

**\*TM 1-4931-727-13&P**

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**TECHNICAL MANUAL**

**OPERATORS, AVIATION UNIT,  
AND  
AVIATION INTERMEDIATE MAINTENANCE MANUAL  
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST**

**DIAGNOSTIC TROUBLESHOOTING AID**

**13231362**

**NSN 4931-01-342-5215**

\*This manual supersedes TM 1-4931-727-13&P, dated 31 August 1994, including all changes.

**DISTRIBUTION STATEMENT A:** Approved for public release; distribution is unlimited.

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**HEADQUARTERS, DEPARTMENT OF THE ARMY  
21 AUGUST 2001**



## **WARNING**

### **HAZARDOUS SOLVENTS**

When you use solvents, be sure that the place you work in is well ventilated. WEAR GLOVES AND EYE PROTECTION. If you don't have good ventilation, read TB MED 223 and use the recommended respiratory (breathing) protection.

DON'T USE FLAMMABLE SOLVENTS AROUND HEAT, OPEN FLAME, OR SPARKS.

IF YOU GET SOLVENT IN YOUR EYES OR ON YOUR SKIN, FLUSH THE SOLVENT AWAY WITH WATER FOR 15 MINUTES; THEN GET MEDICAL HELP.

Freon reacts with highly active free metals such as sodium, barium, or potassium, and may produce toxic byproducts, fires, or explosions. Do not use Freon near highly active free metals.

### **TOXIC AND FLAMMABLE CHEMICALS**

Use the same care for toxic and flammable chemicals as you would for hazardous solvents.

### **CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL CONTAMINATION**

Notify your supervisor if you think you have been exposed to chemical, biological, or radiological contamination. TM 9-1300-275/2 gives procedures for decontamination.



# LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGE PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and change pages are:

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No. 1-4931-727-13&P

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 21 AUGUST 2001

OPERATORS, AVIATION UNIT, AND  
AVIATION INTERMEDIATE MAINTENANCE  
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST  
DIAGNOSTIC TROUBLESHOOTING AID  
13231362  
NSN 4931-01-342-5215

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any errors or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our e-mail address: [2028@redstone.army.mil](mailto:2028@redstone.army.mil) or FAX us at (256) 842-6546/DSN 788-6546. Instructions for sending an electronic 2028 may be found at the end of this TM immediately preceding the hard copy 2028.

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## HOW TO USE THIS MANUAL

If you cannot find the information you are looking for, you cannot properly do your job. Take a few minutes to look through this manual. You will find it easier to use once you have become familiar with it.

Each chapter and section is set up to lead you through it step by step. For example:

1. On the chapter page, you will see a listing of the sections in that chapter. Listed under the section titles is a listing of the tasks for that section. Find the task (by title) that you have been assigned. Now, look across from the task title and you will find the paragraph and page number for the task. Notice that the chapter number forms part of the page number.
2. Now that you have located the page number, turn to that page and review the task requirements before starting the procedures.
3. Did you notice that each task or job begins with an initial setup?
  - a. INITIAL SETUP lists the configuration, test equipment, tools and special tools, materials/parts, military occupational specialty (MOS), references, safety instructions, condition equipment should be in, and general instructions for you to complete the task. FOLLOWUP lists the procedures to be performed after you have completed the basic task.
  - b. Now, what exactly does INITIAL SETUP mean to you? The term "INITIAL SETUP" means, "DO THIS FIRST BEFORE STARTING THE TASK." Review one of the initial setup tables and become familiar with the requirements.
4. An explanation of the initial setup headings is presented below.
  - a. Tools and Special Tools. Special tools needed to perform the task. Be sure to acquire all the tools before you start the task.
  - b. Materials/Parts. Materials and parts needed to perform the task. Materials can be found in Appendix C. Next to the name of the material listed in the initial setup you will find an item number. This number matches the item number in column (1) of Appendix C. Be sure to acquire all the materials and parts before you start the task.
  - c. Personnel Required. MOS required to do the task. This will also tell you the number of persons needed to perform the task.
5. You can also use the table of contents on page i of this manual to locate page number for chapters, sections, and the appendixes.
6. Let's see if you understand how to find a specific task. Suppose your supervisor wants you to replace a part or assembly.
 

Here's how you would find it:

  - a. Obtain the correct TM for the task and look up the procedure in the chapter covering the type of task you are to perform.
  - b. For example: Replacement is a maintenance task you can find located in the maintenance chapter.

**HOW TO USE THIS MANUAL (cont)**

- c. Looking at the section titles listed in the maintenance chapter index, you should have located the page number for the maintenance procedures. Going to that page you found the section index and located the paragraph and page number of the replacement task.
7. Another approach would be to look in the alphabetical index in the rear of the manual.

**CHAPTER 1**  
**INTRODUCTION**

	Section	Page
General Information . . . . .	I	1-1
Equipment Description and Data . . . . .	II	1-3
Principles of Operation. . . . .	III	1-7

**Section I. GENERAL INFORMATION**

Subject	Para	Page
Scope. . . . .	1-1	1-1
Maintenance Forms, Records, and Reports . . . . .	1-2	1-1
Preparation for Storage and Shipment. . . . .	1-3	1-2
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**1-1. SCOPE**

**a. Type of Manual.** Operator, Aviation Unit Maintenance, and Aviation Intermediate Maintenance. This manual applies only to the electronic equipment listed in step b, and is supplemented by the Gridcase 1550SX User's Guide and the Grid Internal Modem User's Guide provided by the computer manufacturer and shipped with the equipment. For basic computer specifications and operation, refer to these manuals.

**b. Equipment Name.** Diagnostic Troubleshooting Aid (DTA), part number 13231362, designed and manufactured by Lockheed Martin Corp.

**c. Purpose of Equipment.** The DTA is a troubleshooting aid used with the Target Acquisition Designation Sight/Pilot Night Vision Sensor (TADS/PNVIS) equipment on the AH-64A helicopter. It consists of a laptop computer with associated accessories that provides on-aircraft flight-line troubleshooting of the TADS/PNVIS system and related interfaces.

**1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS**

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

### 1-3. PREPARATION FOR STORAGE OR SHIPMENT

Refer to chapter 3 for unique instructions about preparation for storage or shipment.

### 1-4. LIST OF ABBREVIATIONS

The abbreviations used in this manual, along with their meanings, are listed below.

<u>Abbreviation</u>	<u>Meaning</u>
AC .....	Alternating current
BIT .....	Built-in test
CCA .....	Circuit card assembly
CCW .....	Counterclockwise
CPG .....	Copilot-gunner
CW .....	Clockwise
FD/LS .....	Fault detection/location system
LRU .....	Line replaceable unit
MS-DOS .....	Microsoft Corp. Disk Operating System
ORT .....	Optical relay tube
PNVS .....	Pilot Night Vision Sensor
SRU .....	Shop replaceable unit
TADS .....	Target Acquisition Designation Sight
TEU .....	TADS electronic unit

**Section II. EQUIPMENT DESCRIPTION AND DATA**

Subject	Para	Page
Equipment Characteristics, Capabilities, and Features . . . . .	1-5	1-3
Location and Description of Major Components . . . . .	1-6	1-4
Equipment Data . . . . .	1-7	1-6

**1-5. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES**

**CHARACTERISTICS**

- Portable
- Battery or ac power
- Troubleshooting data can be stored in computer for later retrieval

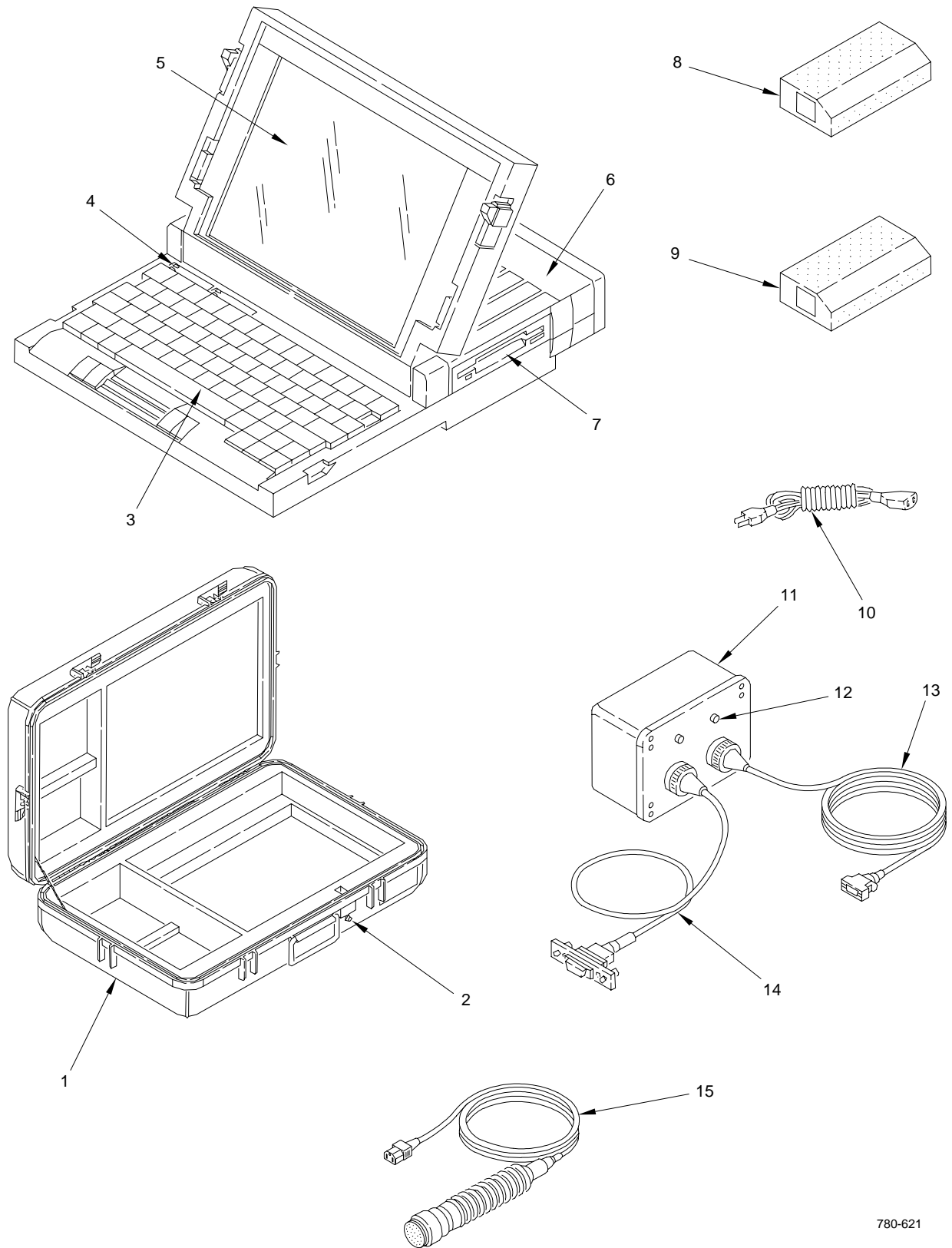
**CAPABILITIES AND FEATURES**

- Internal floppy disk drive
- Computer ac power supply adjusts to power source line frequency
- Easily upgradable software
- Printer output for printed data requirements
- Simultaneous battery charging with ac operation
- Interface cabinet assembly converts FD/LS BIT data from parallel to serial format for use by computer

## 1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

- 1 CASE. Houses computer, interface cabinet assembly, cables, backup software disk, and manuals.
- 2 PRESSURE EQUALIZER SCREW. Equalizes atmospheric pressure between case interior and ambient.
- 3 KEYBOARD. Provides keys used for entering data into computer memory, retrieving data, saving data, and controlling many computer functions.
- 4 INDICATORS. Six indicators alert the user to the status of certain keyboard keys, the internal processor, and the internal battery.
- 5 SCREEN. Video graphics array backlit LCD screen used to display text and graphic data.
- 6 INTERNAL HARD DISK DRIVE. Contains system software and program data.
- 7 FLOPPY DISK DRIVE. Accepts high density 3.5" floppy disks formatted to MS-DOS format.
- 8 INTERNAL BATTERY PACK. Provides battery power to operate computer when ac power is not available. Refer to computer manufacturer's User's Guide for further information.
- 9 AC POWER PACK. Allows computer to be operated from ac power source other than helicopter.
- 10 AC POWER CABLE. Supplies ac power to ac power pack when computer is operated from ac power source.
- 11 INTERFACE CABINET ASSEMBLY. Converts electronic information from TEU on helicopter to format usable by DTA computer.
- 12 INDICATORS. Two Red LEDs provide visual indication that data is being received from TEU, converted, and transmitted to DTA computer.
- 13 COMPUTER INTERFACE CABLE. Provides electrical connection between interface cabinet assembly and DTA computer.
- 14 AIRCRAFT INTERFACE CABLE. Provides electrical connection between TADS/PNVS TEU mounted on helicopter and interface cabinet assembly.
- 15 POWER CABLE ASSEMBLY. Supplies operating power to computer from 115-volt 60 Hz power connector CBHK on helicopter.

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (cont)



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## 1-7. EQUIPMENT DATA

### Dimensions

#### Case

Length .....	24.5 in. (62.2 cm)
Width .....	16.0 in. (40.6 cm)
Height.....	7.0 in. (17.8 cm)

#### Computer

Length .....	15.0 in. (38.1 cm)
Width .....	11.5 in. (29.2 cm)
Height.....	2.5 in. (6.4 cm)

#### Interface Cabinet Assembly

Length .....	6.25 in. (15.9 cm)
Width .....	3.25 in. (8.3 cm)
Height.....	4.25 in. (10.8 cm)
Attached cable lengths.....	P1 29.0 in., P2 180.0 in.

### Weights

Case.....	4.8 lb (2.2 kg)
Computer.....	12 lb (5.4 kg)
Interface Cabinet Assembly....	1.2 lb (0.54 kg)

### Power Requirements

External .....	100-240v 47-63 Hz
Internal.....	Rechargeable battery pack

### Environments

#### Operational

Temperature.....	-4° C to 40° C (25° F to 104° F)
Relative Humidity .....	10% to 80%
Altitude .....	10,000 ft
Shock.....	4G
Vibration.....	5-200-5 Hz @ 0.2G

#### Storage and transportation

Temperature.....	-16° C to 48° C (3° F to 118° F)
Relative Humidity .....	10% to 90%
Altitude .....	40,000 ft
Shock.....	48G
Vibration.....	5-200-5 Hz @ 0.75G



**Section III. PRINCIPLES OF OPERATION**

Subject	Para	Page
TADS Electronic Unit (TEU) Interface .....	1-8	1-7
Troubleshooting Data .....	1-9	1-7

**1-8. TADS ELECTRONIC UNIT (TEU) INTERFACE**

The TEU contains a computer that interfaces with the helicopter multiplex bus system. Stored within the computer's memory are the results of the helicopter's Fault Detection and Location System (FD/LS) built-in test (BIT) troubleshooting tests, including the status of various Optical Relay Tube switches, and other status data. The DTA acquires the BIT troubleshooting data from the computer's memory, then develops and displays user-friendly, menu-driven troubleshooting information based on the received BIT data.

**1-9. TROUBLESHOOTING DATA**

The FD/LS troubleshooting data is available in parallel format at an output connector on the TEU. The data must be converted into serial format to be useful to the DTA. Conversion from parallel to serial format is accomplished in the interface cabinet assembly, which is connected between the computer's serial port and the TEU. The troubleshooting data can be saved on computer disk and retrieved at a later date and time without being connected to the helicopter, if desired.



**CHAPTER 2**  
**OPERATING INSTRUCTIONS**

	Section	Page
Description and Use of Controls and Indicators. ....	I	2-1
Preventive Maintenance Checks and Services . . . . .	II	2-5
Installation Instructions . . . . .	III	2-10
DTA Operation . . . . .	IV	2-17

**Section I. DESCRIPTION AND USE OF CONTROLS AND INDICATORS**

Subject	Para	Page
Controls and Indicators . . . . .	2-1	2-1

**2-1. CONTROLS AND INDICATORS**

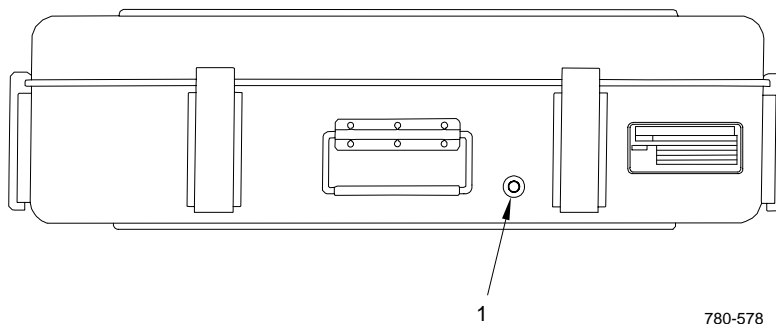
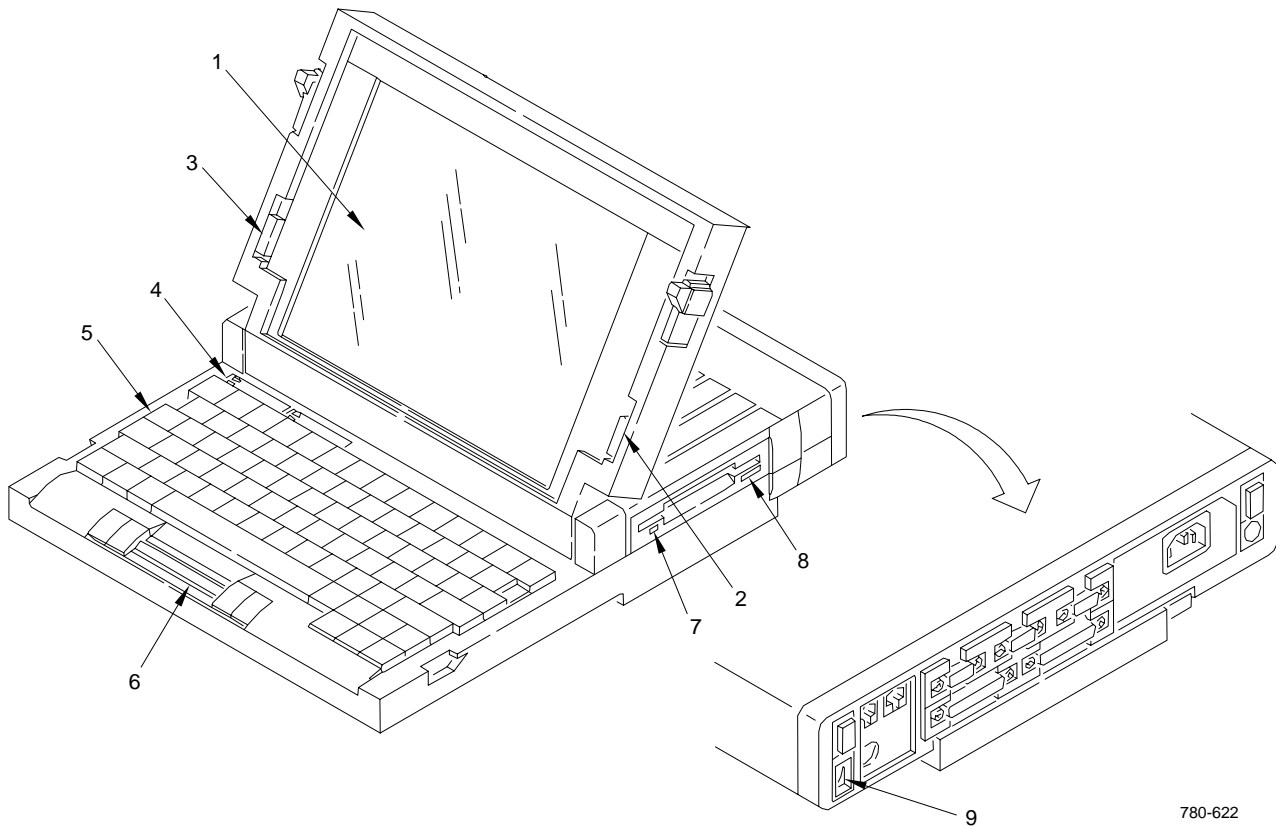


Table 2-1. Case Control

Key	Control or Indicator	Function
1	PRESSURE EQUALIZER screw	When rotated CCW, causes atmospheric pressure inside case to be equal to atmospheric pressure outside case.

**2-1. CONTROLS AND INDICATORS (cont)**



780-622

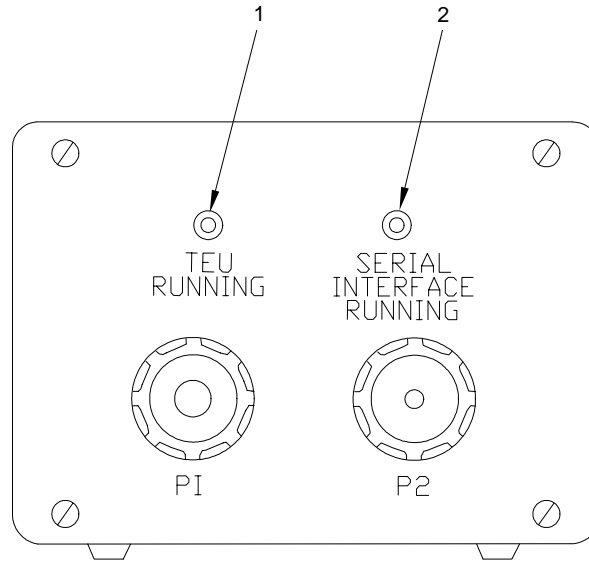
Table 2-2. Computer Controls and Indicators

Key	Control or Indicator	Function
1	Screen	Video graphics array backlit LCD screen used to display text and graphic data.
2	CONTRAST control	Increases or decreases contrast of data on screen.
3	BRIGHTNESS control	Increases or decreases brightness (intensity) of screen.
4	Indicators	Six indicators that perform the following functions:
	Processor	Not lit when computer is operating at normal 20 MHz speed. Glows steady green when computer is operating at slow speed (8 MHz). Flashes green when computer is in standby mode.
	Battery	Flashes red when battery becomes nearly exhausted. Flashes green when battery is rapid-charging. Glows steady green when battery is charging normally.

Table 2-2. Computer Controls and Indicators (cont)

Key	Control or Indicator	Function
	Disk	Glows green when hard disk is in use. Glows orange when floppy disk drive is in use.
	Num Lock	Glows green when keyboard is in NumLock mode.
	Caps Lock	Glows green when keyboard is in CapsLock mode.
	Scroll Lock	Glows green when keyboard is in ScrollLock mode.
5	Keyboard	Provides keys used for entering data into computer memory, retrieving data, saving data, and controlling many computer functions.
6	Isopoint control bar	Pointing device used like a mouse to control the pointer in graphical software. Not used with DTA application.
7	In-use indicator	Lights when floppy disk drive is accessing a floppy disk.
8	Eject button	When pressed, releases disk in floppy disk drive, which partially ejects from drive.
9	Power switch	Turns computer on and off when pressed.

**2-1. CONTROLS AND INDICATORS (cont)**



780-577

Table 2-3. Interface Cabinet Assembly Indicators

Key	Control or Indicator	Function
1	TEU RUNNING indicator	Lights to indicate that data is being received from TEU in parallel format.
2	SERIAL INTERFACE RUNNING indicator	Lights to indicate that parallel data from TEU is being converted into serial data and is being sent to DTA computer.

**Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

Subject	Para	Page
Introduction . . . . .	2-2	2-5
PMCS Procedures . . . . .	2-3	2-5

**2-2. INTRODUCTION**

PMCS are scheduled maintenance items required to make sure that the DTA is ready for operation at all times. Inspect DTA regularly to find any defects and correct them. Follow these rules when performing PMCS:

- Always keep WARNINGS and CAUTIONS in mind.
- Perform before operation and quarterly PMCS.
- Perform routine checks as required.

**2-3. PMCS PROCEDURES**

**a. General.** Table 2-4 (PMCS Table) has been provided so you can keep your equipment in good operating condition and ready for its primary mission.

**b. Explanation of table entries.**

(1) Item number column. Numbers in this column are for reference. When completing DA Form 7404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

(2) Interval column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission.

(3) Item to be checked or serviced column. This column provides the location and the item to be checked or serviced.

(4) Procedure column. This column gives the procedure you must do to check or service the item listed in the check/service column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the interval column.

(5) Not fully mission capable if: column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you make check and service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

Table 2-4. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR DTA

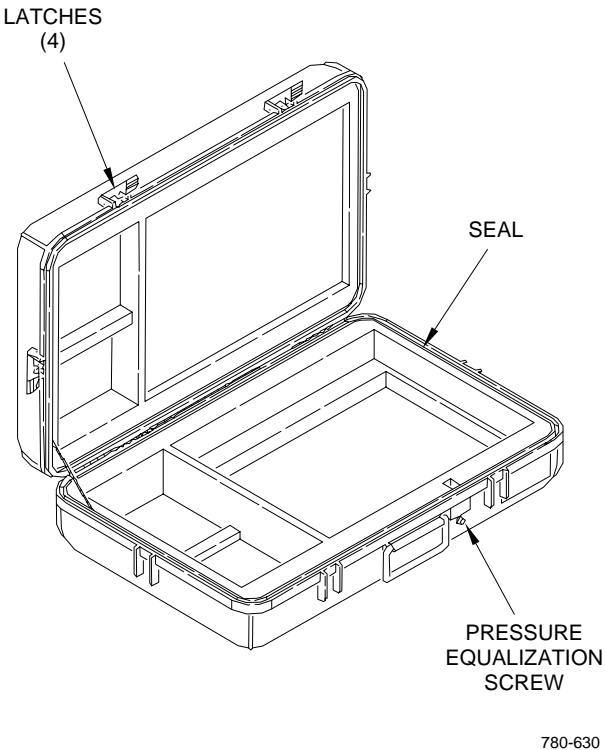
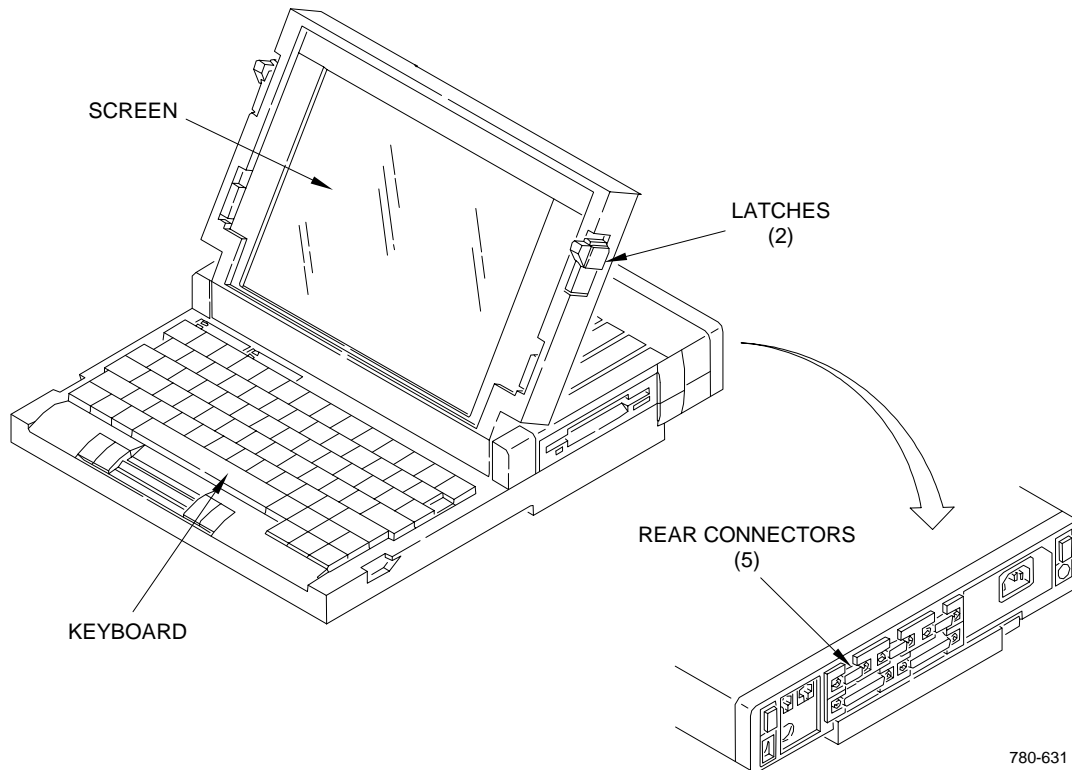
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
1	Weekly	<p>Case</p>  <p style="text-align: right; margin-right: 100px;">780-630</p> <p>a. Appearance</p> <p>b. Latches</p> <p>c. Pressure equalization screw</p> <p>d. Seal</p>	<p>Inspect case for fungus or deformity.</p> <p>Inspect all latches for proper operation.</p> <p>Inspect screw for binds or binding and ease of tightening.</p> <p>Inspect seal for weather cracks and proper fit.</p>	<p>Screw binds does not tighten.</p> <p>Seal contains weather cracks or does not fit properly.</p>



Table 2-4. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR DTA (cont)

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
2	Weekly	Computer		



780-631

	<ul style="list-style-type: none"> <li>a. Screen</li> <li>b. Keyboard</li> <li>c. Latches</li> <li>d. Rear connectors</li> <li>e. Operation</li> </ul>	<p>Inspect screen for damage or scratches.</p> <p>Inspect keyboard for broken or missing keys.</p> <p>Inspect for broken or missing latches.</p> <p>Inspect rear connectors for missing or broken pins.</p> <p>Perform stand-alone operation (para 2-5).</p>	<p>Screen is broken or punctured.</p> <p>Keys are broken or missing.</p> <p>There are missing or broken pins.</p> <p>Computer does not operate correctly.</p>
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Table 2-4. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR DTA (cont)

