XX.X DEG Transmit Frequency: XMTRFRQ XXXXXX HZ Transmit Level: XMTLVL [-]pp.p DBM
JT5;	Measure jitter with standard and low-frequency weighting.	Same as for JT4 command.
JT6;	Measure jitter with low-frequency weighting.	Same as for JT4 command.

*I. Noise Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
NFO;	Use C-message filter.	None
NF1;	Use 3 kHz flat filter.	None.
NF2;	Use 15 kHz flat filter.	None.
NF3;	Use program filter.	None
NF4;	Use 50 kilobit filter.	None
LVO < - > < pp.p>;	Set or change transmitter level to pp.p, where pp.p is the level in dBm. For levels below 0 dBm, precede the level with a minus sign (-).	If the level is out of range, an SRQ will be generated.

<b>TEST EXECUTION</b>		
NO0;	Start measurement in noise with tone mode.	Notch Power: NOTCH pp.p DBRN Transmit Frequency: XMTRFRQ 1004 HZ Transmit Level: XMTLVL [-]pp.p DBM Holding Tone Status: RCVST X (Holding tone out range: X = 0) (Holding tone in range: X = 1)
NO1;	Start measurement in signal-to-noise mode.	Signal-to-Noise Ratio: SGNS pp DB Received Level: AVGLVL [-]pp.p DBM Holding Tone Status: RCVST X (Holding tone out range: X = 0) (Holding tone in range: X = 1)
NO2;	Start idle (C-Message) noise measurement.	Noise Power: NOIS pp DBRN QUIET TERM

COMMAND	DESCRIPTION	RESULTS RETURNED
NO3;	Start measurement in noise-to-ground mode.	Noise Power: NSTOG pp DBRN QUIET TERM

*m. Transients Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
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**TEST SETUP**

IN2;	Set count rate to 7/sec.	None
IN3;	Set count rate to 8/sec.	None
IN4;	Set count rate to 100/sec.	None
IN5;	Set Impulse threshold step size to 2 dB	None
IN6;	Set Impulse threshold step size to 4 dB	None
IN7;	Set impulse threshold step size to 6 dB	None
IN8;	Set Impulse threshold step size to 8 dB	None
INA;	Set phase hit threshold to 5 degrees	None
INB;	Set phase hit threshold to 10 degrees	None
INC;	Set phase hit threshold to 15 degrees	None
IND;	Set phase hit threshold to 20 degrees	None
INE;	Set phase hit threshold to 25 degrees	None
INF;	Set phase hit threshold to 30 degrees	None
ING;	Set phase hit threshold to 35 degrees	None
INH;	Set phase hit threshold to 40 degrees	None
INI;	Set phase hit threshold to 45 degrees	None
INJ;	Set gain hit threshold to 2 dB	None
INK;	Set gain hit threshold to 3 dB	None
INL;	Set gain hit threshold to 4 dB	None
INM;	Set gain hit threshold to 5 dB	None
INN;	Set gain hit threshold to 6 dB	None
INO;	Set gain hit threshold to 7 dB	None

COMMAND	DESCRIPTION	RESULTS RETURNED
INP;	Set gain hit threshold to 8 dB	None
INQ;	Set gain hit threshold to 9 dB	None
INR;	Set gain hit threshold to 10 dB	None
INS < mmmm >;	Set test duration to mmmm (minutes). The duration value must be a four digit number including leading zeroes.	If the count time is set to zero or less or to 9999 or more, an SRQ will be generated.
INT < pp >;	Set low impulse threshold to pp dBm.	If the threshold is set to less than 30 dBm or to more than 110 dBm, an SRQ will be generated.
<b>TEST EXECUTION</b>		
INO;	Start transient measurement. This command resets all counters and the elapsed time timer to zero.	Elapsed Time: ELAPSED TIME mmmm:ss Imp. Noise Lo Count: IMPLO XXXX CNTS Imp. Noise Mid Count: IMPMD XXXX CNTS Imp. Noise Hi Count: IMPHI XXXX CNTS Phase Hits Count: PHHIT XXXX CNTS Gain Hits Count: GNHIT XXXX CNTS Dropout Count: DPOUT XXXX CNTS Transmit Frequency: XMTFRQ 1004 HZ Transmit Level: XMTLVL [-]pp.p DBM Tone Loss Status: RCVST X (Tone Loss: X = 3)  (No Tone Loss: X = 2) TEST MODIFICATION
IN1;	Suspend transient measurement and retrieve measurement data. Current counts and the elapsed time remain unchanged.	Same as INO command.
INU;	Re-start transient measurement after suspension. This command does not reset the counters or the elapsed time timer.	None.

*n. Return Loss Measurement Commands.*

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST SETUP</b>		
LVO <- > <pp.p>;	Set or change transmitter level to pp.p, where pp.p is the level in dBm. For levels below 0 dBm, precede the level with a minus sign (-).	If the level is out of range, an SRQ will be generated.