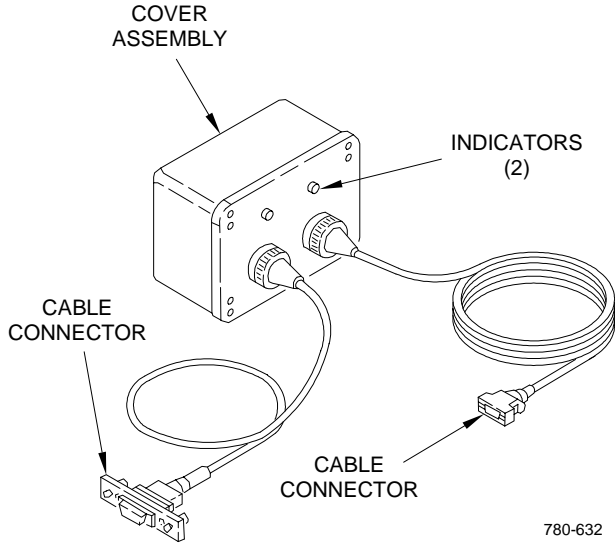
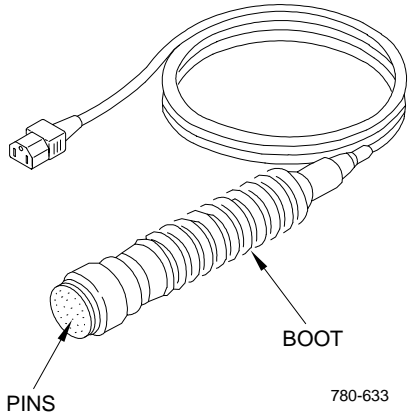
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
3	Before	Interface Cabinet Assembly	 <p style="text-align: right; margin-right: 50px;">780-632</p>	
		<ul style="list-style-type: none"> <li>a. Cable connectors</li> <li>b. Indicators</li> <li>c. Cover assembly</li> </ul>	<p>Inspect pins for broken or bent pins.</p> <p>Inspect for broken or missing indicators.</p> <p>Inspect cover for fungus or deformity.</p>	<p>Connectors have broken or bent pins.</p> <p>Indicators are broken or missing.</p>

Table 2-4. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR DTA (cont)

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
4	Before	<p>Power Cable Assembly</p>  <p>a. Pins</p> <p>b. Boot</p>	<p>Inspect for broken or bent pins.</p> <p>Check for frayed, cracked, or worn boot.</p>	<p>Pins are broken or bent.</p> <p>Boot is frayed, cracked, or worn.</p>

**Section III. INSTALLATION INSTRUCTIONS**

Subject	Para	Page
Installation on Helicopter . . . . .	2-4	2-10
Stand-Alone Operation . . . . .	2-5	2-15

**2-4. INSTALLATION ON HELICOPTER**

**INITIAL SETUP**

**Personnel Required**

68X Aircraft Fire Control/Electrical Repairer  
 One Assistant

**References**

TM 55-1520-238-23-1

**Equipment Conditions**

<u>Ref</u>	<u>Condition</u>
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TM 55-1520-238-23-1 Helicopter safed

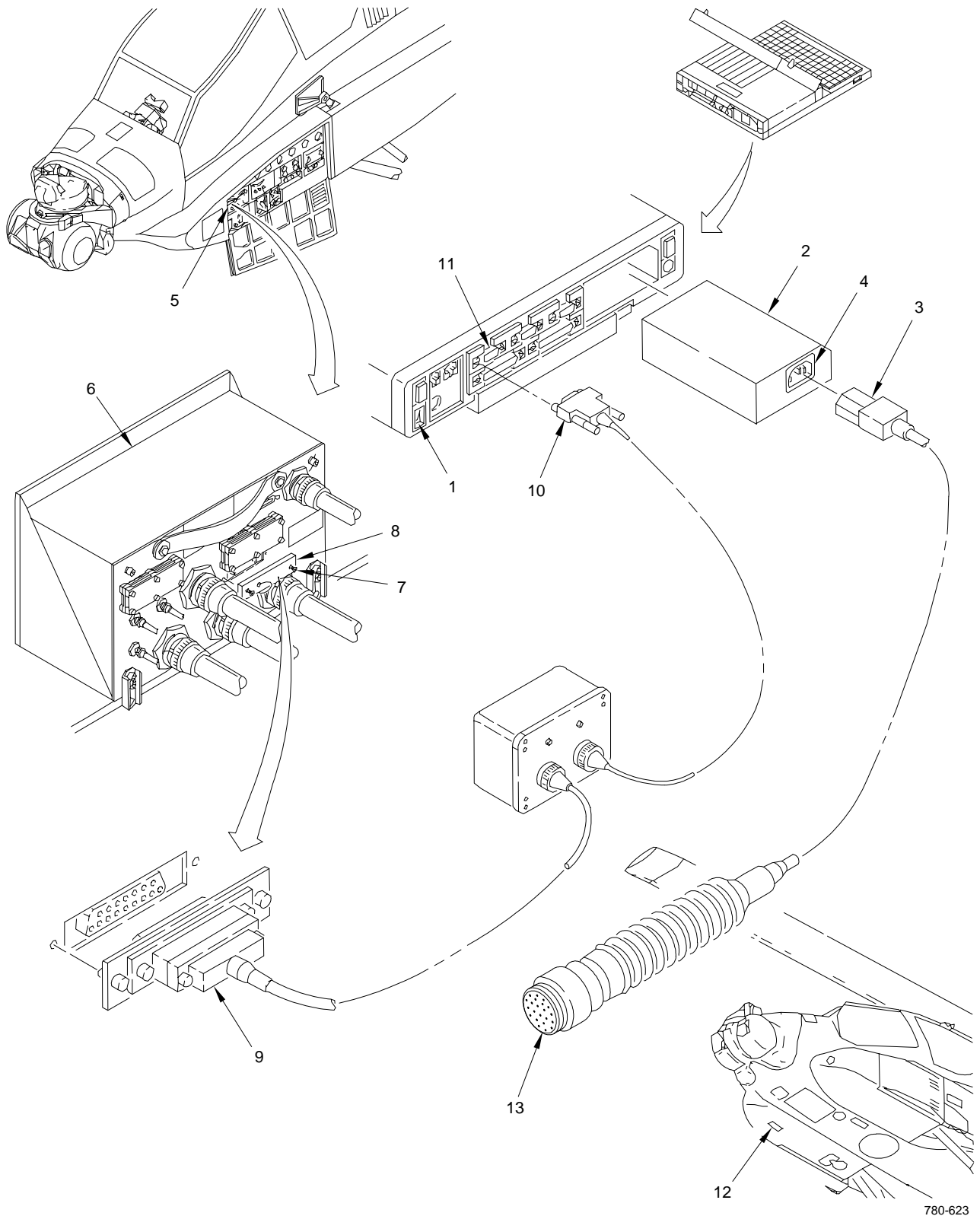
**INSTALLATION**

**WARNING**

- Accidental actuation of helicopter power plant.
- Accidental actuation of helicopter hydraulic system.
- Accidental firing or armament.
- Accidental jettison of canopy or stores.
- Ensure that all helicopter power is turned off while the DTA equipment is being connected to prevent severe injury or death.
- Ensure that helicopter safety procedures in TM 55-1520-238-23-1 have been performed.

1. Ensure that computer power switch (1) is in off (O) position.
2. If not already installed, install ac power pack (2) in computer's power pack slot.
3. Connect P1 (3) of power cable assembly to power pack input connector (4) on rear of power pack. P2 will be connected later.
4. Open helicopter's left forward avionics bay (5).

2-4. INSTALLATION ON HELICOPTER (cont)



780-623

## 2-4. INSTALLATION ON HELICOPTER (cont)

5. Locate TEU (6). Loosen two captive screws (7) securing connector J5 cover plate (8) and remove cover plate.

### CAUTION

Damage to TEU connector J5 during installation of cable connector P1.

- Use care when connecting aircraft interface cable connector P1 to prevent damage to TEU connector J5.
  - Do not move P1 from side to side or twist it.
  - Position interface cabinet assembly to minimize stress and/or strain on connection, perhaps in an unused portion of left forward avionics bay.
6. Carefully connect P1 (9) of aircraft interface cable to J5 on TEU. Use a small narrow-blade screwdriver to gently and evenly turn large clamping screws on P1 connector plate assembly. Alternately turn screws one revolution at a time. Do not overtighten screws.
  7. Connect P2 (10) of computer interface cable to 1 SERIAL A connector (11) on rear panel of computer.
  8. Located underneath helicopter's right forward avionics bay is Utility Light and Ground Power Outlet Access Door B60R (12). Turn two camloc fasteners 1/4 turn CCW and open this door. Locate Utility Light and Ground Power Receptacle J16 inside.
  9. Connect P2 (13) of power cable assembly to J16 inside door B60R.
  10. Refer to para 2-6 for information on controlling the DTA display, and para 2-7 for DTA operation.

### REMOVAL

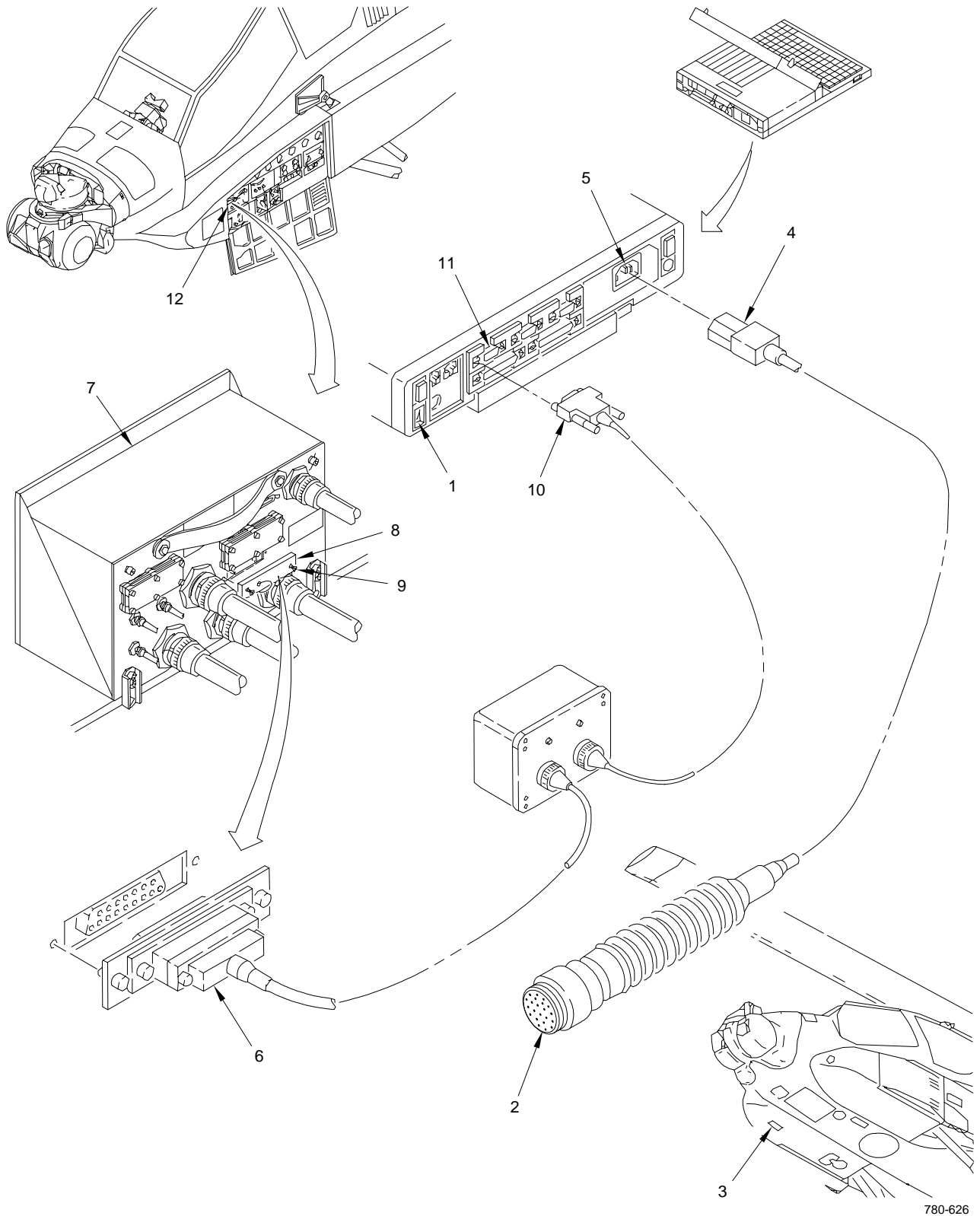
11. Set computer power switch (1) to off (0) position.
12. Disconnect P2 (2) of power cable assembly from J16 inside door B60R (3). Close door B60R and secure by turning two camloc fasteners 1/4 turn CW.
13. Disconnect P1 (4) of power cable assembly from power pack input connector (5) on rear of power pack.

### CAUTION

Damage to TEU connector J5 during removal of cable connector P1.

- Use care when removing aircraft interface cable connector P1 to prevent damage to TEU connector J5.
- Do not move P1 from side to side or twist it.

2-4. INSTALLATION ON HELICOPTER (cont)



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#### **2-4. INSTALLATION ON HELICOPTER (cont)**

14. Carefully disconnect P1 (6) of aircraft interface cable from J5 on TEU (7). Use a small narrow-blade screwdriver to gently and evenly turn large clamping screws on P1 connector plate assembly. Alternately turn screws one revolution at a time until P1 is removed.
15. Install connector J5 cover plate (8) on TEU by tightening two captive screws (9).
16. Disconnect P2 (10) of computer interface cable from 1 SERIAL A connector (11) on rear panel of computer.
17. Close and secure helicopter's left forward avionics bay (12).
18. Return all components of DTA to proper storage.



## 2-5. STAND-ALONE OPERATION

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer

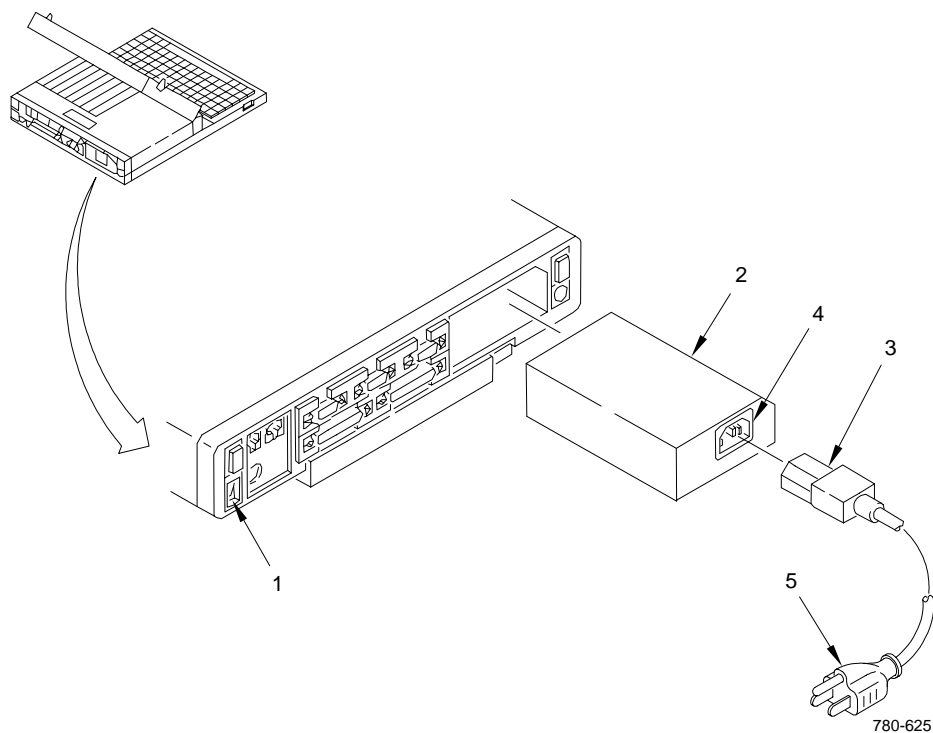
---

### INSTALLATION

#### NOTE

- Perform stand-alone operation whenever you desire to analyze data that was saved to computer's hard disk at flight line, or to use various computer capabilities such as copying disks and printing reports.
- In a stand-alone installation, only the computer is installed, so you cannot use the interface cabinet assembly capabilities.
- Refer to computer manufacturer's User's Guide for computer usage not covered in this manual.

1. Ensure that computer power switch (1) is in off (0) position.
2. If not already installed, install ac power pack (2) in computer's power pack slot.



## 2-5. STAND-ALONE OPERATION (cont)

3. Connect female connector of ac power cord (3) to power pack input connector (4) on rear panel of computer. Connect male end of power cord (5) to a standard ac outlet.
4. On computer, unlatch and raise lid. Set power switch (1) to on (I) position. The DTA software is self-booting and will automatically begin executing. After a few moments, software will be loaded and main menu will appear.

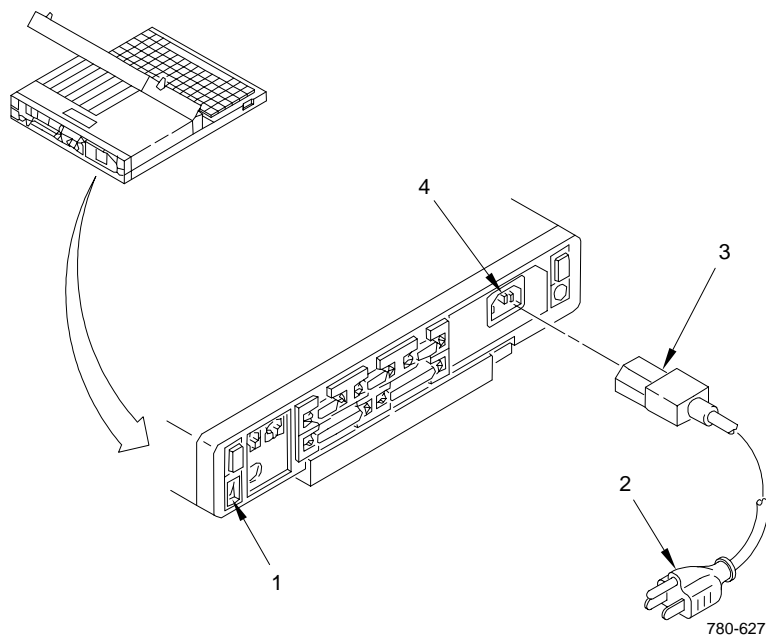
### NOTE

Do not select any menu option other than **Retrieve Data** or **Quit Program**. Otherwise, computer will attempt to establish communication with TEU, which is not connected. If you select another menu option by mistake, press ESC to return to main menu.

5. Refer to para 2-11 for instructions on retrieving data previously saved to computer's hard disk.

### REMOVAL

6. Set computer power switch (1) to off (O) position.
7. Disconnect male connector (2) of ac power cord plug from ac outlet.
8. Disconnect female connector (3) of ac power cord from ac power pack input connector (4).
9. Return all components of DTA to proper storage.



**Section IV. DTA OPERATION**

Subject	Para	Page
Controlling the Display . . . . .	2-6	2-17
Operation . . . . .	2-7	2-19
TADS or PNVS Initiated and Continuous FD/LS . . . . .	2-8	2-20
TADS or PNVS Continuous FD/LS . . . . .	2-9	2-31
ORT Switch Checkout . . . . .	2-10	2-32
Retrieve Data . . . . .	2-11	2-41
Quit Program . . . . .	2-12	2-45

**2-6. CONTROLLING THE DISPLAY**

---

**INITIAL SETUP**

**Personnel Required**

68X Aircraft Fire Control/Electrical Repairer

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Certain keyboard keys are used to control the software program. Refer to the top figure on the facing page for their locations. The program control line at the bottom of the main menu screen (bottom figure) lists available options for controlling the software program, which are:

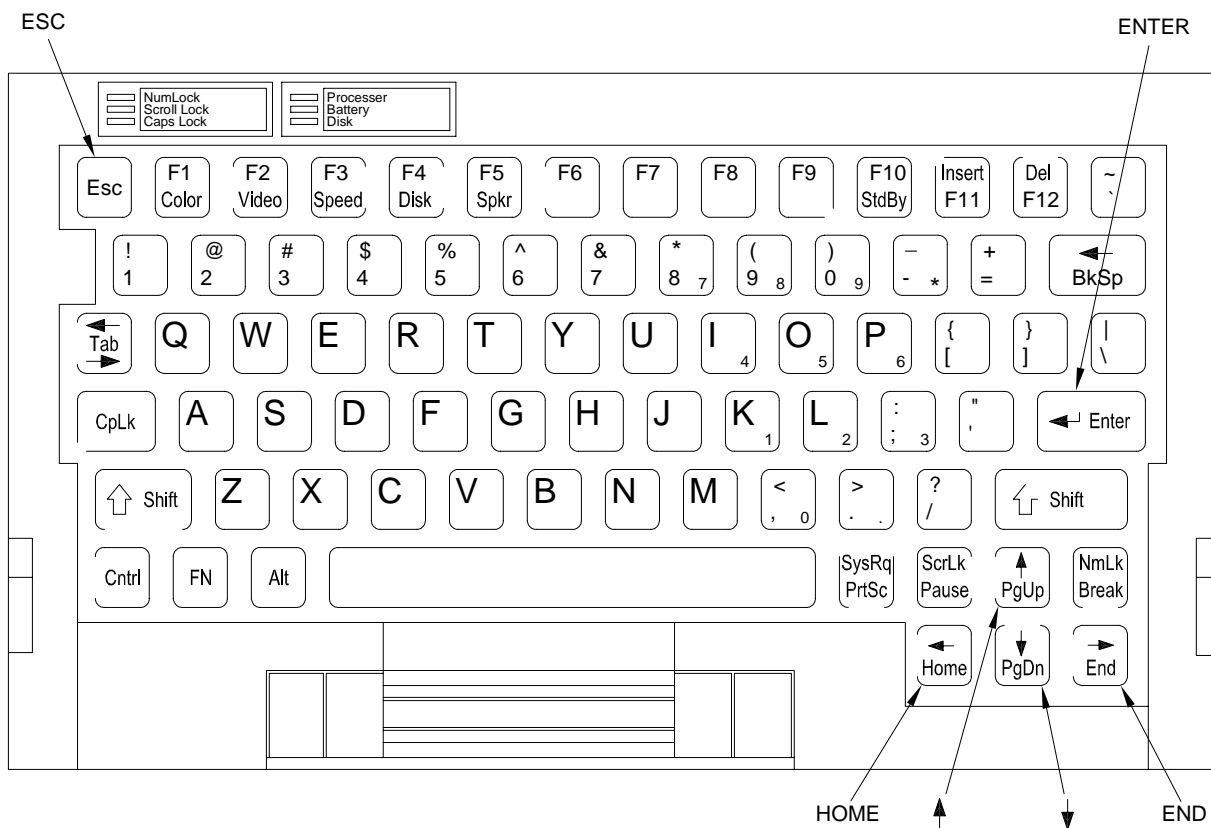
- ESC - Press this key at any time when program is operating. Computer will return to previous screen. If you wish to return to main menu and previous screen is not main menu, continue pressing ESC until main menu appears.
- ENTER - Press this key when prompted by software program, or under certain other conditions that are explained in this manual.

Cursor control line, also at bottom left of screen, lists available options for controlling cursor position, which are:

- ↑-up - Press up arrow key to move cursor to a menu option above current position.
- ↓-down - Press down arrow key to move cursor to a menu option below current position.
- HOME-first - Press HOME key to move cursor to first item listed in a menu.
- END-last - Press END key to move cursor to last item listed in a menu.

The program control line will display additional options from time to time.

**2-6. CONTROLLING THE DISPLAY (cont)**



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TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID    Version 2.0  
 (c) Copyright 1990,1993 Martin Marietta Technologies Inc.  
 P.O. Box 555837, Orlando, Florida 32855-5837

TADS FD/LS    TADS Software Version - P15 (1DBF)

SELECT MODE

TADS FD/LS

PNVS FD/LS

TADS/PNVS Continuous FD/LS

ORT Switch Checkout

Retrieve Data

Quit Program

ESC-exit program    ENTER-select mode  
 ↑-up   ↓-down   HOME-first   END-last    PROGRAM CONTROL LINE

CURSOR CONTROL LINE

780-597

## 2-7. OPERATION

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
One Assistant

#### References

TM 1-1270-476-T  
TM 1-5855-265-T  
TM 55-1520-238-23-1

#### Equipment Conditions

<u>Ref</u>	<u>Condition</u>
TM 55-1520-238-23-1 Para 2-4	Helicopter safed DTA installed

---

1. Inside helicopter, refer to TM 1-1270-476-T and perform initial switch setting procedures and TADS power-up procedures.
2. If using DTA to troubleshoot PNVS, refer to TM 1-5855-265-T (PNVS) and perform power-up procedures.

#### NOTE

Computer screens shown depict typical TADS hardware. There is no change in presentation of material for PNVS hardware.

3. On DTA computer, unlatch and raise lid. Set power switch to on (I) position. The DTA software is self-booting and will automatically begin executing. After a few moments, software will be loaded and main menu will appear.
4. Go to one of following paragraphs, depending on DTA testing requirements:

<u>Requirement</u>	<u>Para</u>
TADS or PNVS initiated and continuous FD/LS	2-8
TADS or PNVS continuous FD/LS	2-9
ORT switch checkout	2-10
Retrieve data	2-11
Quit program	2-12

## 2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS

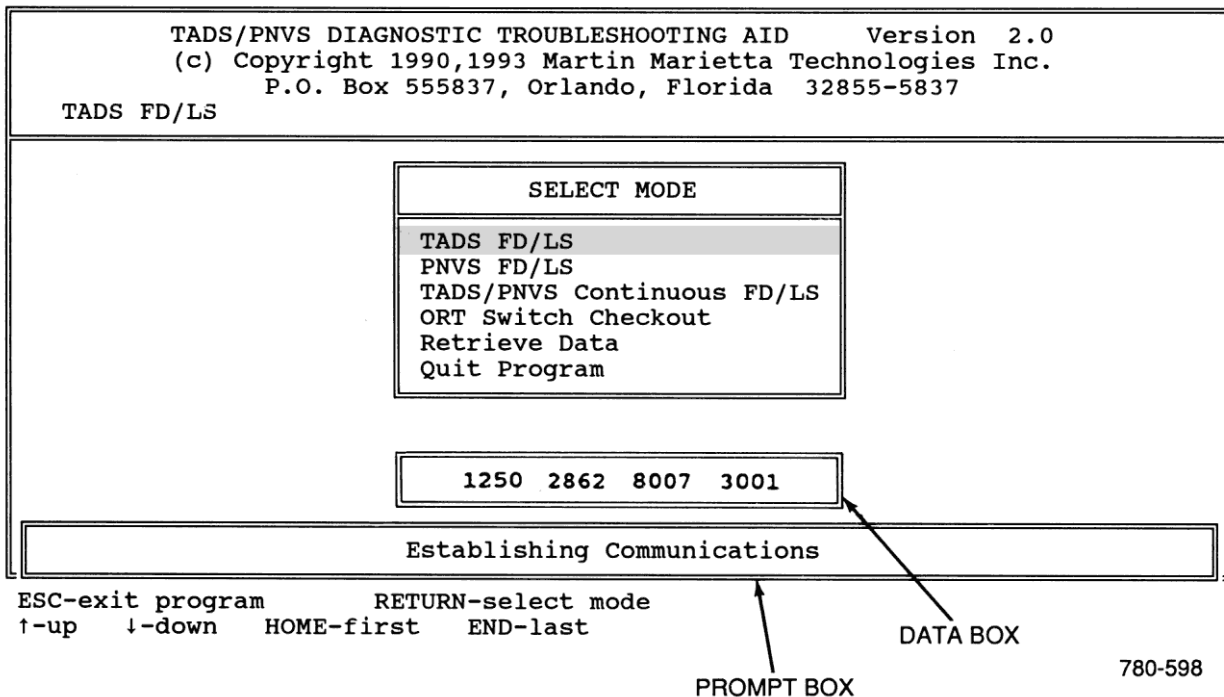
### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repair

### 1. ESTABLISHING COMMUNICATION

- a. If DTA is to receive TADS data, use up or down arrow key to highlight **TADS FD/LS** on main menu. If it is to receive PNVS data, highlight **PNVS FD/LS**. Press ENTER.
- b. DTA will attempt to establish communication with TEU. During this time, prompt box will display message **ESTABLISHING COMMUNICATIONS**, as shown in sample below, unless it was immediately successful. If communication was immediately established, screen may appear too quickly to be seen, and prompt box will display message **GETTING TADS SOFTWARE VERSION**.

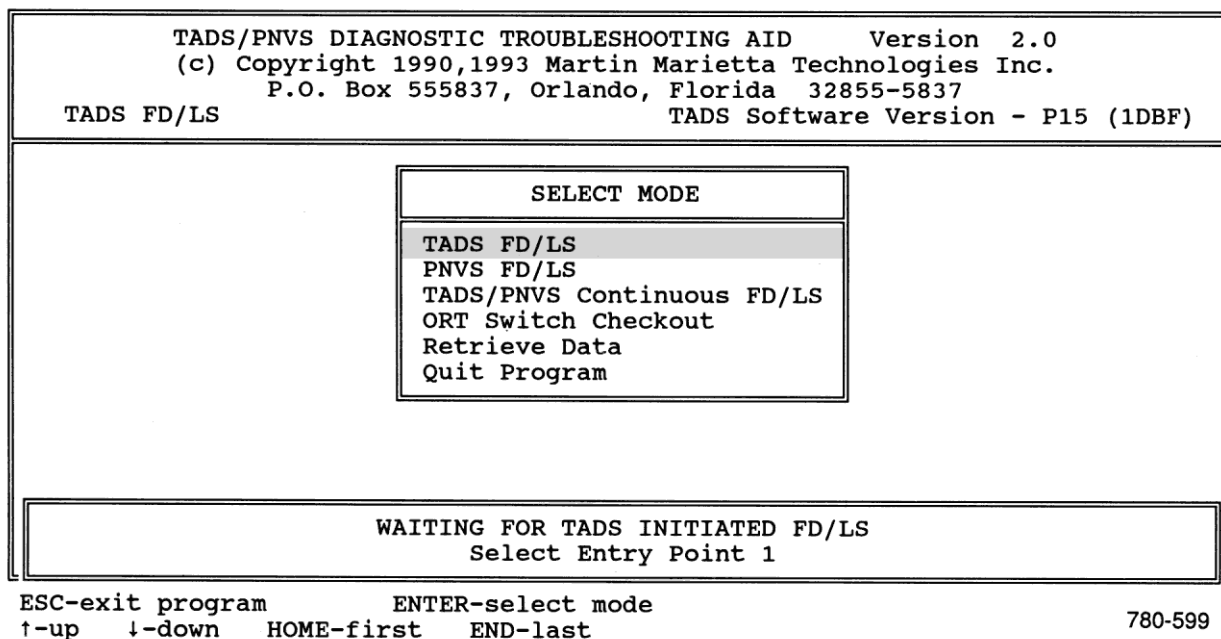


**2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)**

- c. If communication was not established, prompt box may display message **TEU COMMUNICATIONS FAILURE...PRESS F1 FOR HELP...ANY OTHER KEY WHEN READY.** Press F1, if desired, for troubleshooting assistance. For additional troubleshooting, refer to troubleshooting procedures in chapters 3 and 4. Or, prompt box may display message **DATA LINK TIMED OUT...PRESS A KEY WHEN READY.** Program will return to main menu when you press a key. While communication is in progress, you may exit by pressing ESC. Prompt box will then display **RESETTING COMMUNICATIONS and COMMUNICATIONS ABORTED...PRESS ANY KEY.** Return to main menu by pressing any key.

**2. ACQUIRING TADS OR PNVS INITIATED DATA**

- a. Assuming that communication with TEU was established, once computer receives TADS software version from TEU, a screen similar to one shown below will appear. DTA is now waiting for TADS initiated FD/LS to be selected from helicopter.
- b. Refer to TM 1-1520-238-T-1 and perform TADS or PNVS INITIATED BIT procedures at helicopter's CPG station. System will now run FD/LS to completion without stopping at a failure.



- c. When automatic portion of class B FD/LS has completed, HOD in helicopter's CPG station will display **ARE OPERATOR INTERACTIVE TESTS REQUIRED? (Y/N).** Screen similar to one below will appear on DTA, signifying that data is being requested. You must answer no (N) at CPG station to this prompt for DTA to receive FD/LS data. When data is being received, data box on DTA displays incoming data in hexadecimal format, and prompt box displays **GETTING TADS INITIATED FD/LS DATA.**

## 2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0 (c) Copyright 1990,1993 Martin Marietta Technologies Inc. P.O. Box 555837, Orlando, Florida 32855-5837								
TADS FD/LS	TADS Software Version - P15 (1DBF)							
<table border="1"><tr><td>SELECT MODE</td></tr><tr><td>TADS FD/LS</td></tr><tr><td>PNVS FD/LS</td></tr><tr><td>TADS/PNVS Continuous FD/LS</td></tr><tr><td>ORT Switch Checkout</td></tr><tr><td>Retrieve Data</td></tr><tr><td>Quit Program</td></tr></table>		SELECT MODE	TADS FD/LS	PNVS FD/LS	TADS/PNVS Continuous FD/LS	ORT Switch Checkout	Retrieve Data	Quit Program
SELECT MODE								
TADS FD/LS								
PNVS FD/LS								
TADS/PNVS Continuous FD/LS								
ORT Switch Checkout								
Retrieve Data								
Quit Program								
<table border="1"><tr><td>TADS INITIATED IN PROGRESS</td></tr><tr><td>When Complete, Answer NO to Operator Interactive FD/LS</td></tr></table>		TADS INITIATED IN PROGRESS	When Complete, Answer NO to Operator Interactive FD/LS					
TADS INITIATED IN PROGRESS								
When Complete, Answer NO to Operator Interactive FD/LS								

ESC-exit program      ENTER-select mode      780-600  
↑-up   ↓-down   HOME-first   END-last

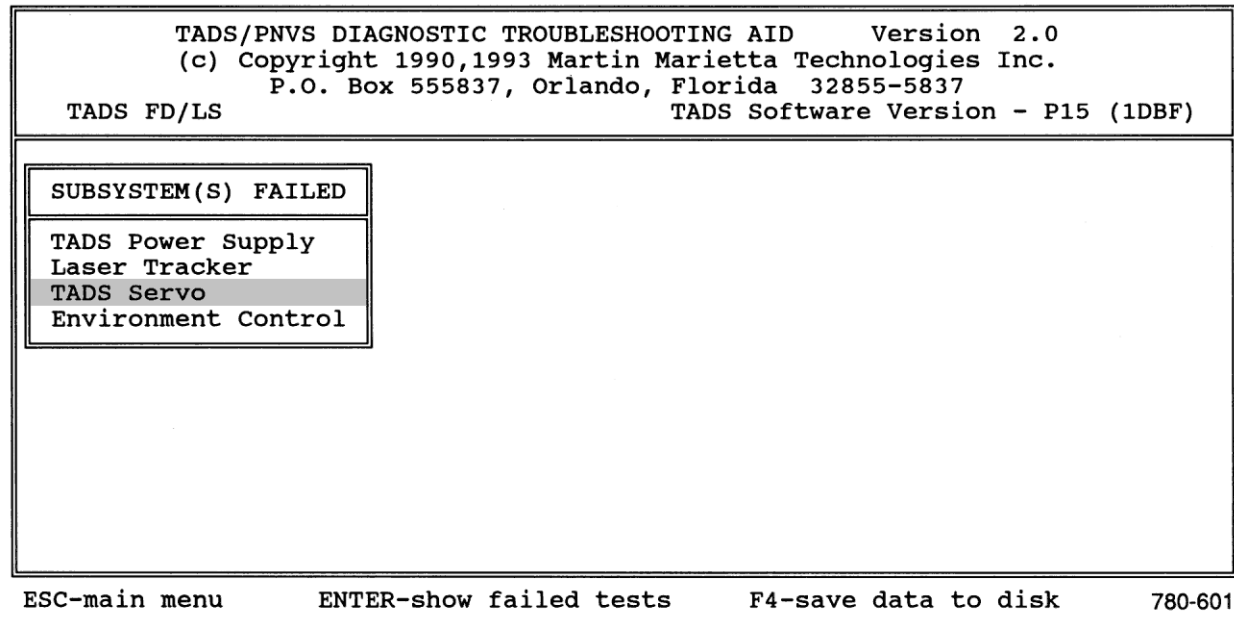
- d. If prompt box displays random characters or characters other than numerals plus the letters A through F (hexadecimal data), press F1 and perform suggested maintenance actions.

### 3. ACQUIRING TADS OR PNVS CONTINUOUS DATA

- a. When DTA receives all TADS initiated FD/LS data, it will automatically request and receive continuous FD/LS data. At this time, prompt box displays GETTING CONTINUOUS FD/LS DATA.
- b. When DTA receives all continuous data (after about 45 seconds), DTA will reset communication link to TEU. Prompt box will display RESETTING COMMUNICATIONS. When hexadecimal data completely disappears from data box, data has been successfully transferred into computer's memory. Then a screen similar to one shown below appears.



**2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)**



**4. FAILED SUBSYSTEMS**

- a. If no hardware fails, main menu remains on display and prompt box displays the message **NO SUBSYSTEM FAILURES PRESS ANY KEY**, the TADS/PNVS system has not failed any initiated or continuous tests. Computer will return to main menu, and will display message **IF THE AIRCRAFT REPORTS A TADS/PNVS FAILURE, PRESS F1 FOR HELP**. Press F1 for assistance. A DTA HELP screen will appear, listing a series of failure symptoms accompanied by recommended actions to follow. Follow prompts on program control line.
- b. Screen shown above is an example of a failure message if DTA detected any test failures. **SUBSYSTEMS FAILED** box displays names of all subsystems that failed a test. In example shown, four TADS subsystems failed.

**5. SAVING TEST DATA**

When F4-save data to disk appears on program control line (see previous screen), you can save all FD/LS data in computer memory to the hard drive or to a floppy disk.

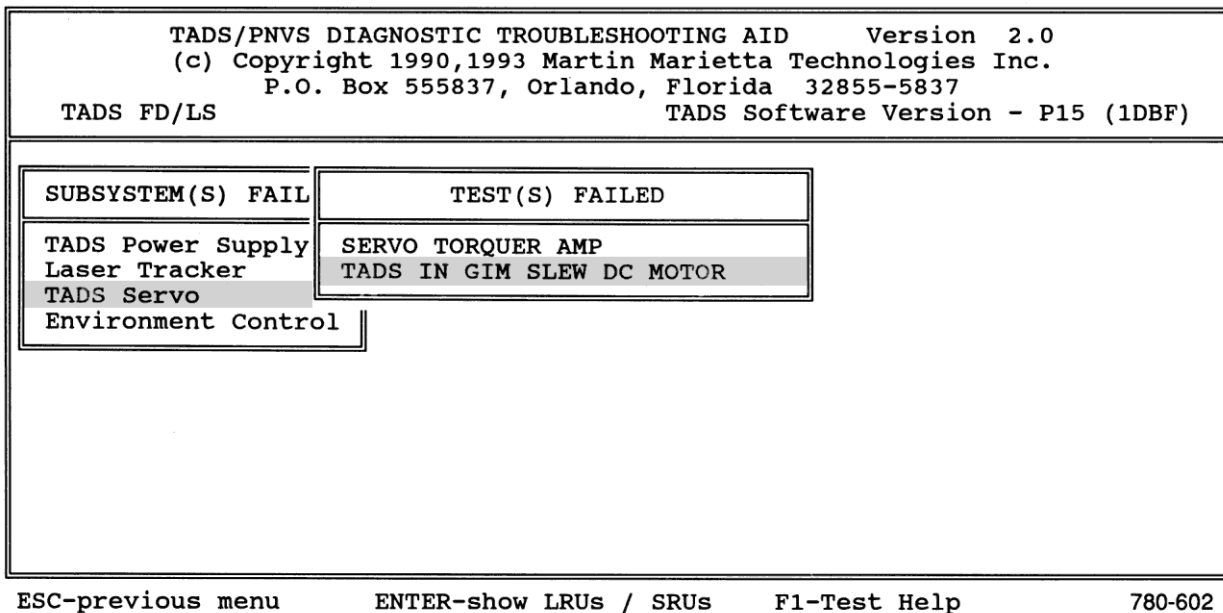
- a. When ready to save the test data, press F4. (Be sure a floppy disk is inserted in floppy disk drive if you intend to save data to a floppy disk.)
- b. Screen will display a default filename. Press ENTER to use default filename, or press F1 to change filename.

## 2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)

- c. To change filename, type new filename over old one. To save the data to a floppy disk, change path in front of filename from **C:\DTA\** to **A:\**.
- d. Press ENTER and the data will be saved.

## 6. FAILED TESTS

- a. Use up or down arrow key to highlight one of the subsystems, then press ENTER. Screen similar to one shown below will appear, displaying names of tests that selected subsystem failed.



- b. In example shown, SERVO TORQUER AMP and TADS IN GIM SLEW DC MOTOR tests failed. These tests are associated with failed TADS servo subsystem from **SUBSYSTEMS FAILED** box.
- c. If you do not wish to examine failed test data at this time, press ESC. Test failed box will disappear. Highlighting a different subsystem listed in **SUBSYSTEMS FAILED** box and pressing ENTER will return to screen shown above, but with a different set of failed tests. These failed tests (if any) are associated with the most recently highlighted subsystem in **SUBSYSTEMS FAILED** box. In this manner, it is possible to obtain a list of all tests that failed, along with the associated subsystems by cycling between the last two previously shown screens. You can exit any mode at any time by pressing ESC.

**2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)**

- d. When computer is displaying **TESTS FAILED** screen, **F1 - Test Help** is also displayed at bottom of screen. Pressing F1 will produce a screen containing a technical description of test currently highlighted by cursor. This description may include voltage measurements and other data to assist in troubleshooting.

**7. SUSPECTED HARDWARE**

- a. When computer is displaying last screen shown above, view computer's list of suspected failed hardware by highlighting one of tests displayed in **TESTS FAILED** box, then press ENTER. Screen shown below will appear, displaying **SUSPECT LRUs/SRUs** box. This box will list all LRUs and/or SRUs that may be cause of failed test highlighted in **TESTS FAILED** box.

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0 (c) Copyright 1990,1993 Martin Marietta Technologies Inc. P.O. Box 555837, Orlando, Florida 32855-5837		
TADS FD/LS	TADS Software Version - P15 (1DBF)	
SUBSYSTEM(S) FAIL TADS Power Supply Laser Tracker TADS Servo Environment Control	TEST(S) FAILED SERVO TORQUER AMP TADS IN GIM SLEW DC M	SUSPECT LRUs* / SRUs * T1A4 Azimuth Gimbal Assy T1A4A3 Inner Gimbal Assy T1A4A6 AngularAccelerometer * T1A1A2 Elect Ctrl Amp Assy * T1A5 Day Sensor Assy T1A5A6 AngularAccelerometer * T1A5A8 Pitch Rate Gyro CCA * T1A5A9 Yaw Rate Gyro CCA * T3 TADS Elect. Unit Assy T3A7 Analog I/O CCA ----- MORE

ESC-previous menu    ENTER-show End-to-End wires    F2-Test Sum    F3-SubSystem Sum  
 ↑-up    ↓-down    HOME-first    END-last  
780-603

- b. Illustration above also shows conventions used when displaying possible hardware failures. LRUs are identified by asterisks. An LRU that is the most likely cause of failure is called a primary LRU in this manual and is listed first. Any SRUs that might be cause of LRU failure are listed directly underneath LRU. Additional LRUs that may be cause of failure are called secondary LRUs, and are listed in descending order of probable cause along with their SRUs. Hardware reference designation numbers are the same as those used elsewhere in TADS/PNVS documentation, except that they are preceded by "T" for TADS or "P" for PNVS.

## 2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)

### 8. TROUBLESHOOTING PHILOSOPHY

- a. When DTA displays hardware failure data, you have two options: 1) replace listed LRUs to determine if failed component is an LRU; or 2) troubleshoot possible defective helicopter or TADS/PNVS wiring. Some TADS/PNVS failures will cause failure of more than one subsystem and/or test, making it difficult to determine which is the defective component. DTA provides summary screens to summarize which tests, subsystems, and wiring harnesses are affected by a failure. Summarizing failure data will assist you in determining first, if the defective component is an LRU or defective wiring, and second, which LRU or wiring harness is defective.
- b. If DTA lists only one failed subsystem and a small number of failed tests, the lists of suspected LRUs and possible defective wiring will be short. Since replacing a few LRUs is normally easier and faster than trouble-shooting possible wiring problems, it is recommended that you summarize the failures (para 9) and replace suggested LRUs first. Then, troubleshoot possible wiring problems (para 10) if problem still exists.
- c. If DTA lists multiple failed subsystems and tests, the list of suspected LRUs can be long. Replacing each LRU, one at a time, can be time consuming. In this case, it is recommended that you troubleshoot possible wiring problems first.
- d. When deciding whether to replace LRUs or troubleshoot wiring, consider the difficulty of replacing the LRU or of troubleshooting the wiring harness. Also consider the availability of spares. Prior experience with a similar or identical problem may indicate one choice above the other. For instance, current failure may have previously occurred on this or another helicopter. If so, history data that was recorded and saved for earlier failure will provide direction.
- e. When replacing LRUs, replace primary LRU first. If problem still exists, replace next listed LRU, and so on, until problem is fixed, or you have replaced all suspected LRUs. Note suspected SRUs in a defective LRU for LRU repair purposes.
- f. Summarizing failures begins next, followed by troubleshooting of defective wiring. Summarizing failures and troubleshooting can be done after helicopter power has been shut down and at any desired location if test data has been saved to computer's hard disk.

### 9. SUMMARY MODE

- a. Determine if any suspected failed hardware is associated with more than one test by entering summary mode. First, return to screen shown in step 7 and press F2. Screen similar to one shown below will appear. Cursor will expand to cover all tests listed in tests failed box. This signifies that any data in **SUMMARY OF SUSPECT LRUs/SRUs** box applies to all failed tests for selected subsystem. Numbers in parentheses under word **FREQ** indicate number of tests the hardware item failed. In example, two hardware items failed both tests. Asterisks represent primary and secondary LRUs.

2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID Version 2.0 (c) Copyright 1990,1993 Martin Marietta Technologies Inc. P.O. Box 555837, Orlando, Florida 32855-5837		
TADS FD/LS	TADS Software Version - P15 (1DBF)	
SUBSYSTEM(S) FAIL	TEST(S) FAILED	FREQ SUSPECT LRUs* /SRUs SUMMARY
TADS Power Supply	SERVO TORQUER AMP	2 * T1A1A2 Elect Ctrl Amp Assy
Laser Tracker	TADS IN GIM SLEW DC M	2 * T3 TADS Elect. Unit Assy
TADS Servo		1 * T1A4 Azimuth Gimbal Assy
Environment Control		1 T1A4A3 Inner Gimbal Assy
		1 T1A4A6 AngularAccelerometer
		1 * T1A5 Day Sensor Assy
		1 T1A5A6 AngularAccelerometer
		1 * T1A5A8 Pitch Rate Gyro CCA
		1 * T1A5A9 Yaw Rate Gyro CCA
		1 T3A12 R/D Converter/Mux CCA
		-----MORE-----

ESC-previous menu  
 ↑-up ↓-down HOME-first END-last

780-604

- b. Next, press ESC, then press F3. Screen similar to one shown below will appear. This time, cursor will expand to cover all subsystems listed in **SUBSYSTEM(S) FAILED** box. This signifies that data in **SUMMARY OF SUSPECT LRUs/SRUs** box applies to all failed subsystems as well as to all failed tests. In example, TADS electronic unit assembly failed all six tests listed in **TESTS FAILED** box. Press ESC when ready to exit summary mode. If desired, press ESC three more times to return to main menu. Use information obtained from the two summary mode screens to assist in troubleshooting.

2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0			
(c) Copyright 1990,1993 Martin Marietta Technologies Inc.			
P.O. Box 555837, Orlando, Florida 32855-5837			
TADS FD/LS		TADS Software Version - P15 (1DBF)	
SUBSYSTEM(S) FAIL	TEST(S) FAILED	FREQ	SUSPECT LRUs* /SRUs SUMMARY
TADS Power Supply	TADS NONCRITICAL POWER	6 *	T3 TADS Elect. Unit Assy
Laser Tracker	TADS FLIR POWER 1	4 *	T4 TADS Power Supply Assy
TADS Servo	TADS ECA BLOWER	3	T3A10 Discrete/SerialIO CCA
Environment Contr	LT CORRELATE	3	T4A5 Bite/Controller CCA
	SERVO TORQUER AMP	2 *	T1A1A2 Elect Ctrl Amp Assy
	TADS IN GIM SLEW DC M	2	T3A3 Timing Genrtr/Bite CCA
		2	T4A1 Regulator CCA
		2	T4A7 Power Components Assy
		1 *	T1A1A1 Envrn Ctrl Sys Assy
		1	T1A1A1A1 Elect Ctrl Assy
			-----MORE-----

ESC-previous menu  
 ↑-up   ↓-down   HOME-first   END-last

780-605

- c. Before exiting program, be sure to save troubleshooting data if you haven't saved it earlier by pressing F4.

2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)

10. WIRE HARNESS TROUBLESHOOTING

- a. In addition to determining which LRUs and SRUs could be defective, DTA also determines which specific wire, either aircraft or TADS/PNVS, could cause the problem. Note that program control line shown in step 7 displays **ENTER-show End-to-End Wires**. Press ENTER to view screen shown below.

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0							
(c) Copyright 1990,1993 Martin Marietta Technologies Inc.							
P.O. Box 555837, Orlando, Florida 32855-5837							
TADS FD/LS				TADS Software Version - P15 (1DBF)			
ASSOCIATED END-TO-END WIRE(S)							
HARNESS	CONN	PIN#	LOCATION	to	HARNESS	CONN	PIN# LOCATION
W255	P848	033	TPS J1		W255	P862	111 TEU J8
W255	P849	0ZA	TPS J2		W255	P761	00H CPG CB PAN #2 J1
W255	P849	0ZB	TPS J2		W255	P761	00F CPG CB PAN #2 J1
W255	P849	0ZC	TPS J2		W255	P761	00E CPG CB PAN #2 J1
W255	P848	093	TPS J1		W255	GROU	ND GS811-F-A3
W255	P848	078	TPS J1		1A5W1	P07	022 TV SENSOR J1
W255	P848	097	TPS J1		1A5W1	P04	015 LTR J1
W255	P848	074	TPS J1		1A5W1	P04	016 LTR J1
W255	P848	073	TPS J1		W255	P853	033 TEU J3
W255	P848	086	TPS J1		W255	P853	013 TEU J3
SIGNAL NAME => NONCRIT PWR							
MORE							
ESC-previous menu    ENTER-show wire segments    F2-Test Sum    F3-SubSystem Sum							
↑-up    ↓-down    HOME-first    END-last							
780-606							

- b. In figure shown above, all boxes have been replaced by **ASSOCIATED END-TO-END WIRES** box. Circuit paths listed in this box contain aircraft or TADS/PNVS wires DTA has pinpointed as most likely cause of failure. Prompt box at bottom of screen displays signal name for currently highlighted wire path. In example shown above, 10 separate circuit paths are listed. The word **MORE** at bottom of screen means that there are more than 10 circuit paths. Press keys listed on cursor control line to view all circuit paths. Path listed first is in harness number W255 and runs from connector P848, pin 33 to connector P862, pin 111, which connects to TEU connector J8.
- c. Normally, check continuity of first path listed in **ASSOCIATED END-TO-END WIRES** box. If continuity check from pin 33 of P848 to pin 111 of P862 shows that this path is not cause of failure, check path listed next, and so forth, until all listed paths have been checked for continuity.

**2-8. TADS OR PNVS INITIATED AND CONTINUOUS FD/LS (cont)**

- d. If a circuit path fails continuity check, DTA can list all individual wire segments that make up failed circuit path. Note statement in control line: **ENTER-show wire segments**. Use up or down arrow to highlight failed circuit path. Press ENTER. A box will appear in middle of screen containing statement **LOOKING FOR WIRE SEGMENT DATA...PLEASE WAIT**. After a few moments, box may contain statement **THERE ARE NO WIRE SEGMENTS FOR THIS END-TO-END WIRE**. This means circuit path that failed continuity path contains only one wire segment.
- e. If failed circuit path contains individual wire segments, a screen similar to one shown below will appear. There are two boxes approximately in middle of screen. Top box lists failed circuit path. Bottom box lists each wire segment making up entire circuit path. In example, three individual wire segments make up circuit path. Check continuity from pin P002 at connector P01 of wiring harness 1A1W2 to pin P00L at connector J08 of same wiring harness. If continuity exists, check continuity from pin P00H at connector J08 of wiring harness 1A1W2 to pin P037 at connector J07 in same wiring harness. Continue checking continuity of individual wire segments until fault has been located. If no circuit paths failed continuity check, press ESC to return to screen shown in step 9 above and perform summary mode procedures (step 9 above).

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID Version 2.0							
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P.O. Box 555837, Orlando, Florida 32855-5837							
TADS FD/LS				TADS Software Version - P15 (1DBF)			

WIRE SEGMENT(S) FOR END-TO-END WIRE(S)							
HARNESS	CONN	PIN#	LOCATION	to	HARNESS	CONN	PIN# LOCATION
1A1W2	P01	P002	TECA J1		1A4W1	P13	P002 INNER GIMBAL J1
1A1W2	P01	P002	TECA J1		1A1W2	J08	P00L SRV DISCONN J8
1A1W2	J08	P00H	SRV DISCONN J8		1A1W2	J07	P037 PRT ACS PAN J7
1A4W1	P04	P037	PRT ACS PAN J7		1A4W1	P13	P002 INNER GIMBAL J1

SIGNAL NAME => YAW DRIVE #2
<del>MORE</del>

ESC-previous menu

780-607

- f. Appendix D lists abbreviations used on wire segment listings and provides a detailed description of each abbreviation.



## 2-9. TADS OR PNVS CONTINUOUS FD/LS

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer

---

### 1. SELECTING

- a. If a hardware failure has been detected by continuous FD/LS tests, you can bypass initiated tests and select TADS/PNVS Continuous FD/LS from main menu.
- b. TADS and PNVS continuous FD/LS data are acquired in exactly the same method as described in para 2-8, except that initiated data is not requested, and certain computer screens described in para 2-8 are not used.

### 2. ACQUIRING

- a. To acquire continuous data only, do the following:
  - (1) Install DTA and apply power as described in Chapter 2, section III.
  - (2) Establish communication as described in para 2-8, step 1, except highlight **TADS/PNVS Continuous FD/LS** with cursor.
  - (3) DO NOT perform para 2-8, step 3.
- b. At this time, DTA will automatically request and receive continuous FD/LS data. Prompt box at bottom of screen will display **GETTING CONTINUOUS FD/LS DATA**.
- c. When DTA receives all continuous data (after about 45 seconds), DTA will reset communication link to TEU. Prompt box will display **RESETTING COMMUNICATIONS**. When hexadecimal data completely disappears from data box, all data has been successfully transferred into computer's memory. Then screen similar to one shown in para 2-8, step 3 appears.

### 3. USING

Perform steps in para 2-8, step 4 through 2-8, step 10 to analyze continuous data received by DTA.

## 2-10. ORT SWITCH CHECKOUT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
One Assistant

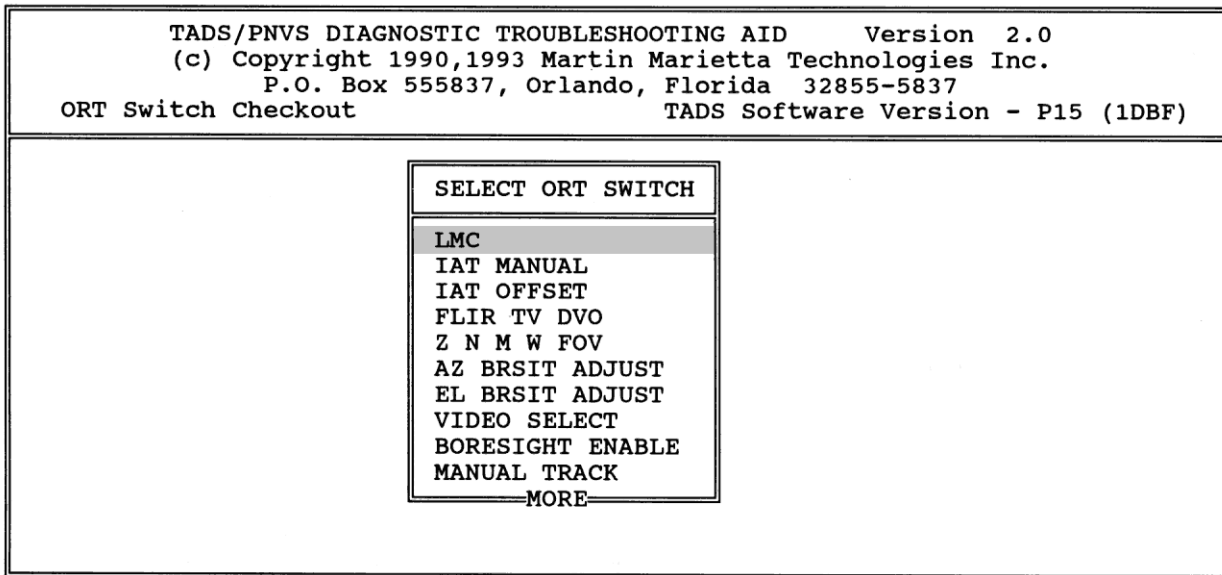
---

### 1. CONCEPT

The ORT switch checkout capability allows you to test 14 switches and controls on the optical relay tube (ORT). If a TADS/PNVS operation provided by a particular switch or control does not function, ORT switch checkout may eliminate some LRUs as being defective and may cause others to be suspected. Large graphic displays on DTA computer screen provide visual indications of results of switch or control checkout.

### 2. ESTABLISHING COMMUNICATION

- a. Highlight **ORT Switch Checkout** on main menu and press ENTER.



ESC-main menu      ENTER-test selected switch      780-609  
↑-up   ↓-down   HOME-first   END-last   PGUP-page up   PGDN-page down

## 2-10. ORT SWITCH CHECKOUT (cont)

- b. If you have already operated DTA to obtain FD/LS data, communication link to TEU is already made. Screen similar to one shown below will appear. If not, prompt box below menu will display message **ESTABLISHING COMMUNICATIONS**, unless it was immediately successful. If communication was immediately established, screen may appear too quickly to be seen, and prompt box will display message **GETTING TADS SOFTWARE VERSION**.
- c. If communication was not established, prompt box below menu may display message **TEU COMMUNICATIONS FAILURE...PRESS F1 FOR HELP...ANY OTHER KEY WHEN READY**. Press F1 for assistance, if desired, and follow prompts on program control line. Or, prompt box may display message **DATA LINK TIMED OUT...PRESS A KEY WHEN READY**. Program will return to main menu when you press a key. While communication is in progress, you may exit by pressing ESC. Then prompt box will display **RESETTING COMMUNICATIONS and COMMUNICATIONS ABORTED...PRESS ANY KEY**. Return to main menu by pressing any key.
- d. Assuming that communication with TEU was established, once computer receives TADS software version from TEU, screen shown above appears.

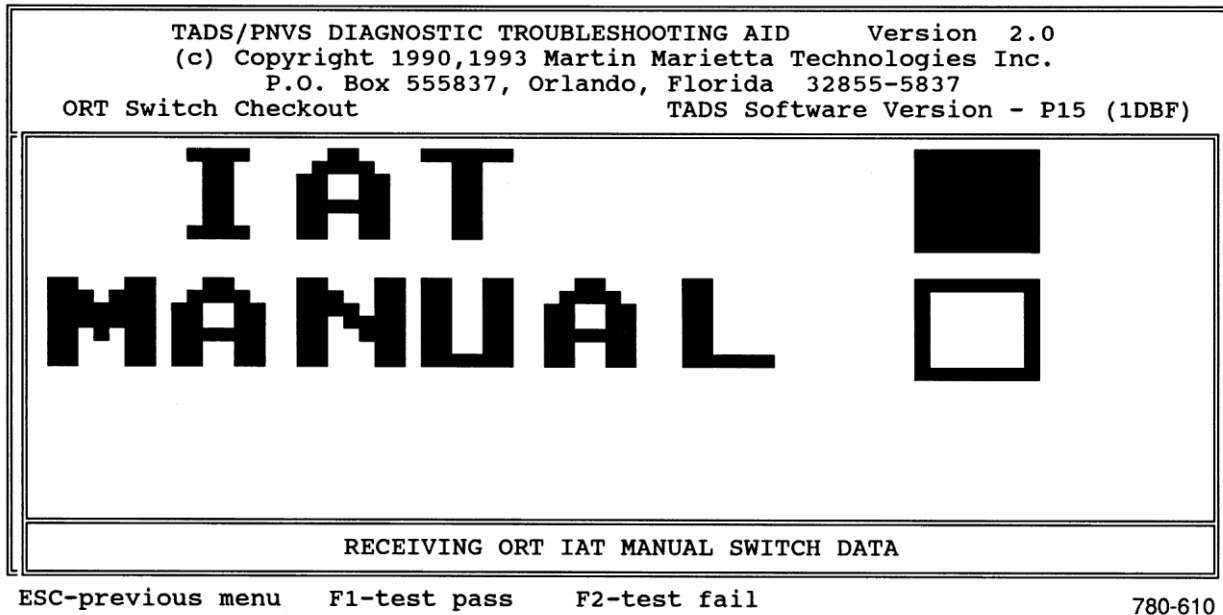
## 3. SWITCH AND CONTROL CHECKOUT

### WARNING

During switch and control checkout procedure, TADS/PNVS system is powered up and is in operation. When you operate a switch or control, that function will occur. Have personnel stand clear of all moving parts.