COMMAND	DESCRIPTION	RESULTS RETURNED
<b>TEST EXECUTION</b>		
RL3 <ffff >;	Start sine wave return loss measurement with a frequency of fflff; Hz.	Sine Wave Return Loss: SINRL [-] pp.p DB Average Receive Level: AVGLVL [-]pp.p DBM Transmit Frequency: XMTFRQ fffff HZ Transmit Level: XMTLVL [-]pp.p DBM
RL4;	Start echo return loss (ERL) measurement.	Echo Return Loss: CHORL [-]pp.p DB Average Receive Level: AVGLVL [-]pp.p DBM Transmit Level: XMTLVL [-]pp.p DBM
RL5;	Start low-band singing return loss (SRL) measurement.	Singing Return Loss: SRLLO [-]pp.p DB Average Receive Level: AVGLVL [-]pp.p DBM Transmit Level: XMTLVL [-]pp.p DBM
RL6;	Start high-band SRL measurement.	Singing Return Loss: SRLHI [-]pp.p DB Average Receive Level: AVGLVL [-]pp.p DBM Transmit Frequency: XMTFRQ fffff HZ Transmit Level: XMTLVL [-]pp.p DBM
LF1;	Put 60 Hz filter In.	None.
LF2;	Take 60 Hz filter out.	None.

D-11/(D-12 Blank)



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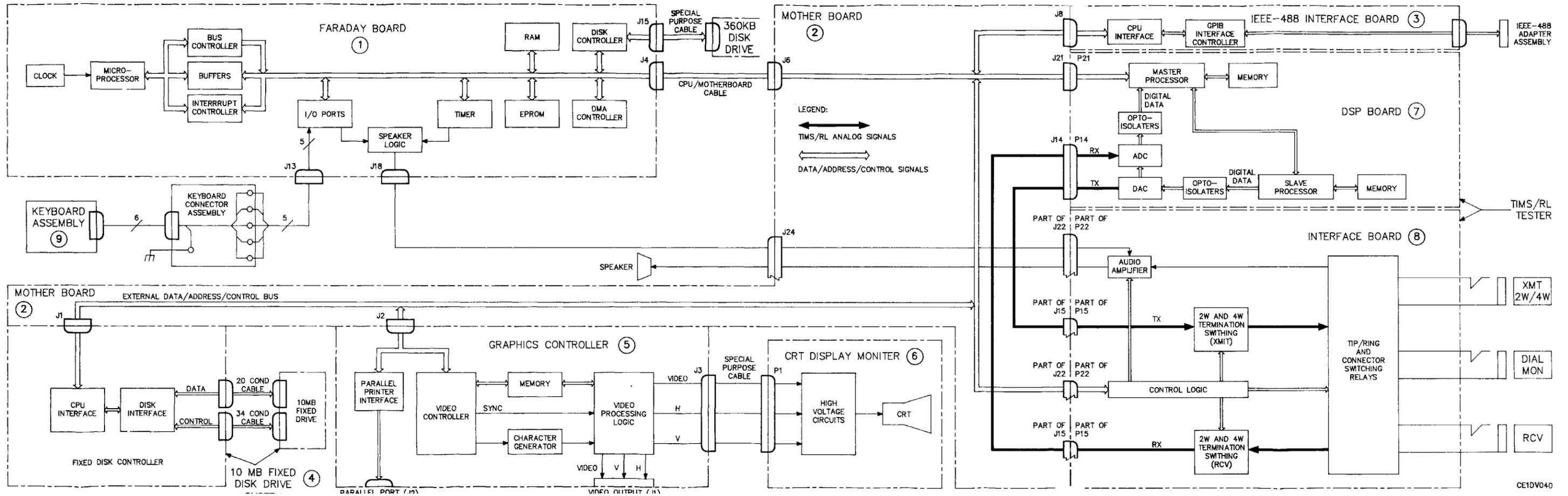


Figure FO-1. Transmission Test Set AN/USM-608 Detailed Block Diagram



NOTES:

1. BLACK AND WHITE WIRES ON POWER CABLE ASSEMBLY P/N 91000031 ARE 16 AWG, TWISTED PAIRS.
2. ON WIRE HARNESS ASSEMBLY P/N 91000026:
  - A. YELLOW, PURPLE, ORANGE, AND BROWN WIRES ARE 18 AWG.
  - B. UNLESS OTHERWISE SPECIFIED, ALL RED AND BLACK WIRES ARE 16 AWG
3. ALL CONNECTORS NOT SHOWN ARE NOT USED.
4. THE 10-MB FIXED DISK DRIVE SYSTEM CONSISTS OF THE FOLLOWING:
  - A. 10MB FIXED DISK DRIVE
  - B. HARD DISK CONTROLLER BOARD
  - C. 34-CONDUCTOR CABLE
  - D. 20-CONDUCTOR CABLE
5. PINS NOT SHOWN ARE NOT CONNECTED.