- a. Computer screen will give a visual indication of each position of a switch and amount of rotation of a control, as explained below.
- b. When assistant is operating a switch from helicopter cockpit, make sure computer screen clearly indicates when switch positions have changed. Look for intermittent operation of switch as evidenced by an erratic indication on screen. Change switch positions several times slowly to check for continued proper operation.
- c. When assistant is operating a control, make sure computer screen indicates smooth, continual, and constant movement as control is rotated. As with a switch, look for intermittent operation of control as evidenced by erratic indication on screen. Rotate control slowly from minimum to maximum several times to check for continued proper operation.
- d. On program control line of screen shown below are instructions to press F1 if switch or control passes test, or F2 if it fails. Pressing F1 returns to ORT switch menu shown in previous screen. From there, select another switch or control to test, or press ESC until main menu appears. If you press F2, **ORT SUBSYSTEM(S) FAILED** box appears (step 4 below).

**2-10. ORT SWITCH CHECKOUT (cont)**



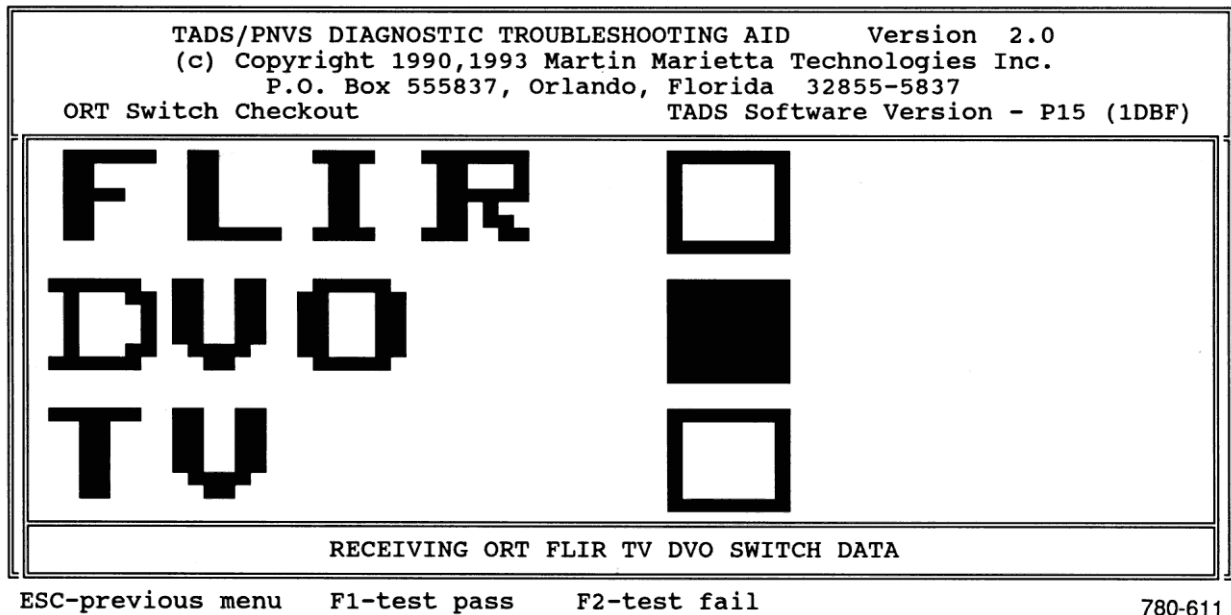
**e. TWO POSITION SWITCHES**

- (1) Shown in screen above is a sample two position switch checkout screen. When you select any two position switch from ORT switch menu, a screen similar to this appears on computer. Switch position nomenclature is reproduced.
- (2) In sample shown, IAT/MAN switch is in IAT position, as represented by solid square to right of word IAT. If IAT/MAN switch is operating properly, switching to MANUAL position will cause bottom square to become solid instead of top one.
- (3) Seven two position switches on ORT are checked. They are:
  - LMC
  - IAT/MAN
  - IAT OFS
  - VID SEL
  - BRSIT ENABLE
  - FLIR PRT
  - SLAVE

**f. THREE POSITION SWITCHES**

- (1) Shown below is a sample three position switch checkout screen. When you select any three position switch from ORT switch menu, a screen similar to this appears on computer.

2-10. ORT SWITCH CHECKOUT (cont)



(2) In sample shown, sensor select (FLIR/TV/DVO) switch is in DVO position, as represented by solid square to right of DVO. If switch is operating properly, switching to FLIR position will cause top square to become solid instead of middle one, and switching to TV position will cause bottom square to become solid instead of top one.

(3) Three three position switches on ORT are checked. They are:

- FLIR/TV/DVO
- WHT/AUTO/BLK
- AUTO/OFF/MAN

g. FOUR POSITION SWITCH

(1) Shown below is the field of view switch checkout screen. This is the only four position switch checked by DTA. When you select this switch from ORT switch menu, screen shown below appears on computer.

(2) As shown, switch is in WIDE (W) position, as represented by box enclosing word WIDE. If switch is operating properly, switching to any other position will cause that position to be enclosed by box.

2-10. ORT SWITCH CHECKOUT (cont)

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID Version 2.0  
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P.O. Box 555837, Orlando, Florida 32855-5837  
ORT Switch Checkout TADS Software Version - P15 (1DBF)

ZOOM MED  
NARW WIDE

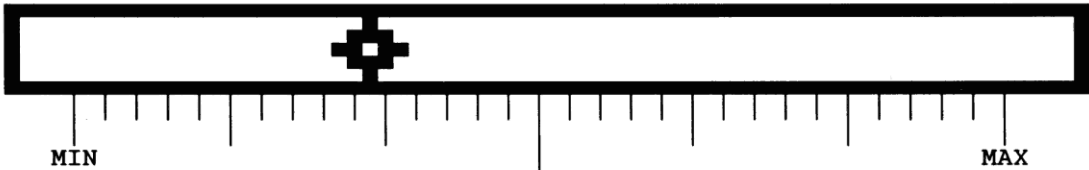
RECEIVING ORT Z N M W FOV SWITCH DATA

ESC-previous menu F1-test pass F2-test fail 780-612

h. ADJUSTABLE CONTROLS

- (1) A sample control checkout screen is shown below. When you select any adjustable control from ORT switch menu, a screen similar to this appears on computer.

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P.O. Box 555837, Orlando, Florida 32855-5837  
ORT Switch Checkout TADS Software Version - P15 (1DBF)



RECEIVING ORT AZ BRSIT ADJUST SWITCH DATA

ESC-previous menu F1-test pass F2-test fail 780-613

**2-10. ORT SWITCH CHECKOUT (cont)**

- (2) **MIN** position in figure represents minimum position of control, and **MAX** position represents maximum position. If control is operating properly, symbol shown will travel back and forth between **MIN** and **MAX**, but may not reach **MIN** or **MAX**.
- (3) Two controls on ORT are checked. They are:
  - AZ ADJUST
  - EL ADJUST

i. MANUAL TRACK (MAN TRK) CONTROL

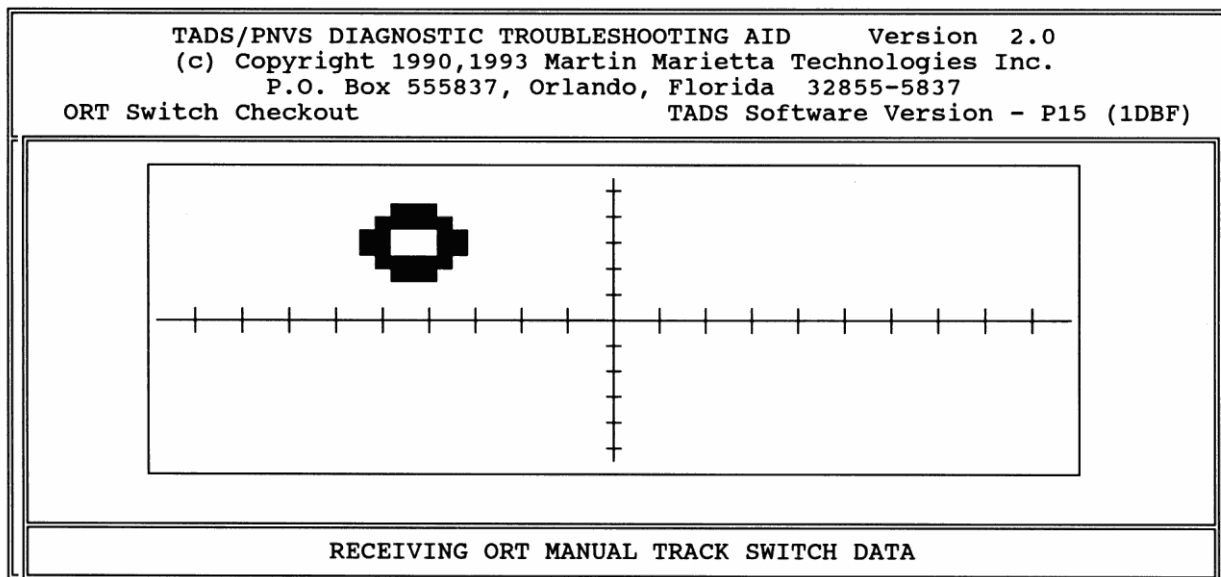
**WARNING**

During switch and control checkout procedure, TADS/PNVS system is powered up and is in operation. When you operate a switch or control, that function will occur. Have personnel stand clear of all moving parts.

**CAUTION**

TADS Turret will move between stops during test of MAN TRK control. Be aware of turret position at all times to keep from driving it against stops.

- (1) Manual track control checkout screen is shown below. When you select this control from ORT switch menu, a screen similar to this appears on computer.



ESC-previous menu

F1-test pass

F2-test fail

780-614

## 2-10. ORT SWITCH CHECKOUT (cont)

- (2) When you adjust MAN TRK control, symbol shown in figure will move in direction of control movement.

## 4. FAILURE ANALYSIS

### a. FAILED SUBSYSTEMS

- (1) If you pressed F2 because a switch or control test failed, screen shown below appears, indicating that ORT subsystem has failed. At this screen, program control line provides option of pressing ENTER to show failed tests or F4 to save test data to computer's hard drive.

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0	
(c) Copyright 1990,1993 Martin Marietta Technologies Inc.	
P.O. Box 555837, Orlando, Florida 32855-5837	
ORT Switch Checkout	TADS Software Version - P15 (1DBF)
SUBSYSTEM(S) FAILED	
ORT	

ESC-main menu      ENTER-show failed tests      F4-save data to disk      780-615

- (2) Press ENTER the first time this screen appears in order to view tests that failed and list of suspected LRUs.

### b. FAILED TESTS

- (1) Pressing ENTER causes screen similar to one shown below to appear. **TESTS FAILED** box lists each switch or control that failed ORT switch checkout test. In example shown, one ORT switch failed to work properly, although more than one switch or control could fail, giving multiple indications in this box.







## 2-11. RETRIEVE DATA

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer

---

#### NOTE

When computer saves test data, it automatically adds current date and time to data. If you find that date and/or time is incorrect, refer to Disk Operating System manual supplied with computer for instructions for changing date and time.

### 1. ACCESSING PREVIOUSLY SAVED DATA

- a. If you have previously saved test data to computer's hard drive, highlight **RETRIEVE DATA** on main menu and press ENTER. A screen will appear listing saved file by its filename in **DIRECTORY** box.
- b. If only one file has been saved, press ENTER to load that file. If more than one file exists, highlight desired filename with cursor, then press ENTER.
- c. If file path is not current computer directory, press F1 and enter correct file path. Press ENTER to load file.
- d. When you select a filename, a screen similar to the one shown below appears. If more than one test session has been saved under same filename, all sessions will appear in **SAVED TEST SESSIONS** box. Date, time, and type of operation are displayed to assist in selecting the correct session. When you highlight desired session and press ENTER, computer will load test data and begin displaying data with **SUBSYSTEM(S) FAILED** box.
- e. At this point, your options are:
  - (1) Return to para 2-8, 2-9, or 2-10 and analyze the saved data, depending on whether the saved data was acquired by initiated or continuous FD/LS or ORT switch settings.
  - (2) Perform an edit summary (step 2 below).
  - (3) Print a report (step 3 below).

## 2-11. RETRIEVE DATA (cont)

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0 (c) Copyright 1990,1993 Martin Marietta Technologies Inc. P.O. Box 555837, Orlando, Florida 32855-5837 Retrieving Data      TADS Software Version - P15 (1DBF)		
SAVED TEST SESSION(S)		
1	12:42 11/01/1993	Continuous FD/LS
READING FD/LS DATA		

ESC-previous menu      ENTER-select session      780-618

## 2. EDIT SUMMARY

- a. An option is available that allows you to save additional notes or maintenance comments along with test data. This option is called EDIT SUMMARY, and is accessed from **SUBSYSTEM(S) FAILED** box discussed above after you have retrieved test data from computer's hard disk. When you print a test report (para 3), edit summary data is also printed as a part of the test report.
- b. The statement **F1-edit summary** on program control line provides program direction. When you press F1 from this screen, a screen similar to one below appears. Enter any desired data into box in center of screen. Cursor control line lists editing keys available. HOME places cursor at beginning of data file, and END places cursor at end of file. INS and DEL keys allow you to insert and delete information as necessary. If necessary, refer to computer manufacturer's User's Guide for more information on these keys.
- c. To save information you have typed into computer, press F1. If you decide not to save information and have not yet pressed F1, press ESC and information will be discarded.

2-11. RETRIEVE DATA (cont)

TADS/PNVS DIAGNOSTIC TROUBLESHOOTING AID      Version 2.0 (c) Copyright 1990,1993 Martin Marietta Technologies Inc. P.O. Box 555837, Orlando, Florida 32855-5837 Retrieving Data			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">SUBSYSTEM(S) FAILED</td> </tr> <tr> <td style="text-align: center; padding: 5px;">ENTER ANY ADDITIONAL INFORMATION ABOUT THIS TEST</td> </tr> <tr> <td style="height: 100px;"></td> </tr> </table>	SUBSYSTEM(S) FAILED	ENTER ANY ADDITIONAL INFORMATION ABOUT THIS TEST	
SUBSYSTEM(S) FAILED			
ENTER ANY ADDITIONAL INFORMATION ABOUT THIS TEST			

ESC-do not save text      F1-save text  
 EDIT KEYS: ↑      →      ↓      HOME      END      INS      DEL      BACKSPACE      ENTER      780-619

3. PRINTING REPORTS

- a. Another option available from **SUBSYSTEM(S) FAILED** box is the print option. If a printer is connected to computer's parallel port as described in computer manufacturer's User's Guide, computer will print all test data currently in memory when instructed to do so.
- b. The statement **F2-print report** on program control line provides program direction. When you press F2 from this screen and a printer is connected, the data will be printed. Screen below shows part of a typical printed report.

2-11. RETRIEVE DATA (cont)

TADS/PNVs DIAGNOSTIC TROUBLESHOOTING AID					Page 1				
NAME: 22-76131.ADF									
DATE AND TIME OF TEST: 11/01/1993 12:42									
TEST MODE: TADS/PNVs Continuous FD/LS									
-----									
MAINTENANCE COMMENTS:									
SUBSYSTEM FAILED: TADS Power Supply									
TEST FAILED: TADS FLIR POWER 2									
SUSPECT LRUs(*) AND SRUs:									
1)* T4 TADS Power Supply Assy									
2) T4A7 Power Components Assy									
3) T4A5 Bite/Controller CCA									
4) T4A1 Regulator CCA									
5)* T1A3 Night Sensor Assy									
6)* T3 TADS Elect. Unit Assy									
7) T3A10 Discrete/SerialIO CCA									
POSSIBLE FAILED WIRES AND WIRE SEGMENTS:									
	HARNESS	CONN	PIN#	LOCATION	to	HARNESS	CONN	PIN#	LOCATION
1)	W255	P848	P022	TPS J1		W255	P862	P125	TEU J8
2)	W255	P848	P057	TPS J1		W255	P862	P115	TEU J8
2a)	I								
3)	W255	P849	P0ZA	TPS J2		W255	P761	P00H	CPG CB PAN#2 J1
4)	W255	P849	P0ZB	TPS J2		W255	P761	P00F	CPG CB PAN#2 J1
5)	W255	P849	P0ZC	TPS J2		W255	P761	P00E	CPG CB PAN#2 J1
6)	W255	P848	P093	TPS J1		W255	GROU	ND	GS811-F-A3
6a)	OHMS)								
7)	W255	P848	P031	TPS J1		1A4W1	J02	P002	TADS NSA P1
7a)	W255	P848	P031	TPS J1		W255	P845	P041	TADS BLKHD J6
7b)	1A1W2	J06	P041	TADS BLKHD J6		1A1W2	J11	P002	DRP ACS PAN J11

780-620

- c. In example, a space is provided at top of form for maintenance comments (para 2). LRUs and SRUs are listed in same manner as on computer screen. An asterisk is beside primary LRUs, and secondary LRUs are listed under primary LRUs.
- d. When printing wiring harness data, wire segments are printed under harnesses they are a part of. In example, a complete end-to-end interconnection is listed on line 1 under POSSIBLE FAILED WIRES AND WIRE SEGMENTS.
- e. Appendix D lists abbreviations used on printed reports and provides a detailed description of each abbreviation.

## 2-12. QUIT PROGRAM

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer

---

When main menu is on screen, highlight **QUIT PROGRAM** with cursor and press ENTER. Prompt box will display **Do you wish to exit the program? (Y/N)**. If you press **Y**, program will end and computer will display DOS prompt. If you press **N**, program will return to main menu.





**CHAPTER 3**

**OPERATOR AND AVIATION UNIT MAINTENANCE**

	Section	Page
Service Upon Receipt . . . . .	I	3-1
Troubleshooting Procedures . . . . .	II	3-3
Maintenance Procedures . . . . .	III	3-5
Preparation for Storage or Shipment . . . . .	IV	3-6

**Section I. SERVICE UPON RECEIPT**

Subject	Para	Page
Service Upon Receipt of Materiel . . . . .	3-1	3-1
Service Upon Receipt Checks . . . . .	3-2	3-2

**3-1. SERVICE UPON RECEIPT OF MATERIEL**

Upon receipt of materiel, use instructions in this chapter to ensure that equipment is complete and free of defects before it is operated. Each time a new DTA is received, observe instructions in following steps and then perform applicable procedures in service upon receipt checks in table.

**a. Unpacking.**

- (1) Remove wrappings, protective tape, and preservative material.
- (2) Note tags and stencils on equipment since they may contain information related to operation and maintenance.

**b. Checking Unpacked Equipment.**

- (1) Inspect equipment for damage incurred during shipment. If equipment has been damaged, report damage on DD Form 6, Packaging Improvement Report.
- (2) Check equipment against packing slip to see if shipment is complete. Report all discrepancies in accordance with instructions in DA Pam 738-750.
- (3) Check to see whether equipment has been modified.

### 3-2. SERVICE UPON RECEIPT CHECKS

Listed below are service upon receipt checks and tests to be performed on DTA. The checks and tests are numbered in order they are to be performed. Item column lists items to be checked, in procedure sequence. Action column lists inspections and tests to be performed and, in some cases, contains details for procedures. Remarks column lists action to be taken.

#### SERVICE UPON RECEIPT

ITEM	ACTION	REMARKS
1. Case	a. Inspect for fungus and deformation.	Replace case.
	b. Inspect latches for proper operation.	Replace case.
	c. Inspect pressure equalization adjusting screw for proper operation.	Replace case.
	d. Inspect seal for weather cracks and proper fit.	Replace case.
2. Computer	a. Inspect for broken or scratched screen.	Replace computer.
	b. Inspect keyboard for broken or missing keys.	Replace computer.
	c. Inspect for broken or missing latches.	Replace computer.
	d. Inspect all connectors on rear for bent or missing pins.	Replace computer.
3. Interface cabinet assembly	a. Inspect cover assembly for fungus, paint damage, and deformation	Replace cover (notify intermediate maintenance).
	b. Inspect for broken indicators.	Replace diode DS1 and/or DS2 (notify intermediate maintenance).
	c. Inspect cable connectors for bent or missing pins.	Replace connector plug P1 or P2 (notify intermediate maintenance).
4. Power cable assembly	a. Inspect for bent or missing pins, fraying, or cuts.	Repair as necessary (notify intermediate maintenance).
5. Battery pack	a. Inspect for cracked or broken case.	Replace battery pack.
	b. Inspect for corrosion.	Replace battery pack.
	c. Inspect connector for bent or broken pins.	Replace battery pack.
6. AC power pack	a. Inspect for cracked or broken case.	Replace ac power pack.
	b. Inspect for corrosion.	Replace ac power pack.
	c. Inspect connector for bent or missing pins.	Replace ac power pack.

**Section II. OPERATOR AND AVUM TROUBLESHOOTING PROCEDURES**

Subject	Para	Page
Troubleshooting Table . . . . .	3-3	3-3

**3-3. TROUBLESHOOTING TABLE**

This table lists common malfunctions that you may find with the DTA. Perform the inspections in the order they appear.

This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

Table 3-1. TROUBLESHOOTING TABLE

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
DTA HAS NO OPERATING POWER	Check for presence of aircraft power.	Make sure circuit breaker CBHK inside door B60R on helicopter is ON.
	Check for properly connected aircraft power cable.	Make sure aircraft power cable is firmly connected to power supply power connector on rear of computer.
	Check for properly installed computer power supply.	Make sure computer power supply is firmly seated in power supply/ battery compartment on rear of computer.
	Check for defective computer.	Replace computer. If replacement computer operates, notify supervisor.
	Check for defective aircraft power cable.	Replace aircraft power cable. If replacement cable operates, notify supervisor.

Table 3-1. TROUBLESHOOTING TABLE (cont)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<p>DATA IS NOT TRANSFERRED FROM TEU TO COMPUTER. INTERFACE CABINET ASSEMBLY INDICATORS MAY OR MAY NOT BE LIT.</p>	<p>Check for properly connected cables.</p>	<p>Make sure computer interface cable is firmly connected to SERIAL A connector on rear of computer. Make sure aircraft interface cable is firmly connected to TEU connector J5.</p>
	<p>Check for defective interface cabinet assembly.</p>	<p>Replace interface cabinet assembly. If replacement interface cabinet assembly operates, notify supervisor.</p>
<p>DTA SOFTWARE DOES NOT RUN CORRECTLY.</p>	<p>Check for defective computer software program.</p>	<p>Re-install software on computer's hard disk drive (para 3-4).</p>
	<p>Check for defective computer.</p>	<p>Replace computer. If replacement computer operates, notify supervisor.</p>

**Section III. MAINTENANCE PROCEDURES**

Subject	Para	Page
Computer Hard Disk Drive Software Loading . . . . .	3-4	3-5

**3-4. COMPUTER HARD DISK DRIVE SOFTWARE LOADING**

**INITIAL SETUP**

**Personnel Required**

68X Aircraft Fire Control/Electrical Repairer

**Equipment condition**

Computer installed (para 2-4 or 2-5)

**NOTE**

Perform this procedure when computer software has been updated, or when directed by troubleshooting table in section II.

- a. If DTA software loaded automatically and main menu is on screen, highlight **QUIT** with cursor and press ENTER. When prompt **QUIT PROGRAM? (Y/N)** appears, enter **Y** and press ENTER. **C:\DTA>** prompt will be displayed on screen. If DTA software did not load, operate computer as necessary to produce DOS prompt on screen.
- b. Insert software program object disk (normally stored in DTA case) in floppy disk drive.
- c. Enter **A:INSTALL** and press ENTER. Floppy disk drive in-use indicator on computer will light and **COPYING DTA FILES ONTO HARD DRIVE....** will be displayed on screen. Software will be installed onto computer's hard drive, and DTA program will automatically run.
- d. When in-use indicator goes out, remove disk from floppy disk drive and return to storage. Place computer in use or remove power and return it to storage.

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

Subject	Para	Page
General .....	3-5	3-6
Shipping and Storage Requirements .....	3-6	3-6

**3-5. GENERAL**

This section contains shipping and storage information for the DTA while stored in DTA case assembly.

**3-6. SHIPPING AND STORAGE REQUIREMENTS**

DTA case is designed for:

- Long-term stationary storage
- Flyaway storage (storage items subject to immediate flyaway)
- All modes of shipping.

**1. EQUALIZING ATMOSPHERIC PRESSURE**

- a. Whenever DTA has been transported over different elevations (this includes land and sea travel as well as airborne travel), atmospheric pressure inside case may be different from ambient. Also, a change in barometric pressure will cause same effect.
- b. DTA case assembly contains a pressure equalization adjusting screw located on side of case near carrying handle. Adjusting this screw will equalize atmospheric pressure inside case to ambient.
- c. Turn pressure equalization adjusting screw two turns CCW, then turn it CW until tight. Open case.

### 3-6. SHIPPING AND STORAGE REQUIREMENTS (cont)

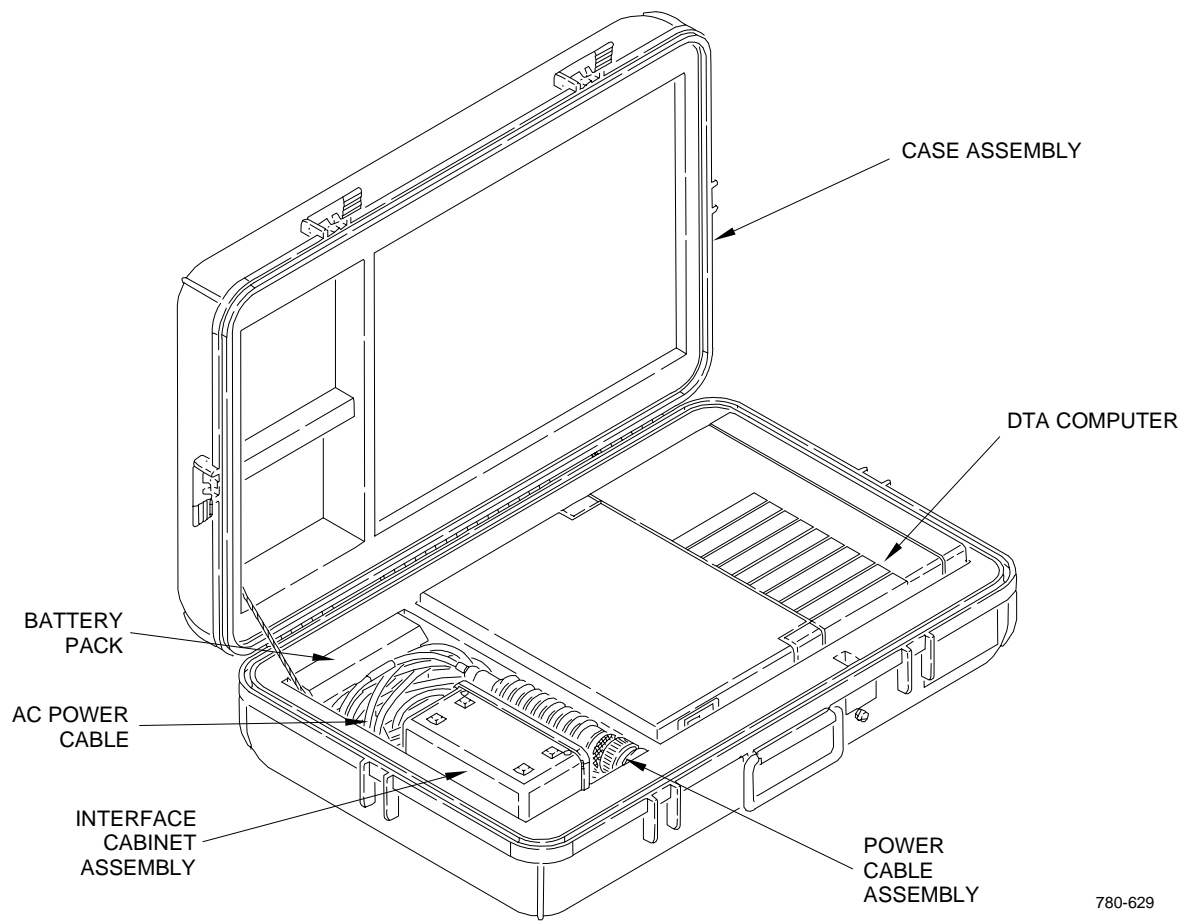
#### 2. STORAGE OF DTA EQUIPMENT

##### CAUTION

Damage to cables when closing case cover.

- Use care when closing case cover to prevent pinching of cables.
- Ensure that cables are coiled and packed properly before closing the cover.

- a. Install ac power pack in computer, if not already installed.
- b. Store DTA computer, interface cabinet assembly, battery pack, ac power cable, and power cable assembly in case assembly as shown.



780-629





**CHAPTER 4**

**AVIATION INTERMEDIATE MAINTENANCE**

	Section	Page
Troubleshooting Procedures . . . . .	I	4-2
Interface Cabinet Assembly Repair . . . . .	II	4-4
Power Cable Assembly Repair . . . . .	III	4-26

**OVERVIEW**

This chapter provides maintenance instructions for the interface cabinet assembly and power cable assembly. The case assembly is not repairable. The index at the beginning of each section provides paragraph references to the material contained within the section. When a non-consumable item is replaced, the unserviceable item must be packed in the container in which the replacement item was shipped.