△ CPU/MOTHERBOARD CABLE P/N 91000001 (RED WIRE INDICATES PIN 1)

△ BLANK PIN INSERTED IN POSITION 4 FOR STABILITY

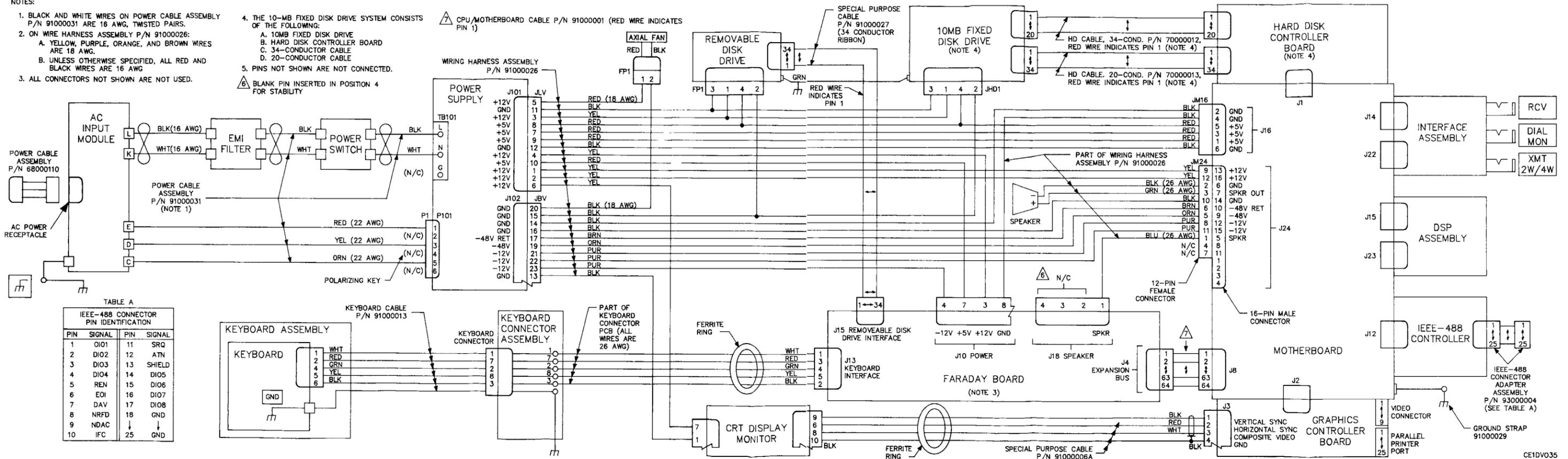


TABLE A  
IEEE-488 CONNECTOR PIN IDENTIFICATION

PIN	SIGNAL	PIN	SIGNAL
1	DIO1	11	SRQ
2	DIO2	12	ATN
3	DIO3	13	SHIELD
4	DIO4	14	DIO5
5	REN	15	DIO6
6	EOI	16	DIO7
7	DAV	17	DIO8
8	NRFD	18	GND
9	NDAC	↓	↓
10	IFC	25	GND

Figure FO-2. Transmission Test Set AN/USM-608 Wiring Diagram

FO-3/(FO-4 Blank)



By Order of the Secretary of the Army:

**CARL E. VUONO**  
*General, United States Army*  
*Chief of Staff*

**R.L. DILWORTH**  
*Brigadier General, United States Army*  
*The Adjutant General*

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3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. **Change Number:** 7
12. **Submitter Rank:** MSG
13. **Submitter FName:** Joe
14. **Submitter MName:** T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 2
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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<small>* Reference to line numbers within the paragraph or subparagraph.</small>							
TYPED NAME, GRADE OR TITLE						TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

<b>TO:</b> (Forward direct to addressee listed in publication)	<b>FROM:</b> (Activity and location) (Include ZIP Code)	<b>DATE</b>
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**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER	DATE	TITLE
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III - REMARKS** (Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM)	DATE
<small>For use of this form, see AR 25-30; the proponent agency is ODISC4.</small>							
TO: ( <i>Forward to proponent of publication or form</i> )( <i>Include ZIP Code</i> )						FROM: ( <i>Activity and location</i> )( <i>Include ZIP Code</i> )	
<b>PART 1 - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER						DATE	TITLE
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON	
<small>* Reference to line numbers within the paragraph or subparagraph.</small>							
TYPED NAME, GRADE OR TITLE						TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

<b>TO:</b> (Forward direct to addressee listed in publication)	<b>FROM:</b> (Activity and location) (Include ZIP Code)	<b>DATE</b>
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**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

<b>PUBLICATION NUMBER</b>	<b>DATE</b>	<b>TITLE</b>
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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