## Section I. AVIM TROUBLESHOOTING PROCEDURES

Subject	Para	Page
Introduction .....	4-1	4-2
Troubleshooting Flowchart .....	4-2	4-3

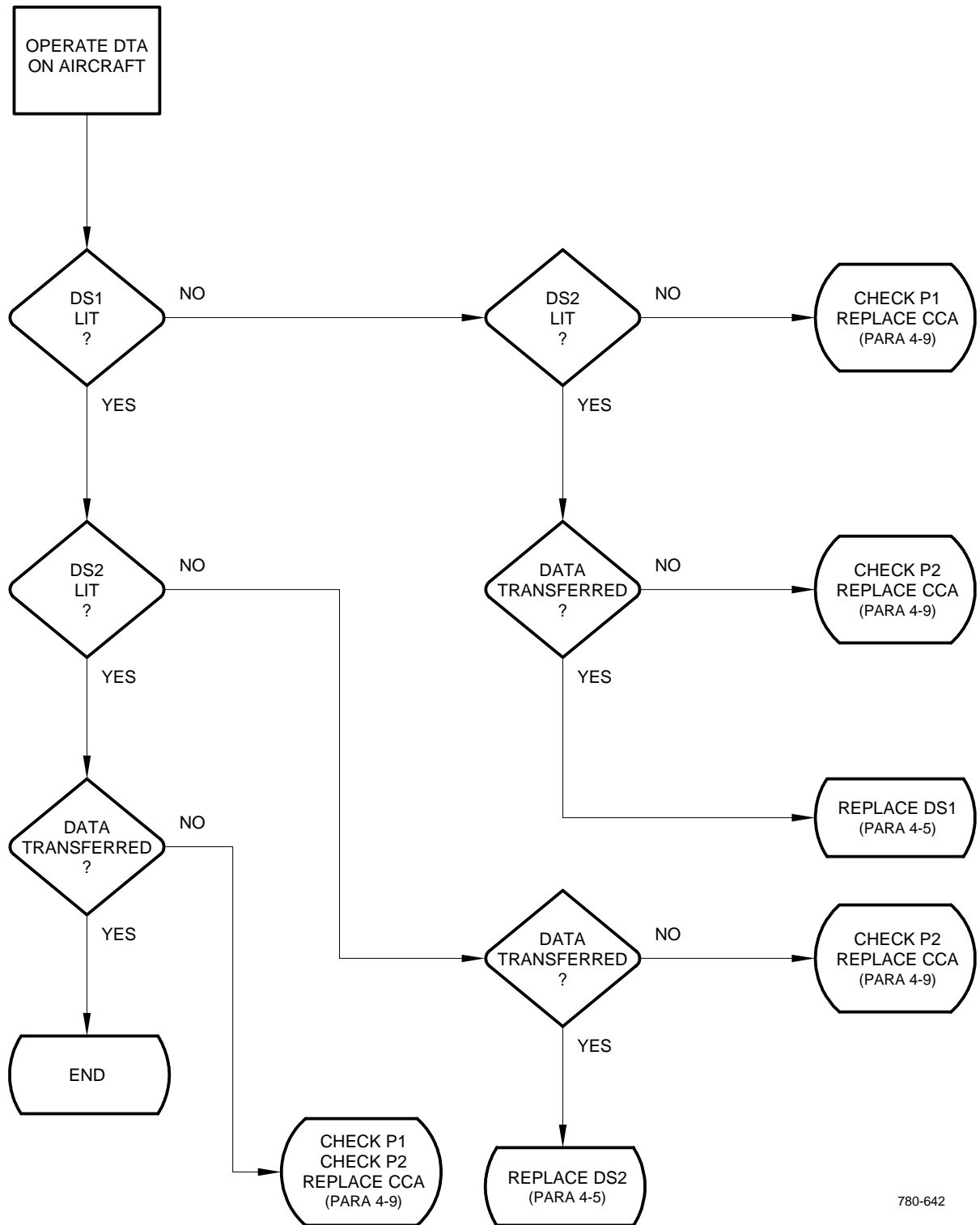
### 4-1. INTRODUCTION

This section contains troubleshooting procedures for the electronic components of the DTA. Included is a troubleshooting flowchart for use when troubleshooting the interface cabinet assembly. The flowchart allows you to isolate malfunctions to the replaceable components in the interface cabinet assembly.

To use the flowchart, install the DTA on a helicopter containing a known good TEU. Then operate the DTA in the normal manner. If data is not transferred into the computer, follow the questions in the flowchart's decision blocks and make the indicated observations. Check or replace components in the order listed. After a suspected component has been checked or replaced, use the flowchart again to determine if the interface cabinet assembly is operating correctly. If you cannot successfully repair the interface cabinet assembly, forward to depot maintenance.

4-2. TROUBLESHOOTING FLOWCHART

DATA IS NOT TRANSFERRED FROM TEU TO COMPUTER



780-642

**Section II. INTERFACE CABINET ASSEMBLY REPAIR**

Subject	Para	Page
General .....	4-3	4-4
Electrostatic Discharge Sensitive (ESDS) Devices .....	4-4	4-4
Diode DS1, DS2 Replacement .....	4-5	4-5
Connector Plug P1 Replacement .....	4-6	4-9
Connector Plug P2 Replacement .....	4-7	4-11
Feedthrough Replacement .....	4-8	4-14
Circuit Card Assembly Replacement .....	4-9	4-18
Rubber Feet Replacement .....	4-10	4-21
Cover Assembly Replacement .....	4-11	4-24

**4-3. GENERAL**

This section covers maintenance procedures for interface cabinet assembly. Preceding initial setup table is a list of items covered and maintenance tasks to be performed. References are provided to allow fast access to the maintenance information within each major task.

**4-4. ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES**

The CCA in the interface cabinet assembly contains ESDS devices that are exposed when the assembly is open. An ESDS device is an electronic component that can be damaged by an electrostatic charge or discharge through its conductors. ESDS parts and their assemblies are identified by the ESDS symbol shown below.



Refer to DOD-STD-1686, DOD-HDBK-263, and MIL-STD-1285 for information and instructions for handling ESDS devices.

## 4-5. DIODE DS1, DS2 REPLACEMENT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

Aircraft armament repairman tool set (item 16)  
Acid-type safety goggles (item 4)  
Rubber apron (item 1)  
Rubber gloves (item 3)  
Soldering kit (item 13)  
Desolder tool (item 15)  
Desoldering kit (item 2)  
Heater gun (item 6)  
Craftsman knife (item 7)  
Digital multimeter (item 10)

#### Materials (appendix F)

Isopropyl alcohol (item 1)  
Artist brush (item 2)  
Cotton wiping cloth (item 3)  
Electronic solder (item 6)  
Insulation sleeving (item 5)

---

### CAUTION

Damage to CCA due to improper handling.  
Use electrostatic discharge sensitive (ESDS) precautionary procedures when handling CCA to prevent accidental discharge of (ESDS) components.

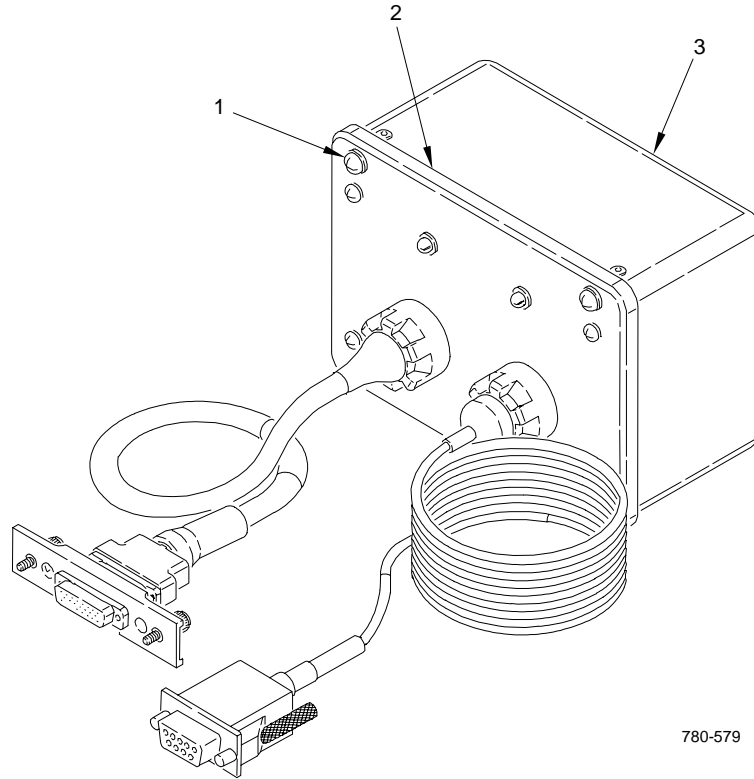
### NOTE

Front panel labeling of DS1 is TEU RUNNING. Front panel labeling of DS2 is SERIAL INTERFACE RUNNING.

### REMOVAL

- a. Place interface cabinet assembly on an ESDS approved work station.
- b. Loosen four captive screws (1) securing cover assembly (2) to rectangular box (3).

#### 4-5. DIODE DS1, DS2 REPLACEMENT (cont)



- c. Remove four sets of nuts (4), lockwashers (5), flat washers (6), spacers (7), retainer (8), and screws (9) securing CCA A1 (10) to cover assembly (2). Carefully pull CCA away from cover assembly to access diodes DS1 and DS2.
- d. Tag and desolder wires from defective diode DS1 or DS2 (11 or 14).
- e. Remove retaining ring (12) from grommet (13) securing diode DS1 (green) (11) or DS2 (red) (14) to cover assembly (2).
- f. Pull diode DS1 (green) (11) or DS2 (red) (14) from grommet (13).
- g. Cut and remove old heat shrinkable insulation sleeving from diode.
- h. Remove grommet (13) from cover assembly (2).

## 4-5. DIODE DS1, DS2 REPLACEMENT (cont)

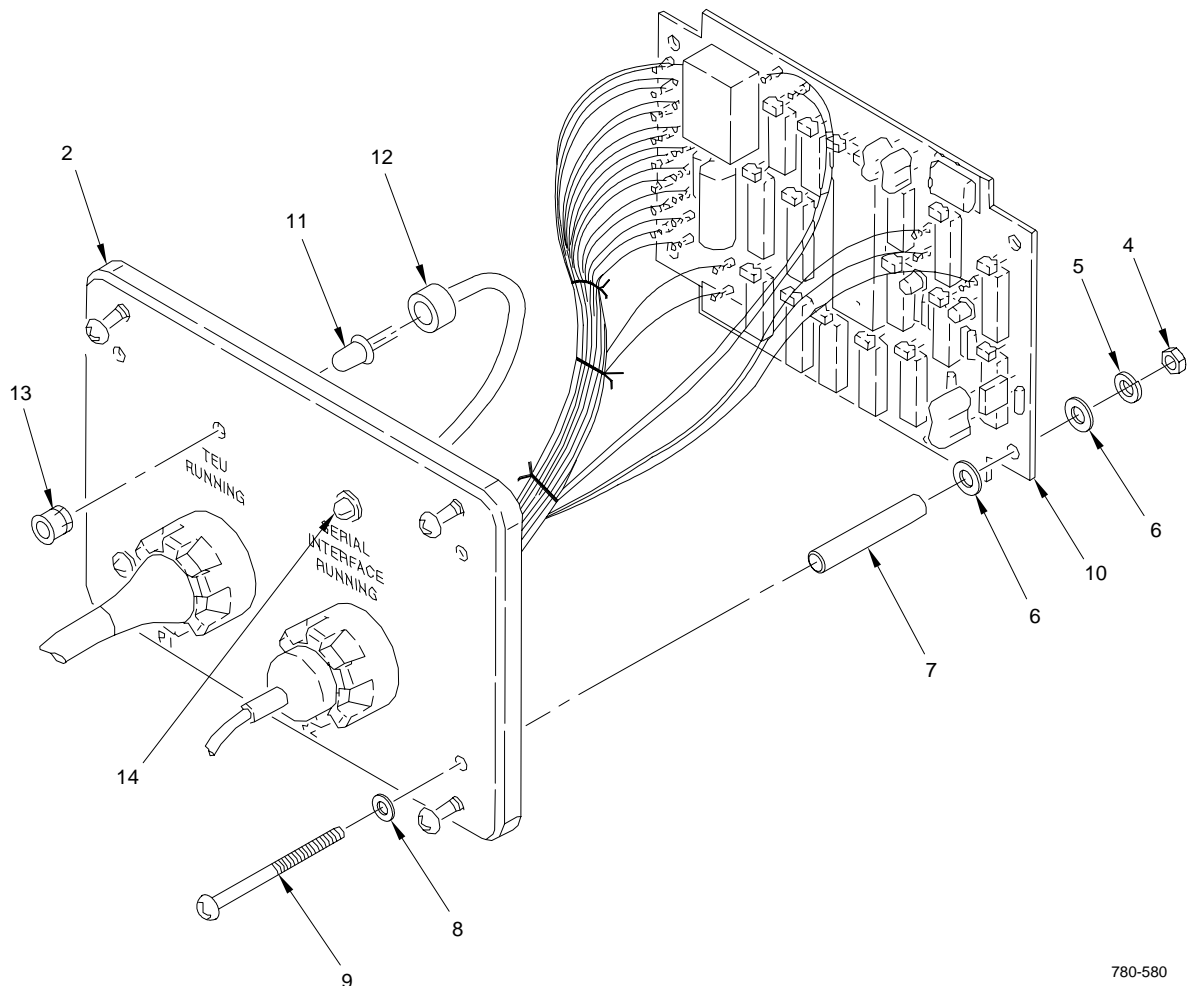
### INSTALLATION

#### WARNING

#### ISOPROPYL ALCOHOL

- Flammable, toxic, irritating. Can cause breathing problems, eye damage.
- Don't: Use near flames or sparks, let it get on skin, or breathe vapors.
- Do: Use in well-ventilated area, close containers when not using. Wear acid-type safety goggles, and rubber apron.
- If it contacts skin or eyes, wash affected areas with running water. Get medical help at once.
- If you experience any breathing problems, get to fresh air at once.

- i. Clean grommet mating surface with small brush and isopropyl alcohol.
- j. Wipe cleaned surface with cloth and isopropyl alcohol, and allow to dry.



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**4-5. DIODE DS1, DS2 REPLACEMENT (cont)**

- k. Push replacement grommet (13) into mounting hole in cover assembly (2).
- l. Push diode DS1 (green) (11) or DS2 (red) (14) into grommet (13) until it snaps in place.
- m. Secure diode with retaining ring (12).
- n. Insulate one lead of diode with insulation sleeving. Heatshrink in place.
- o. Solder wires to leads of diode DS1 or DS2 and remove tags.
- p. Slide insulation sleeving over diode lead.
- q. Inspect replacement diode DS1 or DS2 and grommet for workmanship.
- r. Secure CCA A1 (10) to cover assembly (2) using four sets of screws (9), retainers (8), spacers (7), flat washers (6), lockwashers (5), and nuts (4).
- s. Position cover assembly (2) on rectangular box (3) and tighten captive screws (1).
- t. Perform functional test of interface cabinet assembly in accordance with para 4-1.

END OF TASK



## 4-6. CONNECTOR PLUG P1 REPLACEMENT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

Aircraft Armament Repairman Tool Set (item 16)  
Soldering kit (item 13)  
Craftsman knife (item 7)  
Heater gun (item 6)  
Digital multimeter (item 10)

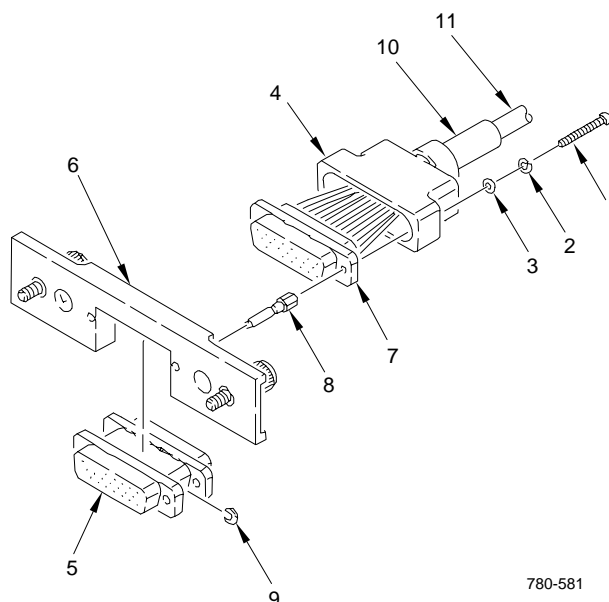
#### Materials (appendix F)

Electronic solder (item 6)  
Insulation sleeving (item 4)  
Insulation sleeving (item 5)

---

### REMOVAL

- a. Place interface cabinet assembly on workbench.
- b. Remove screws (1), lockwashers (2), and flat washers (3) from backshell (4).



780-581

#### **4-6. CONNECTOR PLUG P1 REPLACEMENT (cont)**

- c. Carefully pull electrical connector saver (5) and attached assembly (6) from connector plug P1 (7).
- d. Remove jackscrews (8) and retaining rings (9), and separate electrical connector saver (5) from retainer assembly (6).
- e. Cut and remove shrink insulation (10) from back of backshell (4).
- f. Carefully cut and remove approximately 1 inch of insulation sleeving (11) from cable.
- g. Expose and tag all wires to connector plug P1 (7).
- h. Cut tagged wires from damaged connector P1. Discard connector P1.

#### **INSTALLATION**

- i. Cut replacement piece of insulation sleeving (10) 1.25 to 1.75 inches long, and slide back along tagged wires.
- j. Cut replacement piece of insulation sleeving (11) approximately 1.25 inches long and slide back along tagged wires.
- k. Trim, strip, and tin tagged wires.
- l. Solder wires to replacement connector P1 (7) as tagged.
- m. Dead-end spare wires in connector with end caps.
- n. Inspect soldered wires for accuracy and workmanship.
- o. Remove tags.
- p. Slide insulation sleeving (11) over exposed wires and heatshrink in place.
- q. Position insulation sleeving (10) behind backshell (4) and heatshrink in place.
- r. Install electrical connector saver (5) in retainer assembly (6) and secure using retaining rings (9) and jackscrews (8).
- s. Carefully install electrical connector saver (5) on connector P1 (6) and secure using flat washers (3), lockwashers (2), and screws (1).
- t. Perform functional test of interface cabinet assembly in accordance with para 4-1.

END OF TASK

## 4-7. CONNECTOR PLUG P2 REPLACEMENT

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

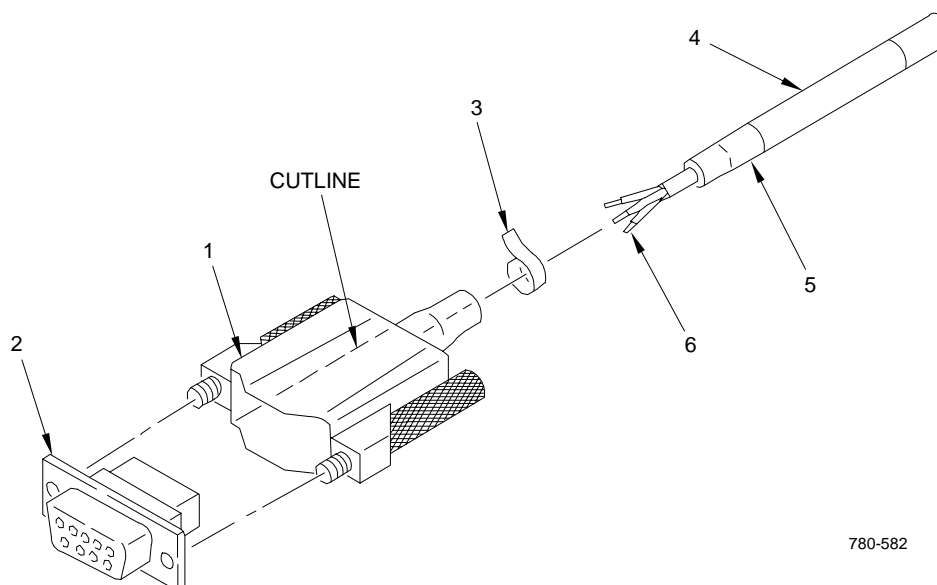
Aircraft armament repairman tool set (item 16)  
Acid-type safety goggles (item 4)  
Rubber apron (item 1)  
Rubber gloves (item 3)  
Crimping tool (item 14)  
Craftsman knife (item 7)  
Heater gun (item 6)  
Digital multimeter (item 10)

#### Materials (appendix F)

Isopropyl alcohol (item 1)  
Artist brush (item 2)  
Cotton wiping cloth (item 3)  
Adhesive tape (item 7)

### REMOVAL

- a. Place interface cabinet assembly on workbench.
- b. As noted on illustration, carefully cut backshell (1) upper and lower surfaces. Use care not to cut through inside components.



780-582

#### 4-7. CONNECTOR PLUG P2 REPLACEMENT (cont)

- c. Remove backshell (1) from connector P2 (2).
- d. Tag wires and remove contacts from damaged connector P2.
- e. Remove adhesive tape (3) from wire bundle.

#### NOTE

There are two layers of insulation sleeving.

- f. Inspect insulation sleeving (4 and 5) for damage and replace, if necessary.

#### INSTALLATION

---

#### WARNING

---

#### ISOPROPYL ALCOHOL

- Flammable, toxic, irritating. Can cause breathing problems, eye damage.
  - Don't: Use near flames or sparks, let it get on skin, or breathe vapors.
  - Do: Use in well-ventilated area, close containers when not using. Wear acid-type safety goggles, and rubber apron.
  - If it contacts skin or eyes, wash affected areas with running water. Get medical help at once.
  - If you experience any breathing problems, get to fresh air at once.
- g. Clean insulation sleeving (4 and 5) with brush and isopropyl alcohol.
  - h. Wipe cleaned surfaces with cloth and isopropyl alcohol and allow to dry.
  - i. Wrap adhesive tape (3) 1-1/2 to 2 times around insulation sleeving (4).
  - j. Slide replacement backshell (1) over contacts (6) and tagged wires, and position behind insulation sleeving (4).
  - k. Examine contacts (6) for damage and replace, if necessary, in accordance with standard maintenance practices.
  - l. Install contacts (6) in connector P2 (2).
  - m. Install unused contacts into connector P2 (2).
  - n. Inspect replacement connector P2 for workmanship.

#### **4-7. CONNECTOR PLUG P2 REPLACEMENT (cont)**

- o. Remove tags from wires.
- p. Position backshell (1) firmly against connector P2 (2) until connector P2 snaps into tabs in backshell (1).

#### **NOTE**

Excess adhesive may show after heating. This excessive adhesive is acceptable.

- q. Heatshrink only area where backshell (1) and insulation sleeving (4) meet.
- r. Perform functional test of interface cabinet assembly in accordance with para 4-1.

END OF TASK

## 4-8. FEEDTHROUGH REPLACEMENT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

Aircraft armament repairman tool set (item 16)  
Adjustable spanner wrench (item 17)  
Acid-type safety goggles (item 4)  
Rubber apron (item 1)  
Rubber gloves (item 3)  
Craftsman knife (item 7)  
Heater gun (item 6)

#### Materials (appendix F)

Isopropyl alcohol (item 1)  
Artist brush (item 2)  
Cotton wiping cloth (item 3)

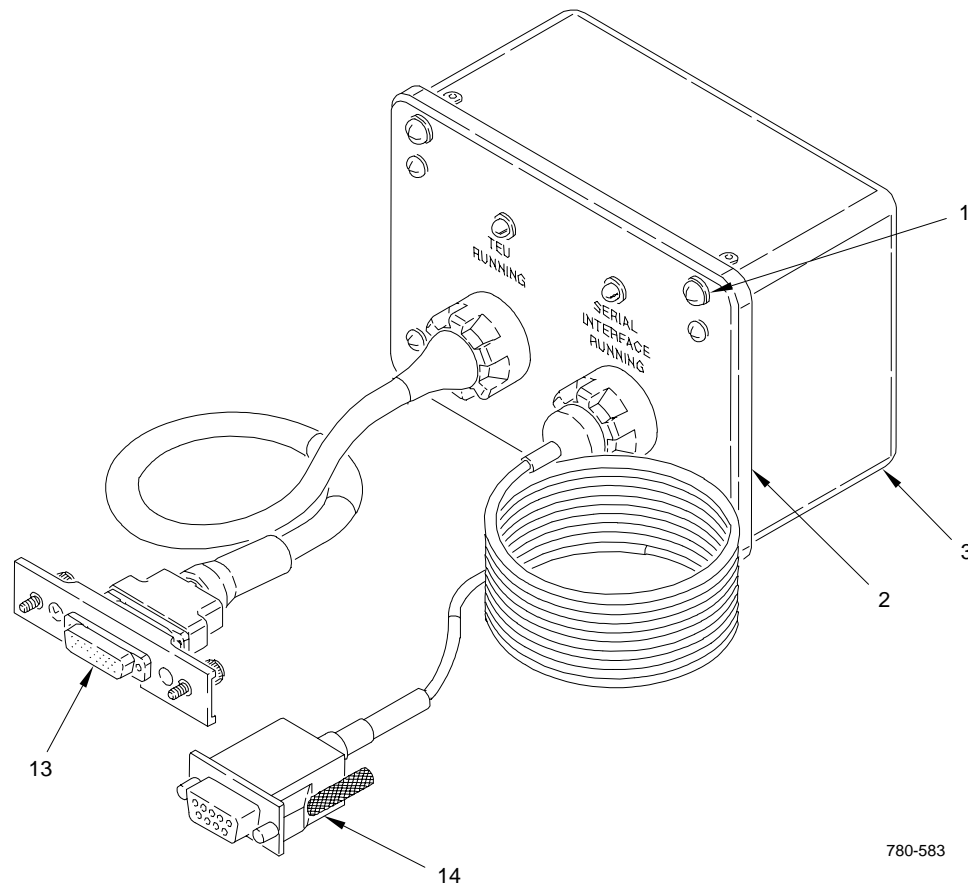
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### CAUTION

Damage to CCA due to improper handling.  
Use electrostatic discharge sensitive (ESDS) precautionary procedures when handling CCA to prevent accidental discharge of (ESDS) components.

### REMOVAL

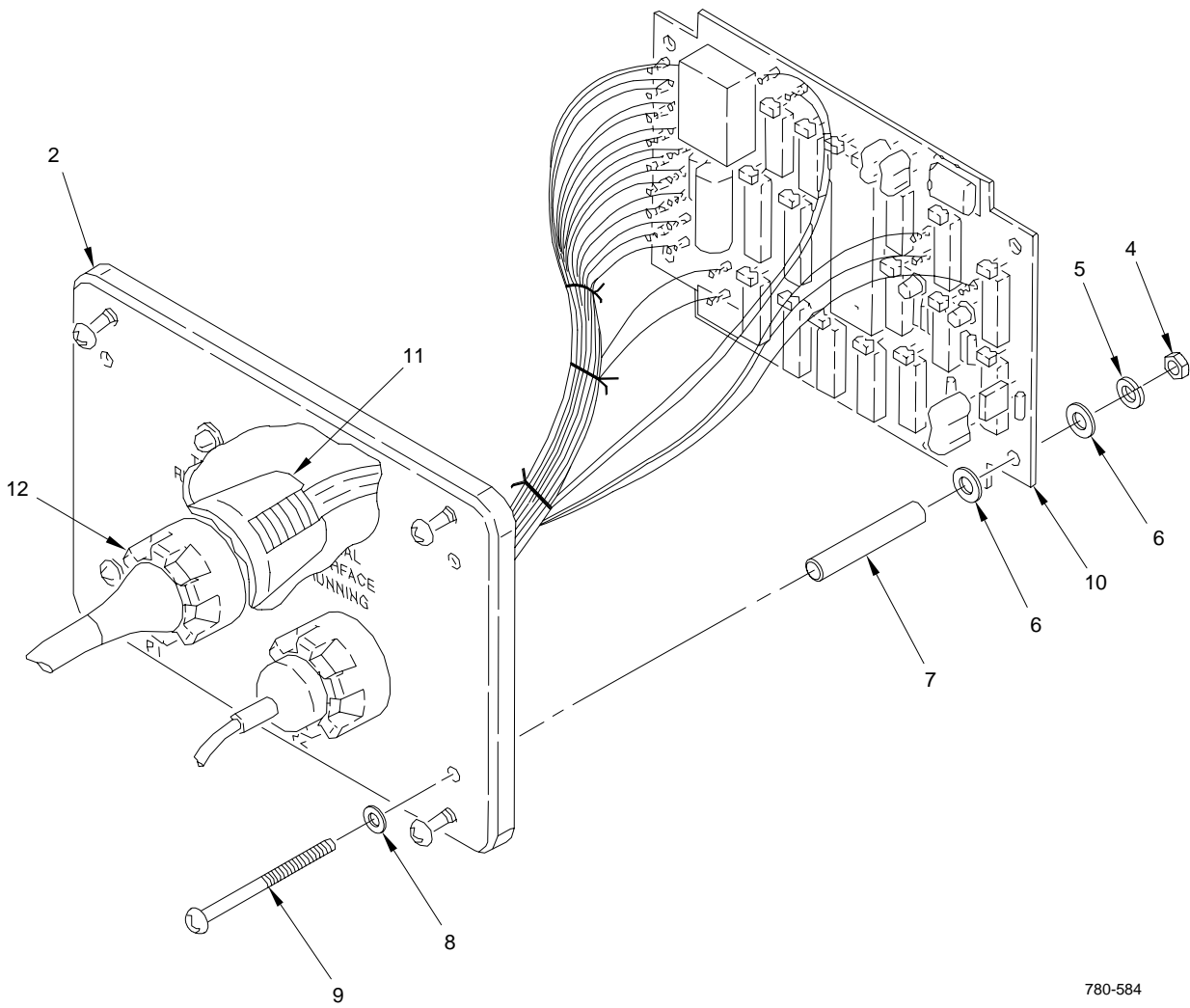
- a. Place interface cabinet assembly on an ESDS approved work station.
- b. Loosen four captive screws (1) securing cover assembly (2) to rectangular box (3), and remove cover assembly.
- c. Remove four sets of nuts (4), lockwashers (5), flat washers (6), spacers (7), retainers (8), and screws (9) securing CCA A1 (10) to cover assembly (2). Carefully pull CCA away from cover assembly to access finger nuts (11).
- d. Depending on which feedthrough (12) you are replacing, remove connector P1 (13) (para 4-5) or connector P2 (14) (para 4-6).

**4-8. FEEDTHROUGH REPLACEMENT (cont)**

780-583

- e. Carefully cut feedthrough (12) in area shown on illustration. Use care not to cut into existing cable.
- f. Loosen heatshrink portion of feedthrough around cable.
- g. While holding feedthrough (12) to keep it from rotating, loosen finger nut (11) using adjustable spanner wrench.
- h. Rotate feedthrough (12) to clear finger nut (11), then remove from cable.
- i. Cut and remove finger nut (11) from cable.

4-8. FEEDTHROUGH REPLACEMENT (cont)



780-584



## 4-8. FEEDTHROUGH REPLACEMENT (cont)

### INSTALLATION

---

#### WARNING

---

#### ISOPROPYL ALCOHOL

- Flammable, toxic, irritating. Can cause breathing problems, eye damage.
- Don't: Use near flames or sparks, let it get in eyes, or breathe vapors.
- Do: Use in well-ventilated area, close containers when not using. Wear acid-type safety goggles, rubber gloves, and rubber apron.
- If it contacts eyes, wash eyes with running water. Get medical help at once.
- If you experience any breathing problems, get to fresh air at once.

- j. Clean cable in area of feedthrough with a brush and isopropyl alcohol.
- k. Wipe surface with cloth and isopropyl alcohol.
- l. Engage replacement finger nut (11) approximately one full thread onto feedthrough (12).
- m. Slide feedthrough (12) and finger nut (11) together over cable.
- n. Firmly push fingers of finger nut through hole in cover assembly (2).
- o. Lightly pull back on feedthrough (12) to prevent finger nut (11) from turning while tightening.
- p. Secure finger nut (11) using adjustable spanner wrench.
- q. Heatshrink only area where feedthrough (12) and cable meet.
- r. Inspect replacement feedthrough (12) for workmanship.
- s. Install connector P1 (13) (para 4-5) or connector P2 (14) (para 4-6).
- t. Secure CCA A1 (10) to cover assembly (2) using four sets of screws (9), retainers (8), spacers (7), flat washers (6), lockwashers (5), and nuts (4).
- u. Position cover assembly (2) on rectangular box (3) and tighten captive screws (1).
- v. Perform functional test of interface cabinet assembly in accordance with para 4-1.

END OF TASK

## 4-9. CIRCUIT CARD ASSEMBLY A1 REPLACEMENT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

Aircraft armament repairman tool set (item 16)  
Soldering kit (item 13)  
Desolder tool (item 15)  
Desoldering kit (item 2)  
Digital multimeter (item 10)

#### Materials (appendix F)

Electronic solder (item 6)

---

### CAUTION

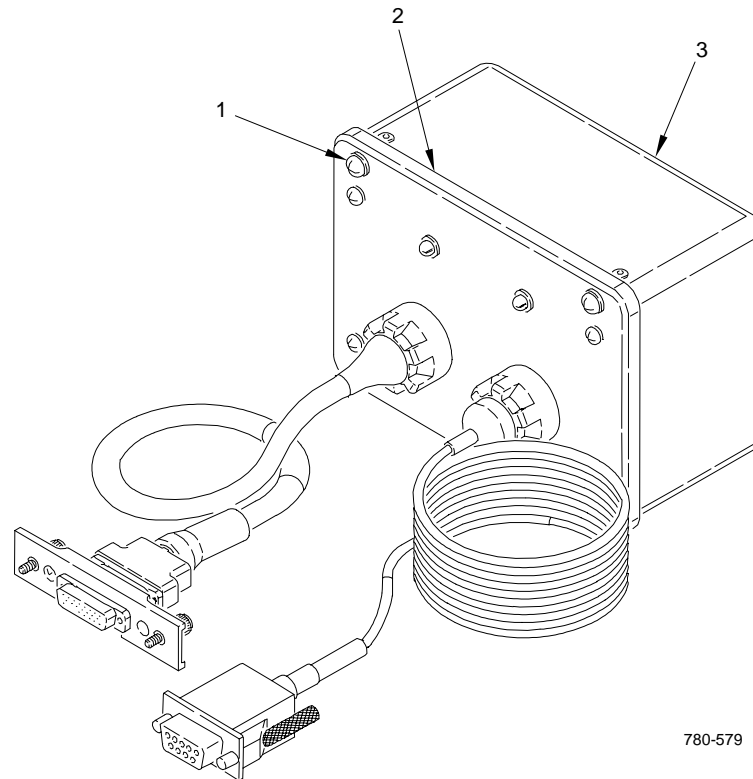
Damage to CCA due to improper handling.  
Use electrostatic discharge sensitive (ESDS) precautionary procedures when handling CCA to prevent accidental discharge of (ESDS) components.

### REMOVAL

- a. Place interface cabinet assembly on an ESDS approved work station.
- b. Loosen four captive screws (1) securing cover assembly (2) to rectangular box (3).
- c. Remove four sets of nuts (4), lockwashers (5), flat washers (6), spacers (7), retainers (8), and screws (9) securing CCA A1 (10) to cover assembly (2). Carefully pull CCA away from cover assembly to access terminal studs.
- d. Tag, desolder, and remove wires (11) from terminal studs.

### INSTALLATION

- e. Remove replacement CCA from ESDS shielded bag and place on grounded mat.
- f. Place defective CCA in ESDS shielded bag for disposition.

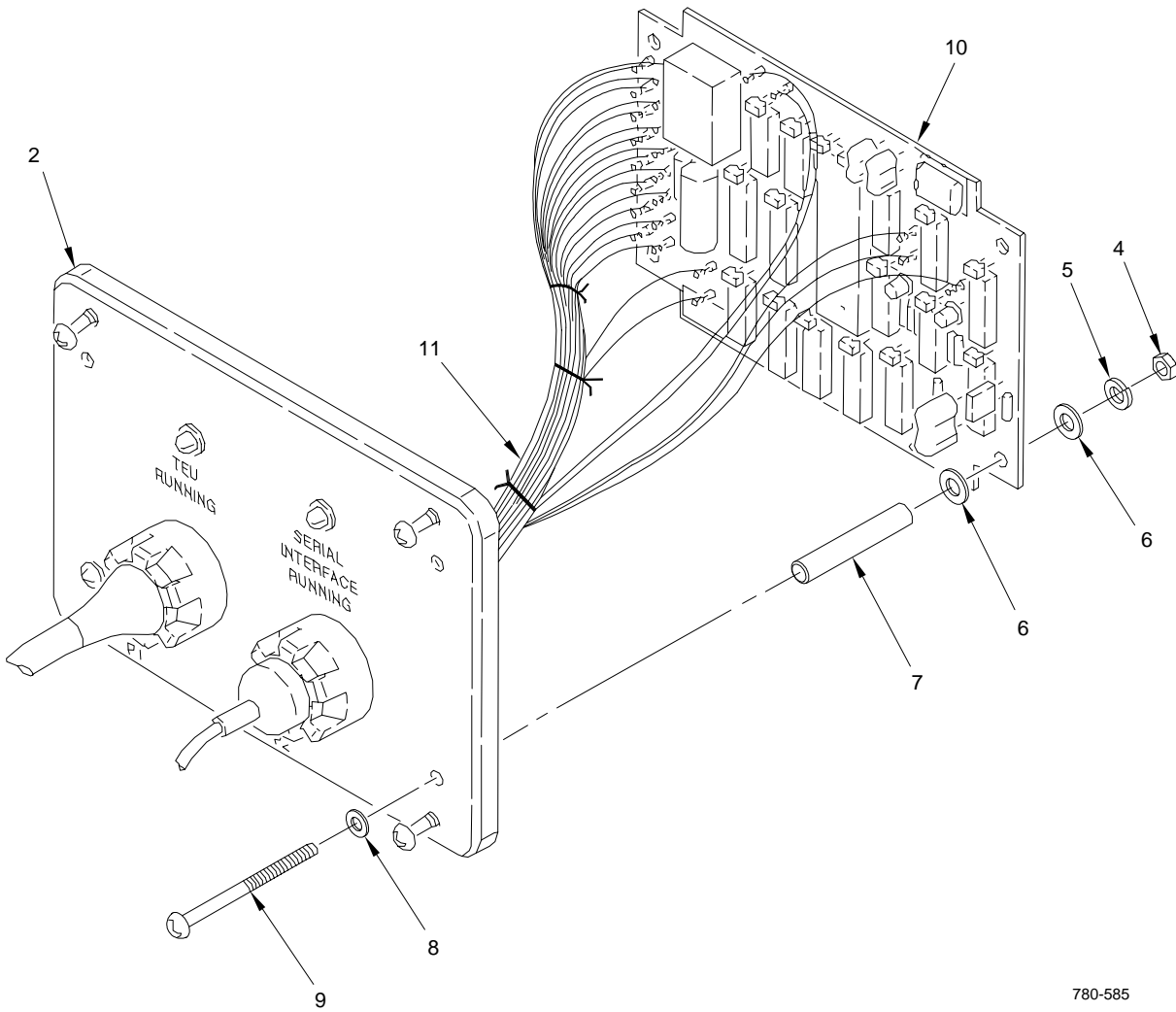
**4-9. CIRCUIT CARD ASSEMBLY A1 REPLACEMENT (cont)**

780-579

- g. Solder wires to terminal studs on replacement CCA as tagged.
- h. Inspect replacement CCA for workmanship.
- i. Remove tags from wires.
- j. Position CCA on cover assembly (2) and install four sets of screws (9), retainers (8), spacers (7),
- k. Position cover assembly (2) on rectangular box (3) and tighten four captive screws (1).
- l. Perform functional test of interface cabinet assembly in accordance with para 4-1.

END OF TASK

4-9. CIRCUIT CARD ASSEMBLY A1 REPLACEMENT (cont)



780-585

## 4-10. RUBBER FEET REPLACEMENT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

Aircraft armament repairman tool set (item 16)

#### Materials (appendix F)

Isopropyl alcohol (item 1)  
Artist brush (item 2)  
Cotton wiping cloth (item 3)

---

### REMOVAL

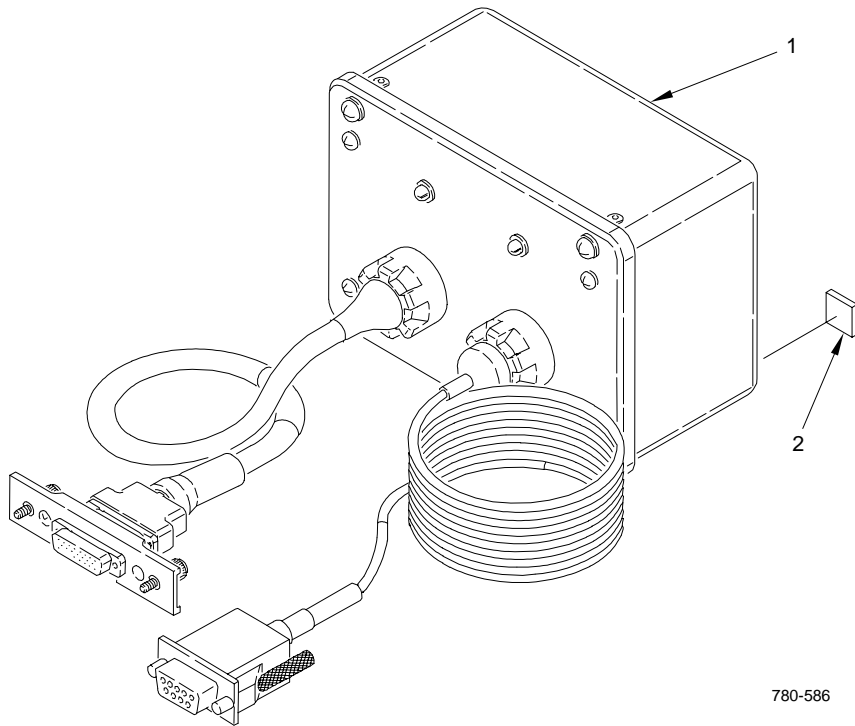
- a. Place interface cabinet assembly (1) on workbench so that rubber feet (2) face up.

WARNING

#### ISOPROPYL ALCOHOL

- Flammable, toxic, irritating. Can cause breathing problems, eye damage.
  - Don't: Use near flames or sparks, let it get on skin, or breathe vapors.
  - Do: Use in well-ventilated area, close containers when not using. Wear acid-type safety goggles, and rubber apron.
  - If it contacts skin or eyes, wash affected areas with running water. Get medical help at once.
  - If you experience any breathing problems, get to fresh air at once.
- b. Apply isopropyl alcohol around base of damaged rubber foot (2).
  - c. Peel off rubber foot (2).

**4-10. RUBBER FEET REPLACEMENT (cont)**



780-586

## 4-10. RUBBER FEET REPLACEMENT (cont)

### INSTALLATION

---

#### WARNING

---

#### ISOPROPYL ALCOHOL

- Flammable, toxic, irritating. Can cause breathing problems, eye damage.
  - Don't: Use near flames or sparks, let it get in eyes, or breathe vapors.
  - Do: Use in well-ventilated area, close containers when not using. Wear acid-type safety goggles, rubber gloves, and rubber apron.
  - If it contacts eyes, wash eyes with running water. Get medical help at once.
  - If you experience any breathing problems, get to fresh air at once.
- d. Thoroughly clean area of rectangular box (1) where rubber foot (2) is to be applied, using small brush and isopropyl alcohol.
- e. Wipe cleaned surface with a cloth and isopropyl alcohol, and allow to dry.
- f. Remove protective paper covering adhesive on replacement rubber foot (2).
- g. Position rubber foot (2) on rectangular box (1) and press firmly.
- h. Inspect rubber foot for workmanship.

END OF TASK

## 4-11. COVER ASSEMBLY REPLACEMENT

---

### INITIAL SETUP

#### Personnel Required

68X Aircraft Fire Control/Electrical Repairer  
68X3F Aircraft Fire Control/Electrical Technical Inspector

#### Tools (appendix B)

Aircraft armament repairman tool set (item 16)

#### Equipment Conditions

<u>Ref</u>	<u>Condition</u>
Para 4-8	CCA A1 has been removed
Para 4-4	Diodes DS1 and DS2 have been removed
Para 4-7	Feedthroughs have been removed

---

### CAUTION

Damage to CCA due to improper handling.  
Use electrostatic discharge sensitive (ESDS) precautionary procedures when handling CCA to prevent accidental discharge of (ESDS) components.

### REMOVAL

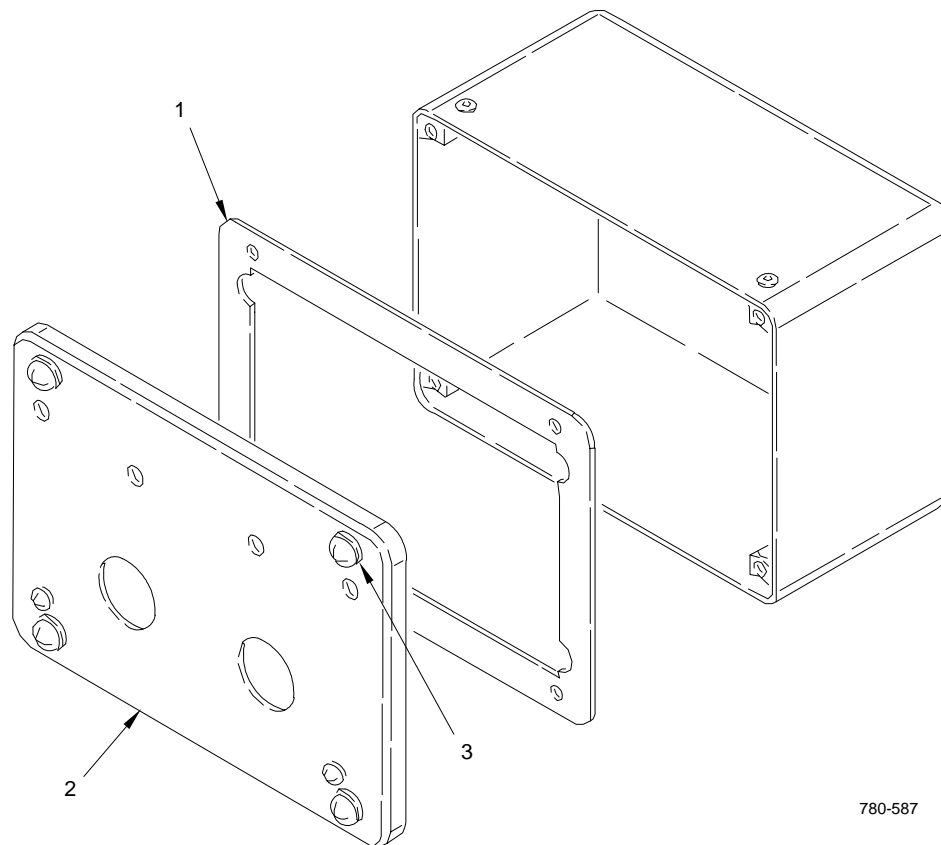
- a. Remove neoprene gasket (1) from cover assembly (2).
- b. Remove four captive screws (3) from cover assembly (2) and retain.
- c. Inspect neoprene gasket (1) for damage. If damaged, remove and make new neoprene gasket in accordance with instructions in Appendix G.



#### 4-11. COVER ASSEMBLY REPLACEMENT (cont)

##### INSTALLATION

- d. Install four captive screws (3) on cover assembly (2).
- e. Install neoprene gasket (1) on cover assembly (2).
- f. Install feedthroughs (para 4-7).



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- g. Install diodes DS1 and DS2 (para 4-4).
- h. Install CCA A1 (para 4-8).

END OF TASK

**Section III. POWER CABLE ASSEMBLY REPAIR**

Subject	Para	Page
Power Cable Assembly W113 Repair . . . . .	4-12	4-26

**4-12. POWER CABLE ASSEMBLY W113 REPAIR**

This task covers replacement of:

- | <u>Para</u> | <u>Item</u>                       |
|-------------|-----------------------------------|
| 1.          | Connector P2, boot, and boot shim |
| 2.          | Power cable                       |

**INITIAL SETUP**

**Personnel Required**

- 68X Aircraft Fire Control/Electrical Repairer
- 68X3F Aircraft Fire Control/Electrical Technical Inspector

**Tools (appendix B)**

- Aircraft and armament repairman tool set (item 16)
- Digital multimeter (item 9)
- Craftsman knife (item 7)
- Heater gun (item 6)

**1. CONNECTOR P2, BOOT, AND BOOT SHIM REPLACEMENT**

**NOTE**

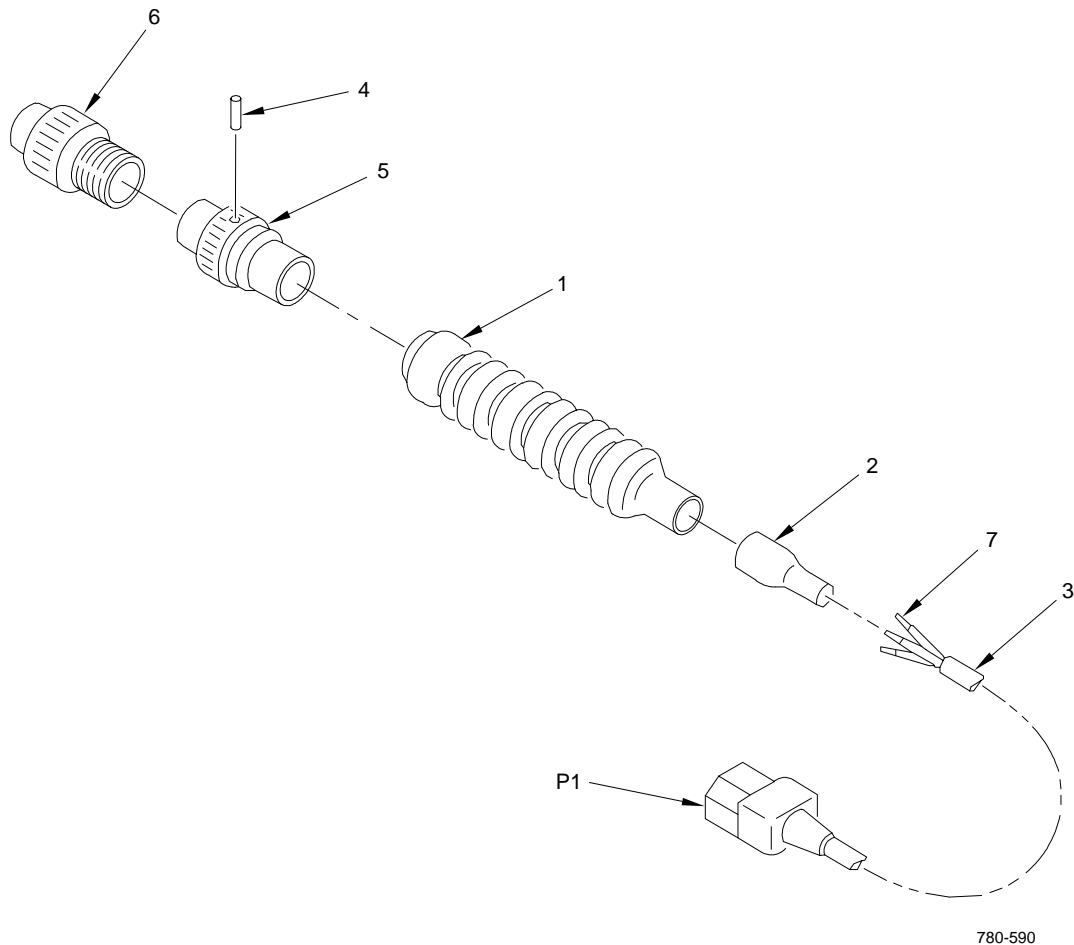
Replacement of damaged boot and boot shim does not require replacement of connector P2, unless it is damaged.

a. Removal

- (1) Carefully cut ends of boot (1) until boot can be slid back over boot shim (2) onto power cable (3).
- (2) Carefully cut end of boot shim (2) until boot shim can be slid back onto power cable (3).
- (3) Remove setscrew (4); then remove spin coupling adapter (5) from connector P2 (6).

**4-12. POWER CABLE ASSEMBLY W113 REPAIR (cont)**

- (4) Tag and remove contacts with attached wires (7) from connector P2 (6). Inspect contacts for damage. Replace damaged contacts in accordance with standard maintenance practices.
- (5) Remove boot (1) and boot shim (2) from power cable (3).

**b. Installation**

- (1) Slide replacement boot shim (2) and boot (1) over end of power cable (3) as shown.

**NOTE**

Connector P2 comes with a strain relief that is not required on power cable W113.

- (2) If installing replacement connector P2 (6), remove and discard strain relief supplied with replacement connector P2.

#### 4-12. POWER CABLE ASSEMBLY W113 REPAIR (cont)

- (3) Install contacts with attached wires (7) in replacement connector P2 (6).
- (4) Install spin coupling adapter (5) on replacement connector P2 (6); then install setscrew (4).
- (5) Using multimeter, check for 1 ohm or less resistance between mating contacts in connectors P1 and P2. Check for greater than 1 megohm resistance between non-mating contacts.

#### NOTE

- The boot and shim come with heat-activated adhesive on both ends. Application of adhesive is not required.
- The boot is not rigid until after it is heatshrunken.

- (6) Slide boot (1) toward replacement connector P2 (6) and fit wide end of boot (1) over end of spin coupling adapter (5).
- (7) Slide boot shim (2) toward boot (1) and fit wide end of boot shim (2) under narrow end of boot (1).

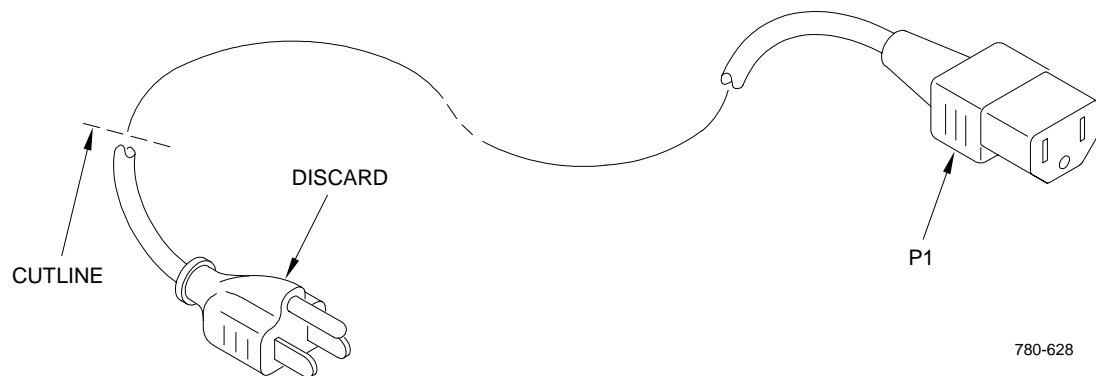
#### NOTE

Excess adhesive may show after heating. This excess adhesive is acceptable.

- (8) Heatshrink boot (1) and boot shim (2) onto replacement connector P2 (6) and power cable (3). Note that boot becomes ridged.

## 4-12. POWER CABLE ASSEMBLY W113 REPAIR (cont)

### 2. POWER CABLE REPLACEMENT



#### a. Removal

- (1) Remove connector P2, boot, and boot shim (step 1a).

#### NOTE

The replacement power cable comes with two connectors installed. Connector P1 remains on the power cable. The connector at the opposite end of the power cable is replaced with connector P2.

- (2) At end opposite connector P1, cut connector from power cable and discard.

#### b. Installation

- (1) Install cable markers on power cable (3) as marked and heatshrink into place.
- (2) Install connector P2, boot, and boot shim (step 1b).

END OF TASK



## APPENDIX A

### REFERENCES

#### A-1. SCOPE

This appendix lists all army regulations, common tables of allowances, field manuals, forms, pamphlets, technical bulletins and technical manuals referenced in this manual, and/or required for operation and maintenance of your equipment.

#### A-2. ARMY REGULATIONS

- AR 40-46 . . . . . Control of Health Hazards from Lasers and Other High Intensity Optical Sources
- AR 385-11 . . . . . Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety)

#### A-3. FIELD MANUALS

- FM 21-11 . . . . . First Aid for Soldiers
- FM 1-511 . . . . . Army Aircraft Quality Control and Technical Inspection

#### A-4. FORMS

- DA Form 2028 . . . . . Recommended Changes to Publications or Blank Forms
- DA Form 2028-2 . . . . . Recommended Changes to Equipment Technical Manuals
- SF 368 . . . . . Quality Deficiency Report

#### A-5. PAMPHLETS

- DA Pam 738-750 . . . . . The Army Maintenance Management System (TAMMS)

#### A-6. TECHNICAL BULLETINS

- TB MED 223 . . . . . Respiratory Protection Program (AFOSH STD 161-1)
- TB MED 251 . . . . . U.S. Surgeon General's Noise Limits
- TB MED 524 . . . . . Control of Hazards to Health from Laser Radiation
- TB 385-4 . . . . . Safety Precautions for Maintenance of Electrical/ Electronic Equipment

## REFERENCES (cont)

### A-7. TECHNICAL MANUALS

- TM 9-1230-476-20-1 . . . . . Aviation Unit Maintenance Manual: AH-64A Helicopter, Fire Control System
- TM 9-1230-476-20-2 . . . . . Aviation Unit Troubleshooting Manual: AH-64A Helicopter, Fire Control System
- TM 1-1270-476-20 . . . . . Aviation Unit Maintenance Manual, Target Acquisition Designation Sight (TADS) Assembly AN/ASQ-170 AH-64A Helicopter
- TM 1-1270-476-T . . . . . Aviation Unit Troubleshooting Manual, Target Acquisition Designation Sight (TADS) Assembly AN/ASQ-170 AH-64A Helicopter
- TM 1-5855-265-T . . . . . Aviation Unit Troubleshooting Manual, Pilot Night Vision Sensor (PNVS) Assembly AN/AAQ-11 AH-64A Helicopter
- TM 9-1300-275/2 . . . . . Technical Escort Information on Chemical Agents and Decontaminating Procedures (TM 1300-30)
- TM 1-8145-476-23 . . . . . Aviation Unit and Intermediate Maintenance Manual for Target Acquisition Designation Sight/Pilot Night Vision Sensor Assembly (TADS/PNVS) Shipping and Storage Containers
- TM 1-5855-265-30 . . . . . Aviation Intermediate Maintenance Manual, Pilot Night Vision Sensor (PNVS) Assembly AN/AAQ-11, AH-64A Attack Helicopter
- TM 55-1500-323-24 . . . . . Organizational, DS and GS, and Depot Maintenance Manual: Installation Practices for Aircraft Electrical and Electronic Wiring
- TM 1-1520-238-23 Series . . . . . Aviation Unit and Intermediate Maintenance Manual: AH-64A Helicopter
- TM 11-5895-1184-23 . . . . . Aviation Unit and Intermediate Maintenance Manual: Symbol Generator; MX-10465/ASQ
- TM 750-244-1-5 . . . . . Procedures for Destruction of Electronic Materiel to Prevent Enemy Use
- TM 55-1730-229-12 . . . . . Operator and Aviation Unit Maintenance Manual: Aviation Ground Unit, Multi-Output GTED, Electrical, Hydraulic, and Pneumatic



**REFERENCES (cont)**

**A-7. TECHNICAL MANUALS (cont)**

- TM 11-6625-3085-12 . . . . . Technical Manual, Operator and Aviation Unit Maintenance (AVUM) Deployment, Operation and Teardown Procedures AH-64A Electronic Equipment Test Facility (EETF) OQ-290(V)2/MSM
- TM 1-1520-238-T-1 . . . . . Aviation Unit Maintenance Manual for Army AH-64A Helicopter Fault Detection/Location System
- TM 1-1520-238-T-2 . . . . . Aviation Unit Maintenance Manual for Army AH-64A Helicopter Integrated Troubleshooting Manual
- TM 1-1520-238-T-3 . . . . . Aviation Unit and Intermediate Maintenance Manual for Army AH-64A Helicopter Multiplex Read Codes
- TM 1-1520-238-T-6 . . . . . Aviation Unit and Intermediate Troubleshooting Manual for Army AH-64A Helicopter
- TM 1-1520-238-T-8 . . . . . Aviation Unit and Intermediate Troubleshooting Manual for Army AH-64A Helicopter
- TM 1-1520-238-T-10 . . . . . Aviation Unit and Intermediate Troubleshooting Manual for Army AH-64A Helicopter Wiring Diagrams
- TM 1-1270-476-30 . . . . . Aviation Intermediate Maintenance Manual Target Acquisition Designation Sight (TADS) Assembly AN/ASQ-170 AH-64A Attack Helicopter

**A-8. MISCELLANEOUS PUBLICATIONS**

- DOD-HDBK-263 . . . . . Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
- DOD-STD-1686 . . . . . Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)



## APPENDIX B

### MAINTENANCE ALLOCATION CHART (MAC)

#### Section I. INTRODUCTION

##### B-1. MAINTENANCE ALLOCATION CHART

a. This Maintenance Allocation Chart (MAC) assigns maintenance functions in accordance with the Three Levels of Maintenance concept for Army aviation. These maintenance levels (categories) - Aviation Unit Maintenance (AVUM), Aviation Intermediate Maintenance (AVIM), and Depot Maintenance - are depicted on the MAC as:

AVUM, which corresponds to an O Code in the Repair Parts and Special Tools List (RPSTL)

AVIM, which corresponds to an F Code in the Repair Parts and Special Tools List (RPSTL)

DEPOT, which corresponds to a D Code in the Repair Parts and Special Tools List (RPSTL)

b. The maintenance to be performed below depot and in the field is described as follows:

(1) Aviation Unit Maintenance (AVUM) activities will be staffed and equipped to perform high frequency "On-Aircraft" maintenance tasks required to retain or return aircraft systems to a serviceable condition. The maintenance capability of the AVUM will be governed by the Maintenance Allocation Chart (MAC) and limited by the amount and complexity of ground support equipment (GSE), facilities required, authorized manning strength, and critical skills available. The range and quantity of authorized spare modules/components will be consistent with the mobility requirements dictated by the air mobility concept. (Assignments of maintenance tasks to divisional company size aviation units will consider the overall maintenance capability of the division, the requirement to conserve personnel and equipment resources, and air mobility requirements.)

(a) Company Size Aviation Units: perform those tasks which consist primarily of preventive maintenance repair and replacement functions associated with sustaining a high level of aircraft operational readiness. Perform maintenance inspections and servicing to include preflight, daily, intermediate, periodic (or phased), and special inspections as authorized by the MAC or higher headquarters. Identify the cause of equipment/system malfunctions using applicable technical manual troubleshooting instructions, built-in test equipment (BITE), installed aircraft instruments, or test, measurement, and diagnostic equipment (TMDE). Replace worn or damaged modules/components that do not require complex adjustments or system alinement and which can be removed/installed with available skills, tools, and ground support equipment. Perform operational and continuity checks and make minor repairs to the electrical system. Inspect, service, and make operational, capacity, and pressure checks to hydraulic systems. Perform servicing, functional adjustments, and minor repair/replacement to the flight control, propulsion, power train, and fuel systems. Accomplish airframe repair that does not require extensive disassembly, jiggling, or alinement. The manufacture of airframe parts will be limited to those items which can be fabricated with tools and equipment found in current air mobile tool and shop sets. Evacuate unserviceable modules/ components and end items beyond the repair capability of AVUM to the supporting AVIM.

## **B-1. MAINTENANCE ALLOCATION CHART (cont)**

(b) Less than Company Size Aviation Units: aviation elements organic to brigade, group, battalion headquarters, and detachment size units are normally small and have less than 10 aircraft assigned. Maintenance tasks performed by these units will be those which can be accomplished by the aircraft crew chief or assigned aircraft repairman and will normally be limited to preventive maintenance, inspections, servicing, spot painting, stop drilling, application of nonstress patches, minor adjustments, module/component fault diagnosis, and replacement of selected modules/components. Repair functions will normally be accomplished by the supporting AVIM unit.

(2) Aviation Intermediate Maintenance (AVIM) provides mobile, responsive "One- Stop" maintenance support. (Maintenance functions which are not conducive to sustaining air mobility will be assigned to depot maintenance.) AVIM may perform all maintenance functions authorized to be done at AVUM. Repair of equipment for return to user will emphasize support or operational readiness requirements. Authorized maintenance includes replacement and repair of modules/components and end items which can be accomplished efficiently with available skills, tools, and equipment. AVIM establishes the Direct Exchange (DX) program for AVUM units by repairing selected items for return to stock when such repairs cannot be accomplished at the AVUM level. The AVIM level inspects, troubleshoots, performs diagnostic tests, repairs, adjusts, calibrates, and aligns aircraft system modules/components. AVIM units will have capability to determine the serviceability of specified modules/components removed prior to the expiration of the Time Between Overhaul (TBO) or finite life. Module/component disassembly and repair will support the DX program and will normally be limited to tasks requiring cleaning and the replacement of seals, fittings, and items of common hardware. Airframe repair and fabrication of parts will be limited to those maintenance tasks which can be performed with available tools and test equipment. Unserviceable reparable modules/ components and end items which are beyond the capability of AVIM to repair will be evacuated to Depot Maintenance. AVIM will perform aircraft weight and balance inspections and other special inspections which exceed AVUM capability. Provides quick response maintenance support, including aircraft recovery and air evacuation, on-the-job training, and technical assistance through the use of mobile maintenance contact teams. Maintains authorized operational readiness float aircraft. Provides collection and classification services for serviceable/unserviceable material. Operates a cannibalization activity in accordance with AR 750-50. (The aircraft maintenance company within the maintenance battalion of a division will perform AVIM functions consistent with air mobility requirements and conservation of personnel and equipment resources. Additional intermediate maintenance support will be provided by the supporting nondivisional AVIM unit.)

**B-2. USE OF THE MAINTENANCE ALLOCATION CHART (SECTION II)****NOTE**

Nomenclatures used throughout the MAC are approved item names. Those terms/nomenclatures expressed in parentheses are generic in nature and are not to be considered as official terminology.

- a. The Maintenance Allocation Chart assigns maintenance functions to the lowest category of maintenance based on past experience and the following considerations:
  - (1) Skills available
  - (2) Work time required
  - (3) Tools and test equipment required and/or available
- b. Only the lowest category of maintenance authorized to perform a maintenance function is indicated. If the lowest maintenance category cannot perform all tasks of any single maintenance function (e.g., test, repair), then the higher maintenance level(s) that can accomplish additional tasks will also be indicated.
- c. A maintenance function assigned to a maintenance category will automatically be authorized to be performed at any higher maintenance category.
- d. A maintenance function that cannot be performed at the assigned category of maintenance for any reason may be evacuated to the next higher maintenance category. Higher maintenance categories will perform the maintenance functions of lower maintenance categories when required or directed by the commander that has the authority to direct such tasking.
- e. The assignment of a maintenance function will not be construed as authorization to carry the related repair parts or spares in stock. Information to requisition or otherwise secure the necessary repair parts will be as specified in the Repair Parts and Special Tools List (RPSTL), Appendix C.
- f. Normally there will be no deviation from the assigned level of maintenance. In cases of operational necessity, maintenance functions assigned to a maintenance level may, on a one-time basis and at the request of the lower maintenance level, be specifically authorized by the maintenance officer of the level of maintenance to which the function is assigned. The special tools, equipment, etc., required by the lower level of maintenance to perform this function will be furnished by the maintenance level to which the function is assigned. This transfer of a maintenance function to a lower maintenance level does not relieve the higher maintenance level of the responsibility for the function. The higher level of maintenance will provide technical supervision and inspection of the function being performed at the lower level.

## **B-2. USE OF THE MAINTENANCE ALLOCATION CHART (SECTION II) (cont)**

g. Changes to the Maintenance Allocation Chart will be based on continuing evaluation and analysis by responsible technical personnel and on reports received from field activities.

## **B-3. MAINTENANCE FUNCTIONS**

Maintenance functions will be 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).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact 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 or 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.

**B-3. MAINTENANCE FUNCTIONS (cont)**

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services<sup>1</sup>, including fault location/troubleshooting<sup>2</sup>, removal/installation, and disassembly/assembly<sup>3</sup> procedures, and maintenance actions<sup>4</sup> 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.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards in appropriate technical publications (i.e., DMWR). 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 materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

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<sup>1</sup>Services - inspect, test, service, adjust, align, calibrate, and/or replace.

<sup>2</sup>Fault locate/troubleshoot - 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).

<sup>3</sup>Disassemble/assemble - encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

<sup>4</sup>Actions - welding, grinding, riveting, straightening, facing, remachining and/or resurfacing.

**B-4. STANDARD GROUPS (Columns 1 and 2)**

Standard groupings are used, as applicable, throughout this MAC. Maintenance manuals and RPSTL will reflect these standard groupings as individual chapters, with sections in each chapter relative to the individual complete systems, subsystems, modules, components, assemblies, or specific parts noted.

**B-5. MAINTENANCE FUNCTION (Column 3)**

Column 3 lists the functions to be performed on the items listed in column 2.

**B-6. MAINTENANCE CATEGORIES AND WORK TIMES (Column 4)**

The maintenance categories (levels) AVUM, AVIM, and DEPOT are listed on the Maintenance Allocation Chart with individual columns that include the work times for maintenance functions at each maintenance level. Work time presentations such as "0.1" indicate the average time it requires a maintenance level to perform a specified maintenance function. If a work time has not been established, the columnar presentation shall indicate " . ." Maintenance levels higher than the level of maintenance indicated are authorized to perform the indicated function.

**B-7. TOOLS AND TEST EQUIPMENT (Column 5 and Section III)**

Common tool sets (not individual tools), special tools, test, and support equipment required to perform maintenance functions are listed alphabetically in Section III with a reference number to permit cross-referencing to column 5 in the MAC. In addition, the maintenance category authorized to use the device is listed along with the item National stock number (NSN) and, if applicable, the tool number to aid in identifying the tool/device.

**B-8. REMARKS (Column 6 and Section IV)**

Remarks (identified by an alphabetic code in column 6) and other notes (identified by a number in parentheses in the applicable column) are listed in Section IV to provide a ready reference to the definition of the remark/note.



**Section II. MAINTENANCE ALLOCATION CHART  
FOR  
SHIPPING AND STORAGE CONTAINERS**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQPT	(6) REMARKS
			AVUM	AVIM	DEPOT		
00	Diagnostic Trouble-shooting Aid	Inspect	0.10	-	-		
	Laptop Computer	Replace	0.10	-	-		
04	Interface Cabinet Assembly	Test	-	0.10	-	10,12	
		Replace	0.10	-	-		
		Repair	-	0.20	-	1,2,3,4,5,6,7, 10,13, 14,15,16,17	
	Protective Cover Assembly	Replacement	-	0.10	-	17	
0404	Circuit Card Assembly	Replace	-	0.20	-	2,10,13,15,16	
		Repair	-	-	0.20	2,4,7,8,11,15	
08	Power Cable Assembly	Test	-	0.10	-	9	
		Replace	0.10	-	-		
		Repair	-	0.20	-	2,4,6,7,13,15, 16	

**Section III. TOOL AND TEST EQUIPMENT  
FOR  
TADS/PNVS SHIPPING AND STORAGE CONTAINERS**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	F	Apron, Rubber	-	5251T1
2	F,D	Desolder Kit	-	7800
3	F,D	Gloves, Rubber	-	ZZG381TY1CLS
4	F,D	Goggles, Safety, Acid-Type	4240-00-052-3776	GGG-531CL1
5	F	Fun, Filtered Air	2520-00-774-4879	902F
6	F	Gun, Heater	4940-00-314-9789	991332
7	F,D	Knife, Craftsman	5110-00-293-1585	GGG-K-450
8	D	Light, Black	-	B-100XR
9	F	Multimeter, Digital	-	8050A
10	F	Multimeter, Digital	-	HP-3466A
11	D	Panavise, PCB Holder	-	MODEL396
12	F	Power Supply	-	MO3-4173
13	F,D	Soldering Kit	-	PRC350C
14	F	Tool, Crimping	5120-00-016-6382	M22520/1-02
15	F,D	Tool, Desolder	3439-00-808-2144	7010-0004
16	F	Tool Set, Repairman, Aircraft Armament	-	SC4933-95-CL-A13
17	F	Wrench, Spanner, Adjustable	-	J5345-5

## APPENDIX C

### OPERATOR'S AVIATION UNIT, AND AVIATION INTERMEDIATE MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

#### Section I. INTRODUCTION

##### C-1. Scope.

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of aviation unit and aviation intermediate maintenance of the Diagnostic Troubleshooting Aid (DTA). It authorizes the requisitioning and issue of spares and repair parts as indicated by the source, maintenance, and recoverability (SMR) codes.

##### C-2. General.

In addition to Section I, Introduction, this Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. The list also includes parts which must be removed for the replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materials are listed in item name sequence. Repair parts kits are listed separately in their own functional group within Section II. Repair parts for repairable special tools are also listed in this section. Items listed are shown on the associated illustration(s)/figure(s).

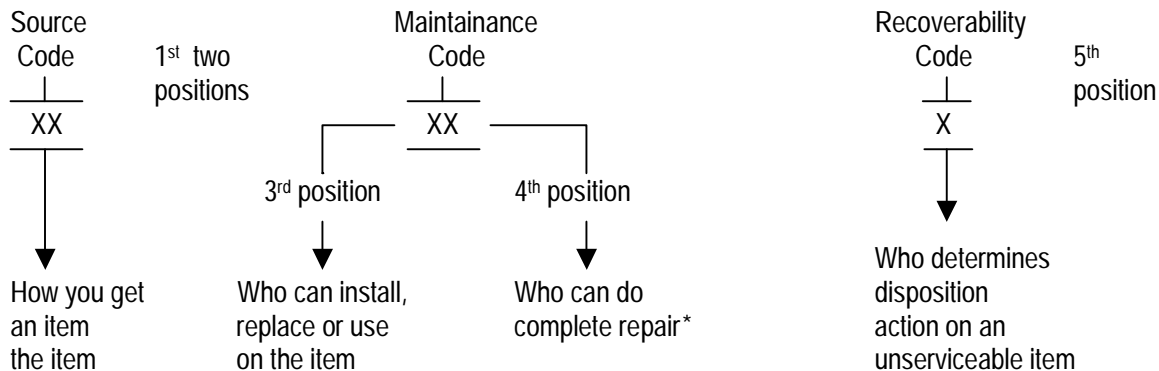
b. Section III. Special Tools List. A list of special tools, special TMDE, and other special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in DESCRIPTION AND USABLE ON CODE column) for the performance of maintenance.

c. Section IV. Cross-reference Index. A list, in National item identification number (NIIN) sequence, of all National stock numbered items appearing in the listing, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance. The figure and item number index lists figure and item number in alphanumeric sequence and cross-references NSN, CAGEC and part number.

##### C-3. Explanation of Columns (Section II and III).

a. ITEM NO. (Column (1)). Indicates the number used to identify items called out in the illustration.

b. SMR CODE (Column (2)). The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instructions, as shown in the following breakout:



- \*Complete repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) Source Code. The source code tells you how you get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

Code	Explanation
PA PB PC** PD PE PF PG PR***	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the category indicated by the code entered in the 3rd position of the SMR code.

**NOTE:**

\*\* Items coded PC are subject to deterioration.

\*\*\* Items coded PR are stocked items which have been replaced and procurement is not authorized (internal command coding). Consume existing stock.

KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of kit which is authorized to the maintenance category indicated in the 3rd position of the SMR code. The complete kit must be requisitioned and applied.
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Code	Explanation
<p>MO -(Made at org/AVUM level)</p> <p>MF - (Made at DS/AVIM level)</p> <p>MH - (Made at GS level)</p> <p>ML - (Made at Specialized Repair Act (SRA))</p> <p>MD - (Made at Depot)</p>	<p>Items with these codes are not to be equested/requisitioned individually. They must be made from bulk material which is identified by NSN in the DESCRIPTION AND USABLE ON CODE (UOC) column. If the item is authorized to you by the 3<sup>rd</sup> position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.</p>

<p>AO - Assembled by org/AVUM category</p> <p>AF - Assembled by DS/AVIM category</p> <p>AH - Assembled by GS category</p> <p>AL - Assembled by SRA</p> <p>AD - Assembled by Depot</p>	<p>Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3rd position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.</p>
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XA - Do not requisition an "XA"-coded item. Order its next higher assembly. (Also, refer to the NOTE below.)

XB - If an "XB" item is not available from salvage, order it using the CAGEC and part number given.

XC - Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.

XD - Item is not stocked. Order an "XD"-coded item through normal supply channels using the CAGEC and part number given, if no NSN is available.

NOTE: Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 700-42.

(2) Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance.

Code	Application/Explanation
------	-------------------------

C- Crew or operator maintenance done within organizational or aviation maintenance.

O- Organizational or aviation unit category can remove, replace, and use the item.

F- Direct support or aviation intermediate level can remove, replace, and use the item.

H- General support level can remove, replace, and use the item.

L- Specialized repair activity can remove, replace, and use the item.

D- Depot level can remove, replace, and use the item.

(b) The maintenance code entered in the fourth position tells you whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized repair functions). (NOTE: Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.) This position will contain one of the following maintenance codes:

Code	Application/Explanation
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O- Organizational or aviation unit is the lowest level that can do complete repair of the item.

F- Direct support or aviation intermediate is the lowest level that can do complete repair of the item

H- General support is the lowest level that can do complete repair of the item.

L- Specialized repair activity (designate the specialized repair activity) is the lowest level that can do complete repair of the item.

D- Depot is the lowest level that can do complete repair of the item.

Code            Application/Explanation

Z- Nonreparable. No repair is authorized.

B- No repair is authorized. (No parts or special tools are authorized for the maintenance of a "B" coded item.) However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

(3) Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR Code as follows:

Recoverability  
Codes            Application/Explanation

Z- Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the third position of SMR code.

O- Repairable item. When uneconomically repairable, condemn and dispose of the item at organizational or aviation unit level.

F- Repairable item. When uneconomically repairable, condemn and dispose of the item at the direct support or aviation intermediate level.

H- Repairable item. When uneconomically repairable, condemn and dispose of the item at general support level.

D- Repairable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.

L- Repairable item. Condemnation and disposal not authorized below specialized repair activity (SRA).

A- Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. CAGEC (Column (3)). The commercial and Government entity code is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

d. PART NUMBER (Column (4)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

NOTE: When you use a NSN to requisition an item, the item you receive may have a different part number from the part ordered.

e. DESCRIPTION AND USABLE ON CODE (UOC) (Column (5)). This column includes the following information:

- (1) The federal item name and, when required, a minimum description to identify the item.
- (2) The physical security classification is not applicable.
- (3) Items that are included in kits and sets are listed below the name of the kit or set.
- (4) Spare/repair parts that make an assembled item are listed immediately following the assembled item line entry.
- (5) Part numbers for bulk materials are referenced in the line item entry for the item to be manufactured/fabricated.
- (6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description (before UOC).
- (7) The USABLE ON CODE, when applicable (see paragraph 5, Special Information).
- (8) In the Special Tools List section, the Basis of Issue (BOI) appears as the last line(s) in the entry for each special tool, special TMDE, and other special support equipment. When density of equipments supported, exceeds density spread indicated in the basis of issue, the total authorization is increased proportionately.
- (9) The statement "END OF FIGURE" appears just below the last item description in Column 5 for a given figure in both Section II and Section III.

f. Qty (Column (6)). The QTY (quantity per figure column) indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

**C-4. Explanation of Columns (Section III).**

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1) STOCK NUMBER column. This column lists the NSN by National item identification number (NIIN) sequence. The NIIN consists of the last nine digits of

NSN  
 the NSN (i.e., 5305-01-674-1467). When using this column to locate an item, ignore the first four digits  
 NIIN

of the NSN. However, the complete NSN should be used when ordering items by stock number.

(2) FIG. column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in Section II and Section III.

(3) ITEM column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. PART NUMBER INDEX. Part numbers in this index are listed by part number in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter



or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

(1) CAGEC column. The commercial and Government entity code is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(2) PART NUMBER column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

(3) STOCK NUMBER column. This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and columns to the left.

(4) FIG. column. This column lists the number of the figure where the item is identified or located in Section II and III.

(5) ITEM column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

**C-5. Special Information.**

a. USABLE ON CODE. The usable on code appears in the lower left corner of the Description column heading. Usable on codes are shown as "UOC: . . . . ." in the Description Column (justified left) on the first line applicable item description/nomenclature. Uncoded items are applicable to all models. Identification of the usable on codes in the RPSTL are:

<u>Code</u>	<u>Used On</u>
E12	13231362

b. SERIAL NUMBER APPLICATION. Part numbers shown in Sections II and III without any serial number restrictions, are applicable to all configurations. When part numbers of spare/repair items are not the same for all configurations, a statement similar to example below, will be used to identify the usable effectivity will be made in the DESCRIPTION AND USABLE ON CODE (UOC) column as follows:

Example: Computer, Laptop (u/o 13231362) is defined as; laptop computer, is used on next higher assembly part number 13076080-019.

(1) EFFECTIVITY CODES. Effectivity codes when used, will be grouped in accordance with system usage. Effectivity codes are used to define restricted usage on component assemblies/parts as used in the Diagnostic Troubleshooting Aid.

c. MODIFICATION WORK ORDERS (MWOs). The following MWOs have been incorporated into this RPSTL.

<u>MWO NO.</u>	<u>TITLE</u>	<u>CLASSI- FICATION</u>	<u>EFF DATE</u>	<u>COMPLETION DATE</u>
MWO 1-4931-424-55-1	Modification of Diagnostic Trouble-shooting Aid (DTA)/ inclusion of Model 1500 series computer	Normal	01 Aug 94	31 July 98

d. FABRICATION INSTRUCTIONS. Part numbers for bulk materials are referenced in the description column of the line item entry for the item to be manufactured/ fabricated. Detailed fabrication instructions for items source codes to be manufactured or fabricated are found in maintenance section of this manual.

e. ASSEMBLY INSTRUCTIONS. Detailed assembly instructions for items source coded to be assembled from component spare/repair parts are found in TM 9-1270-476-30. Items that make up the assembly are listed immediately following the assembly item entry or reference is made to an applicable figure.

f. KITS. Not applicable.

g. INDEX NUMBERS. Not applicable.

h. ASSOCIATED PUBLICATIONS. The publications listed below pertain to the AN/ASQ-170 and its components.

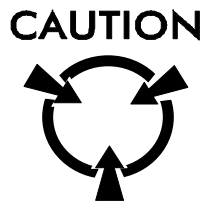
<u>PUBLICATIONS</u>	<u>SHORT TITLE</u>
TM 1-1270-476-T	AVUM Troubleshooting Manual Target Acquisition Designation Sight (TADS) Assembly
TM 1-1270-476-20	AVUM Maintenance, Target Acquisition Designation Sight (TADS) Assembly
TM 1-1270-476-23P	AVUM and AVIM Repair Parts and Special Tools list for Target Acquisition Designation Sight (TADS) Assembly
TM 1-1270-476-30	AVIM Maintenance, Target Acquisition Designation Sight (TADS) Assembly
TM 1-5855-265-T	AVUM Troubleshooting Manual Pilot Night Vision Sensor (PNVS) Assembly
TM 1-5855-265-20	AVUM Maintenance, Pilot Night Vision Sensor (PNVS) Assembly

TM 1-5855-265-23P	AVUM and AVIM Repair Parts and Special Tools list for Pilot Night Vision Sensor (PNVS) Assembly
TM 1-5855-265-30	AVIM Maintenance, Pilot Night Vision Sensor (PNVS) Assembly

i. ILLUSTRATIONS - LISTING. Higher - category RPSTL illustrations are not applicable.

j. ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. This technical manual contains parts and assemblies sensitive to damage by ESD. MIL-STD-1285 should be consulted for specific information on how damage can occur to electronic parts, assemblies and equipment by ESD and the control measures to be taken to protect against such damage.

(1) Illustrations contained within this manual which depict ESDS parts are further identified by the use of the following symbol affixed in the lower left-hand corner of each applicable illustration.



(2) Repair parts lists contained within this manual with ESD sensitive parts are identified by the following symbol (**ESDS**). These symbols are placed in the extreme right of the Description and Usable on Code (UOC) column for the item identified as ESDS.

#### **C-6. How to Locate Repair Parts.**

a. When National Stock Number or Part Number is Not Known:

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) Third. Identify the item on the figure and use the Part Number Index to find the NSN.

b. When National Stock Number or Part Number is Known:

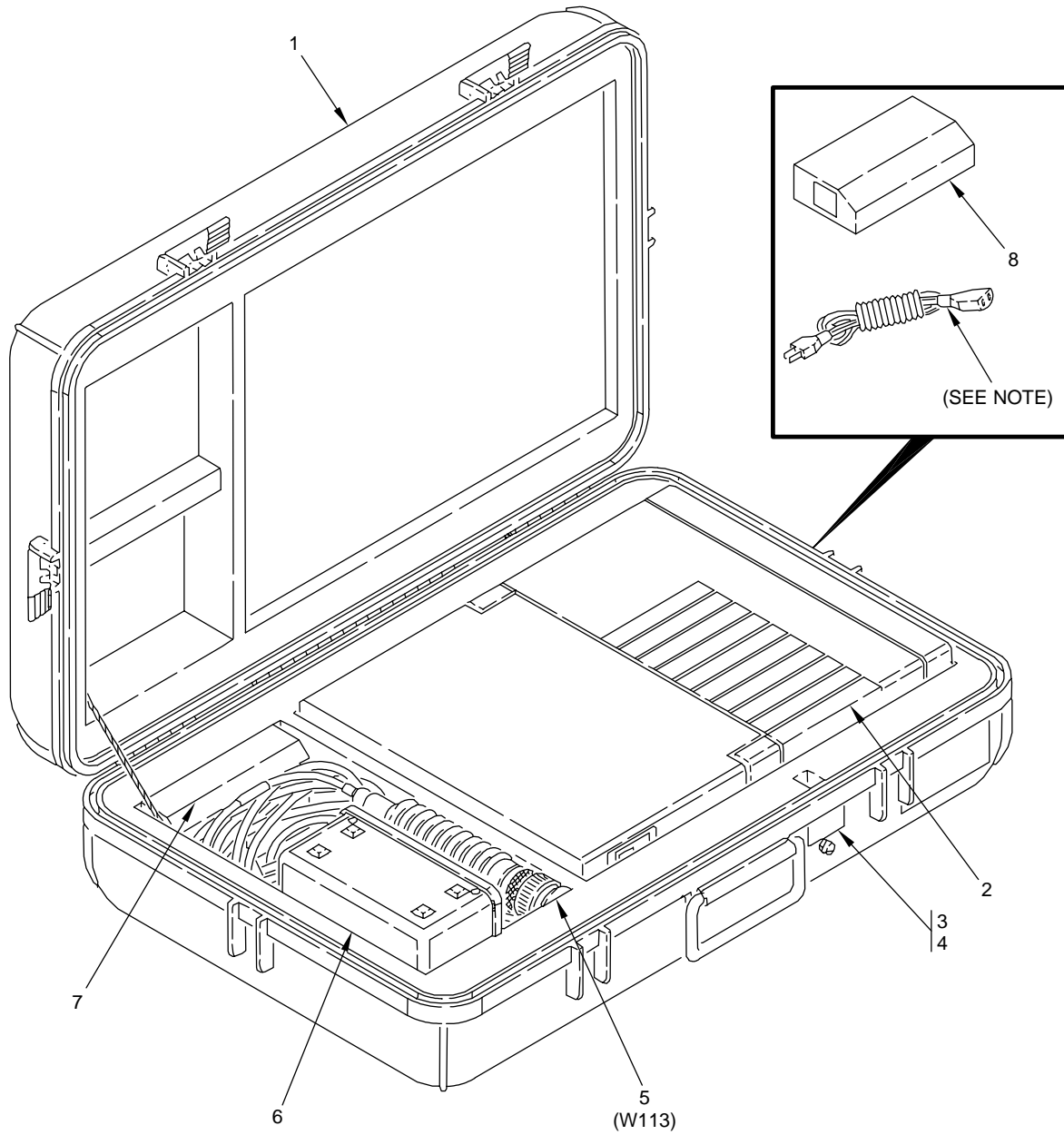
(1) First. Using the National Stock Number and Part Number Index, find the pertinent national stock number or part number. The NSN index is in National Item Identification Number (NIIN) sequence (see 4a (1)). The part numbers in the Part Number index are listed in ascending alphanumeric sequence (see 4b). Both indexes cross-reference you to the illustration/figure and item number of the item you are looking for.

(2) Second. Turn to the figure and item number, verify that the item is the one you're looking for, then locate the item number in the repair parts list for the figure.

**C-7. Abbreviations. (Abbreviations must be applicable to specific RPSTL and not listed in MIL-STD-12).**

<u>Abbreviation</u>	<u>Explanation</u>
AVIM	Aviation Intermediate Maintenance
AVUM	Aviation Unit Maintenance
CAGEC	Commercial and Government Entity Code
NIIN	National Item Identification Number (consists of the last nine digits of the NSN)
NSN	National Stock Number
RPSTL	Repair Parts and Special Tools List
S/N	Serial Number
SRA	Specialized Repair Activity
SRU	Shop Repairable Unit
SUB	Subsequent
UOC	Usable on Code
V	Variable

## **REPAIR PARTS LIST**



NOTE:  
CABLE ASSEMBLY SUPPLIED WITH DTA.

780-573B

Figure C-1. Diagnostic Troubleshooting Aid (13231362) (Group 00)

(1) ITEM NO.	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
1	PBOZZ	04939	13231393	GROUP : 00 ELEC EQPT TEST SET FIG. C-1 DIAGNOSTIC TROUBLESHOOTING AID 13231362-19 (04939) .CASE, TEST SET, DTA.....	1
2	XDFZZ	13007	66A7-2A	UOC:E12 .PLATE, IDENTIFICATION.....	1
3	PBODD	04939	13231376	UOC:E12 .COMPUTER, LAPTOP.....	1
4	XDOZZ	58260	13231953	UOC:E12 .SOFTWARE PROGRAM, OBJECT DISC.....	1
5	PAOFF	04939	13231375	UOC:E12 .CABLE ASSEMBLY, POWER SEE FIG C-3 ASSY BKDN.....	1
6	PAODD	04939	13231364	UOC:E12 .INTERFACE CABINET ASSEMBLY SEE FIG C-2 ASSY BKDN.....	1
7	PAOZZ	0EVL2	MO3-2153	UOC:E12 BATTERY PACK, INTERNAL, RECHARGEABLE ...	1
8	PAOZZ	OTXM1	10-0100	UOC:E12 POWER SUPPLY, INTERNAL/EXTERNAL .....	1
END OF FIGURE					

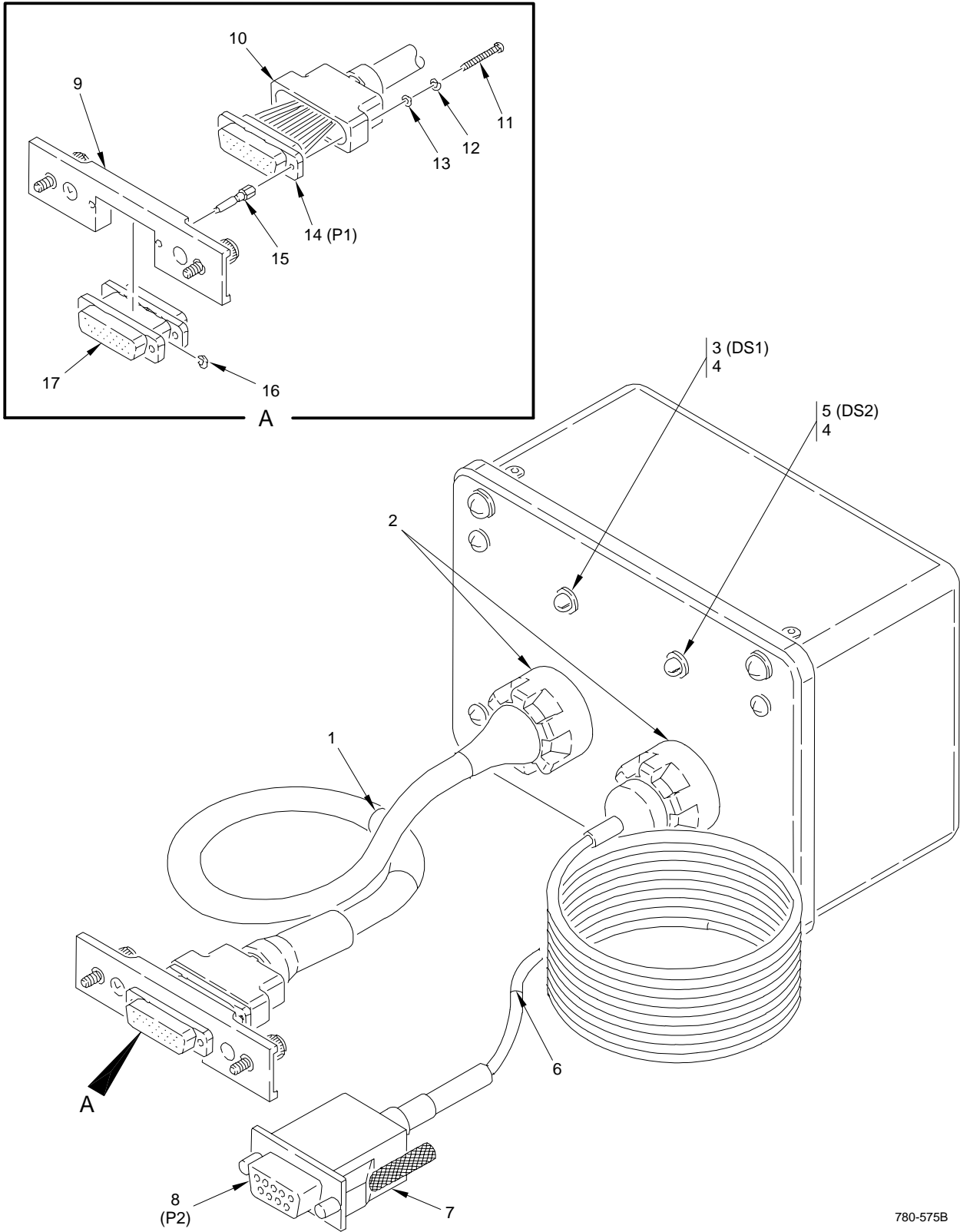
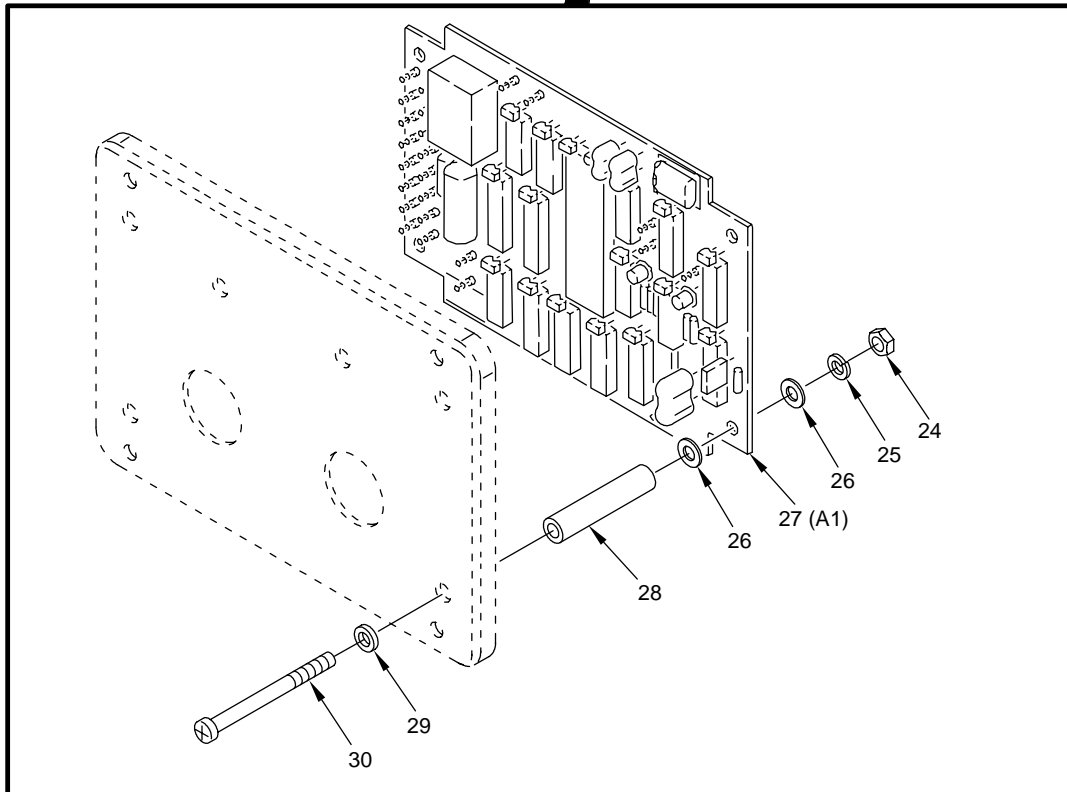
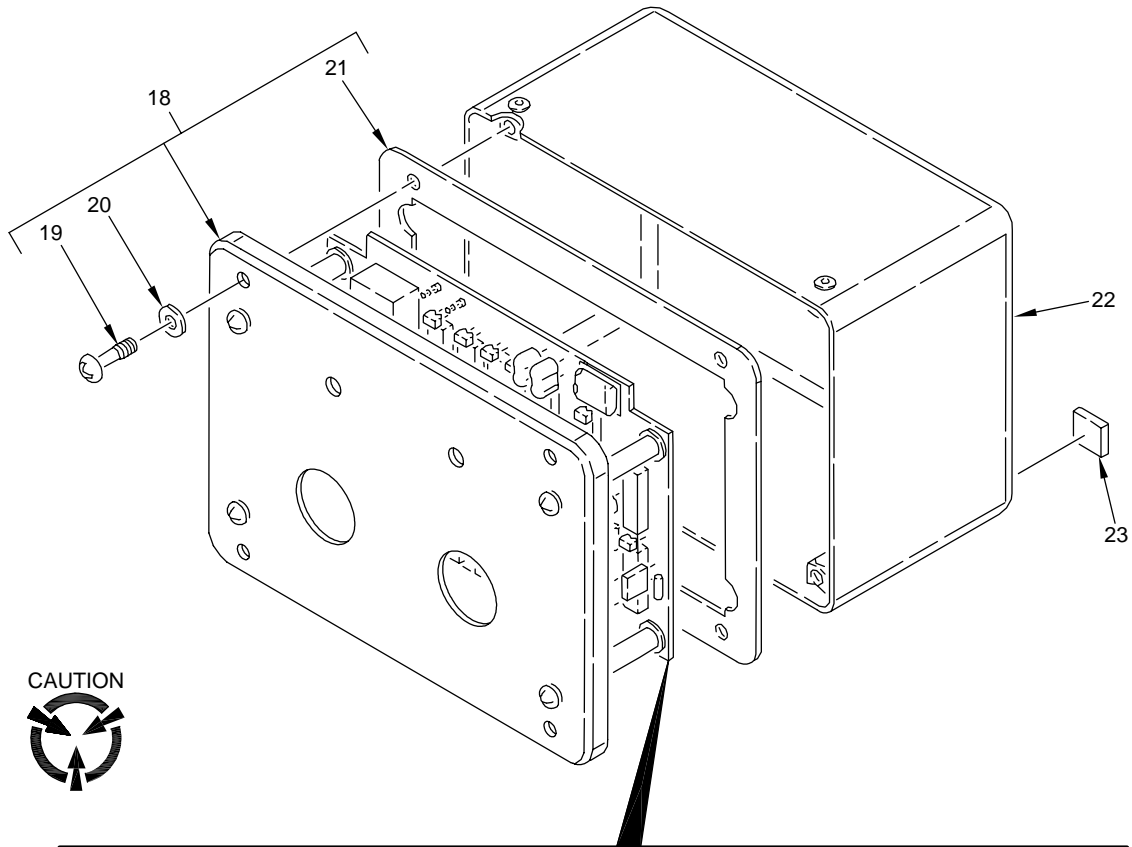


Figure C-2 Interface Cabinet Assembly (13231364) (Group 04) (Sheet 1 of 2)

780-575B



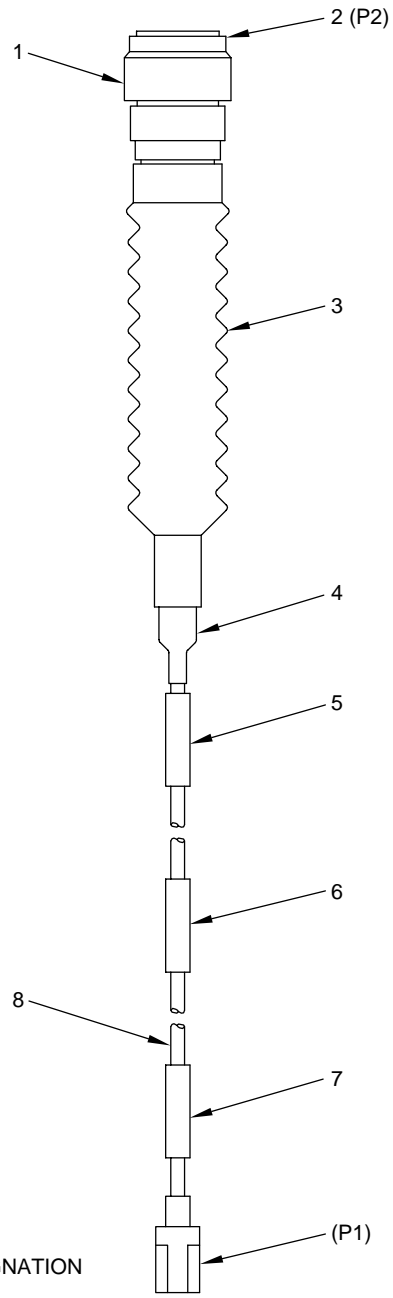
(1) ITEM NO.	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP : 04 INTERCONNECT BOX FIG. C-2 INTERFACE CABINET ASSEMBLY 13231364 (04939)	
1	XDFZZ	04939	13231364-2	.SLEEVE, MARKER, CABLE.....	1
2	PAFZZ	06090	207W213-3/42	.BUSHING, FEEDTHROUGH.....	2
3	PAFZZ	50434	HLMP-3507-009	.SEMICONDUCTOR DEVICE, DIODE.....	1
4	PAFZZ	50434	HLMP-0103	.GROMMET, PRESS-IN.....	2
5	PAFZZ	50434	HLMP-3301-009	.SEMICONDUCTOR DEVICE, DIODE.....	1
6	XDFZZ	04939	13231364-1	.SLEEVE, MARKER, CABLE.....	1
7	PAFZZ	06090	214P009-111	.BOOT, ELECTRICAL CONNECTOR .....	1
8	PAFZZ	81349	M24308/2-1F	.CONNECTOR, PLUG .....	1
9	PAFZZ	04939	13231373	.RETAINER ASSEMBLY, ELECTRICAL.....	1
10	PAFZZ	31461	901-726S51080055	.BACKSHELL, CONNECTOR .....	1
11	PAFZZ	96906	MS35206-206	.SCREW, MACHINE.....	2
12	PAFZZ	96906	MS35338-134	.WASHER, LOCK.....	2
13	PAFZZ	80205	NAS620C2	.WASHER, FLAT.....	2
14	PAFZZ	04939	MDMV51SH048B	.CONNECTOR, PLUG, ELECTRICAL.....	1
15	PAFZZ	04939	13231374	.JACKSCREW, ELECTRIC .....	2
16	PAFZZ	96906	MS16633-4006	.RING, RETAINING .....	2
17	PAFZZ	71468	MDMV98479-49	.CONNECTOR, ELECTRICAL, SAVER.....	1



780-576A

Figure C-2. Interface Cabinet Assembly (13231364) (Group 04) (Sheet 2 of 2)

(1) ITEM NO.	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
18	XDFFF	04939	13231369	.COVER ASSEMBLY PROTECTIVE (ALTERED FROM COVER P/N (19178) ZT68-96C0G-BB) .....	1
19	PAFZZ	19178	ZSP10-1003-1	..SCREW, CAPTIVE.....	4
20	PAFZZ	98376	ZP20733	..WASHER, SEALING .....	4
21	MFFZZ	04939	13231369-2	..GASKET, NEOPRENE .....	1
22	XDFZZ	19178	ZT68-96-48-BB	.BOX, RECTANGULAR, WATERPROOF .....	1
23	PAFZZ	71218	F-3581	.FEET, RUBBER.....	4
24	PAFZZ	80205	NAS671-6	.NUT, PLAIN, HEXAGON.....	4
25	PAFZZ	96906	MS35338-136	.WASHER, LOCK.....	4
26	PAFZZ	80205	NAS1149CN632R	.WASHER, FLAT.....	8
27	PAFDD	04939	13231371	.CIRCUIT CARD ASSEMBLY..... <b>(ESDS)</b>	1
28	PAFZZ	80205	NAS43DD1-96N	.SPACER, SCREW-BOLT .....	4
29	PAFZZ	96906	MS28774-006	.RETAINER, PACKING BACKUP.....	4
30	PAFZZ	96906	MS35206-238	.SCREW, MACHINE.....	4
				END OF FIGURE	



NOTE:  
PREFIX ALL REFERENCE DESIGNATION  
WITH W113.

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Figure C-3. Power Cable Assembly W113 (13231375) (Group 08)

(1) ITEM NO.	(2) SMR CODE	CAGEC	(3) PART NUMBER	(4) DESCRIPTION AND USABLE ON CODE (UOC)	(5) QTY
				GROUP: 08 POWER CABLE FIG. C-3 POWER CABLE ASSEMBLY 13231375 (04939)	
1	PAFZZ	06090	218M618-19B	.ADAPTER, SPIN COUPLING.....	1
2	PAFZZ	04939	MS3106F18-9P	.CONNECTOR, PLUG, ELECTRICAL.....	1
3	PAFZZ	06090	202C632-71/42	.BOOT, ELECTRICAL, CONNECTOR .....	1
4	PAFZZ	06090	202E334-71/42	.BOOT, SHIM.....	1
5	XDFZZ	04939	13231375-2	.CABLE MARKER.....	1
6	XDFZZ	04939	13231375-3	.CABLE MARKER.....	1
7	XDFZZ	04939	13231375-1	.CABLE MARKER.....	1
8	PAFZZ	16428	17519	.CABLE, ELECTRIC, POWER.....	1
END OF FIGURE					



**CROSS-REFERENCE INDEXES  
NATIONAL STOCK NUMBER INDEX  
PART NUMBER INDEX**

**CROSS-REFERENCE INDEXES  
NATIONAL STOCK NUMBER INDEX**

<u>STOCK NUMBER</u>	<u>FIG</u>	<u>ITEM</u>	<u>STOCK NUMBER</u>	<u>FIG</u>	<u>ITEM</u>
5310-00-043-4708	C-2	13	5935-01-150-3107	C-3	8
5330-00-057-5709	C-2	29	5970-01-185-1167	C-3	3
5935-00-131-9325	C-3	2	5935-01-282-2054	C-2	8
5310-00-531-9514	C-2	26	5365-01-303-1876	C-2	28
5310-00-631-1294	C-2	24	5970-01-313-6425	C-3	4
5365-00-753-3868	C-2	16	5980-01-320-0516	C-2	3
5310-00-928-2690	C-2	12	6135-01-369-7984	C-1	7
5310-00-929-6395	C-2	25	5935-01-377-3414	C-2	17
5305-00-953-6382	C-2	11	5975-01-389-6322	C-1	6
5305-00-984-6225	C-2	30	7021-01-389-9186	C-1	3
5970-01-025-4606	C-2	5	5935-01-394-0116	C-2	14



**CROSS-REFERENCE INDEXES  
PART NUMBER INDEX**

<u>CAGEC</u>	<u>PART NUMBER</u>	<u>STOCK NUMBER</u>	<u>FIG.</u>	<u>ITEM</u>
71218	F-3581		C-2	23
50434	HLMP-0103		C-2	4
50434	HLMP-3301-009	5970-01-025-4606	C-2	5
50434	HLMP-3507-009	5970-01-320-0516	C-2	3
71468	MDMV51SH048B	5935-01-394-0116	C-2	14
71468	MDMV98479-49	5935-01-377-3414	C-2	17
0EVL2	MO3-2153	6135-01-369-7984	C-1	7
96906	MS16633-4006	5365-00-753-3868	C-2	16
96906	MS28774-006	5330-00-057-5709	C-2	29
96906	MS3106F18-9P	5935-00-131-9325	C-3	2
96906	MS35206-206	5305-00-953-6382	C-2	11
96906	MS35206-238	5305-00-984-6225	C-2	30
96906	MS35338-134	5310-00-928-2690	C-2	12
96906	MS35338-136	5310-00-929-6395	C-2	25
81349	M24308/2-1F	5935-01-282-2054	C-2	8
80205	NAS1149CN632R	5310-00-531-9514	C-2	26
80205	NAS43DD1-96N	5365-01-303-1876	C-2	28
80205	NAS620C2	5310-00-043-4708	C-2	13
80205	NAS671-6	5310-00-631-1294	C-2	24
98376	ZP20733		C-2	20
19178	ZSP10-1003-1		C-2	19
19178	ZT68-96-48-BB		C-2	22
0TXM1	10-0100		C-1	8
04939	13231364	5975-01-389-6322	C-1	6
04939	13231364-1		C-2	6
04939	13231364-2		C-2	1
04939	13231369		C-2	18
04939	13231369-2		C-2	21
04939	13231371		C-2	27
04939	13231373		C-2	9
04939	13231374		C-2	15
04939	13231375		C-1	5
04939	13231375-1		C-3	7
04939	13231375-2		C-3	5

## PART NUMBER INDEX (Cont'd)

<u>CAGEC</u>	<u>PART NUMBER</u>	<u>STOCK NUMBER</u>	<u>FIG.</u>	<u>ITEM</u>
04939	13231375-3		C-3	6
04939	13231376	7021-01-389-9186	C-1	3
58260	13231953		C-1	4
04939	13231393		C-1	1
16428	17519	5935-01-150-3107	C-3	8
06090	202C632-71/42	5970-01-185-1167	C-3	3
06090	202E334-71/42	5970-01-3136-6425	C-3	4
06090	207W213-3/42		C-2	2
06090	214P009-111		C-2	7
06090	218M618-19B		C-3	1
13007	66A7-2A		C-1	2
31461	901-726S51080055		C-2	10

## APPENDIX D

### WIRE SEGMENT AND PRINTED REPORT ABBREVIATIONS

This appendix lists the abbreviations used on the wire segment listings and the printed reports, along with a detailed description of each.

<u>DTA Callout</u>	<u>Description</u>
AC AMP HARN P1	AC amplifier harness interface on TADS Az Gimbal
BSM J1	Boresight Module J1
CAM CHOKE P15	Day Sensor Television Camera Choke Coil J15
CPG CB PAN #2 J1	CoPilot Gunner circuit breaker panel #2 J1
CPG MRTU J1	CoPilot Gunner Multiplex Remote Terminal (BBC)
CPG MRTU J2	CoPilot Gunner Multiplex Remote Terminal (BBC)
CPG MRTU J3	CoPilot Gunner Multiplex Remote Terminal (BBC)
CPG MRTU J4	CoPilot Gunner Multiplex Remote Terminal (BBC)
DSA P1	Day Sensor Assembly P1
DSA P2	Day Sensor Assembly P2
DSS P1	Day Sensor Shroud Assembly P1
ECS BLOWER P1	TADS Environmental Control Assembly Blower P1
ECS J1	TADS Environmental Control Assembly J1
ECS J2	TADS Environmental Control Assembly J2
ELCT PWR CTR J10	AH-64 Electrical Power Center J10
GS277-A-A1	Ground Strap 277-A-A1
GS277-D-A1	Ground Strap 277-D-A1
GS811-F-A3	Ground Strap 811-F-A3
GS 276	Ground Strap 276
INNER GIMBAL J1	TADS Inner Gimbal Assembly J1
LEU J2	Laser Electronics Unit J2
LEU J3	Laser Electronics Unit J3
LH-FAB MRTU J1	Left hand FAB Multiplex Remote Terminal Unit J1
LH-FAB MRTU J2	Left hand FAB Multiplex Remote Terminal Unit J2
LH-FAB MRTU J3	Left hand FAB Multiplex Remote Terminal Unit J3
LH-FAB XOVER	Left hand FAB Harness Cross-over
LTR J1	Laser Tracker Receiver J1
LTU A1 J1	Laser Transceiver Unit J1
LTU A2 J1	Laser Transceiver Unit Range Receiver J1
LTU J1	Same as LTU A1 J1
NSS P1	Night Sensor Shroud Assembly J1
ORT J1	Optical Relay Tube J1
ORT J2	Optical Relay Tube J2
ORT J3	Optical Relay Tube J3
ORT J4	Optical Relay Tube J4
PECA J1	PNVS Electronic Control Amp Assembly J1
PEU J1	PNVS Electronics Unit J1
PEU J2	PNVS Electronics Unit J2
PEU J3	PNVS Electronics Unit J3
PITCH ACCEL J1	TADS Pitch Accelerometer (on Az Gimbal Assy) J1
PNVS NSA P1	PNVS Night Sensor Assy P1

DTA Callout

Detailed Description

PNVS AZ GIM P1	PNVS Az Gimbal Assembly P1
PRT ACS PAN J10	Port Access Panel (also known as "Moose hole") J10
PRT ACS PAN J11	Port Access Panel (also known as "Moose hole") J11
PRT ACS PAN J7	Port Access Panel (also known as "Moose hole") J7
PRT ACS PAN J9	Port Access Panel (also known as "Moose hole") J9
PTH GYRO CCA P1	Pitch Gyro Circuit Card Assy P1
RH-FAB MRTU J1	Right hand FAB Multiplex Remote Terminal Unit J1
RH-FAB MRTU J3	Right hand FAB Multiplex Remote Terminal Unit J3
RH-FAB XOVER	Right hand FAB harness cross-over
ROLL GYRO CCA P1	Roll Gyro Circuit Card Assy P1
SRV DISCONN J8	Servo Disconnect Plug J8
SYMB GEN J1	Symbology Generator J1
TADS AZ LM SW P1	TADS Azimuth Limit Switch P1
TADS AZ MTR J1	TADS Azimuth Motor Assembly J1
TADS BLKHD J1	TADS Bulkhead J1
TADS BLKHD J2	TADS Bulkhead J2
TADS BLKHD J3	TADS Bulkhead J3
TADS BLKHD J4	TADS Bulkhead J4
TADS BLKHD J5	TADS Bulkhead J5
TADS BLKHD J6	TADS Bulkhead J6
TADS EL LM SW J3	TADS Elevation Limit Switch J3
TADS EL MTR J1	TADS Elevation Motor Assembly J1
TADS NSA P1	TADS Night Sensor Assembly P1
TADS PIT ACEL J1	TADS Pitch Accelerometer (on Az Gimbal Assy) J1
TECA J1	TADS Electronic Control Amplifier Assy J1
TECA J2	TADS Electronic Control Amplifier Assy J2
TEU J1	TADS Electronics Unit J1
TEU J2	TADS Electronics Unit J2
TEU J3	TADS Electronics Unit J3
TEU J6	TADS Electronics Unit J6
TEU J7	TADS Electronics Unit J7
TEU J8	TADS Electronics Unit J8
TEU J9	TADS Electronics Unit J9
TPS J1	TADS Power Supply J1
TPS J2	TADS Power Supply J2
TV SENSOR J1	Day Sensor Television Camera Assy J1
YAW ACCEL J1	TADS Yaw Accelerometer J1 (located on the DSA)
YAW GYRO CCA P1	Yaw Gyro Circuit Card Assy P1

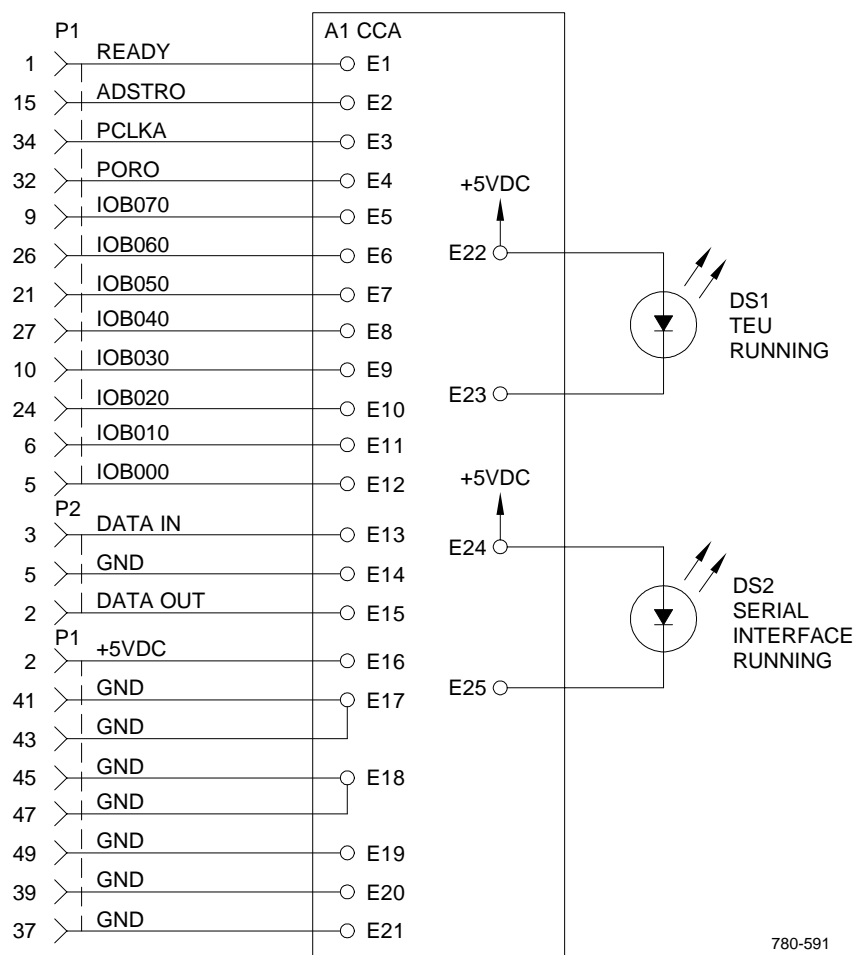
## APPENDIX E

### DIAGRAMS

#### E-1. SCOPE

This appendix contains diagrams supporting the maintenance activities covered in this manual. Use the data in this appendix as reference material to assist in troubleshooting and repairing the DTA.

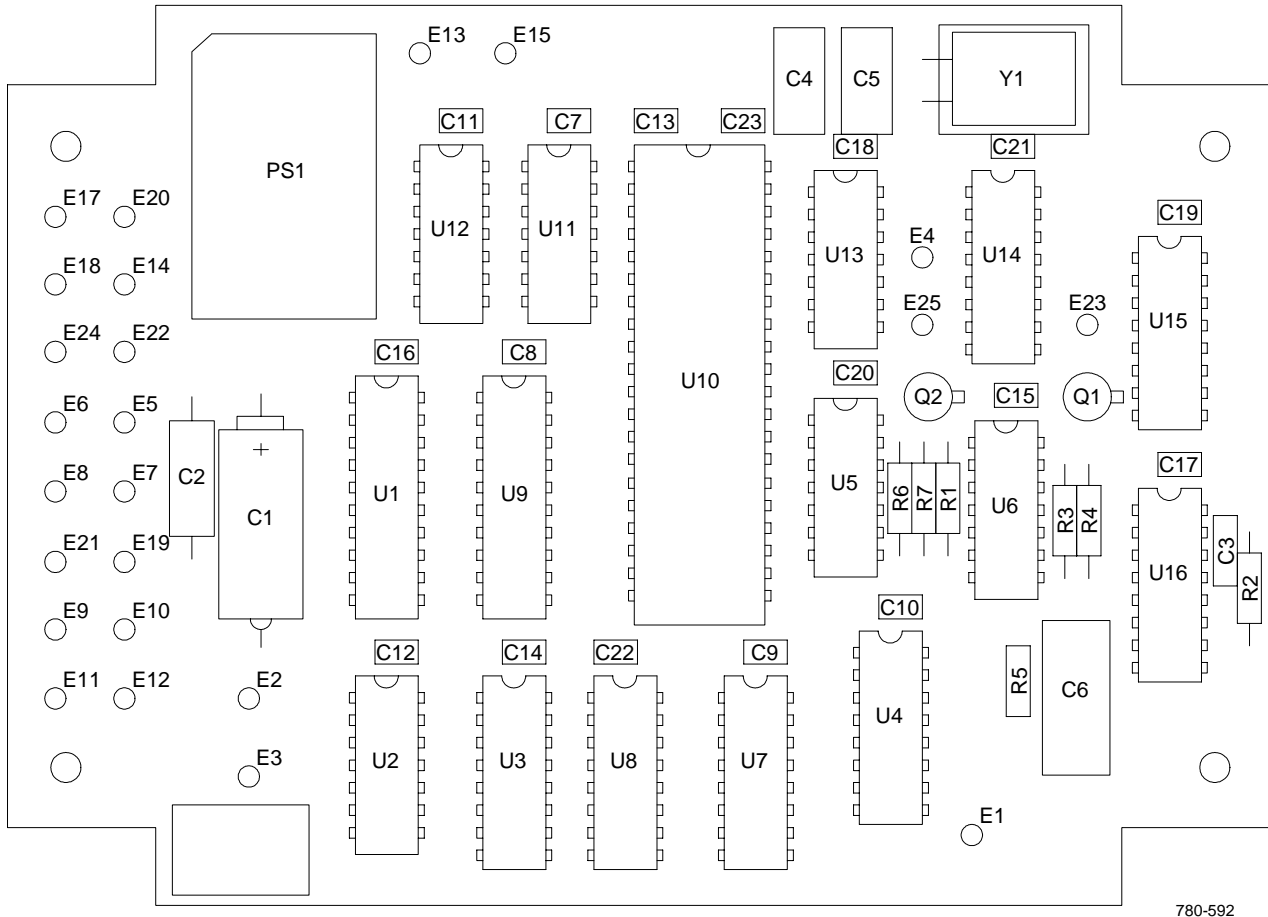
#### E-2. INTERFACE CABINET ASSEMBLY



780-591

Schematic Diagram

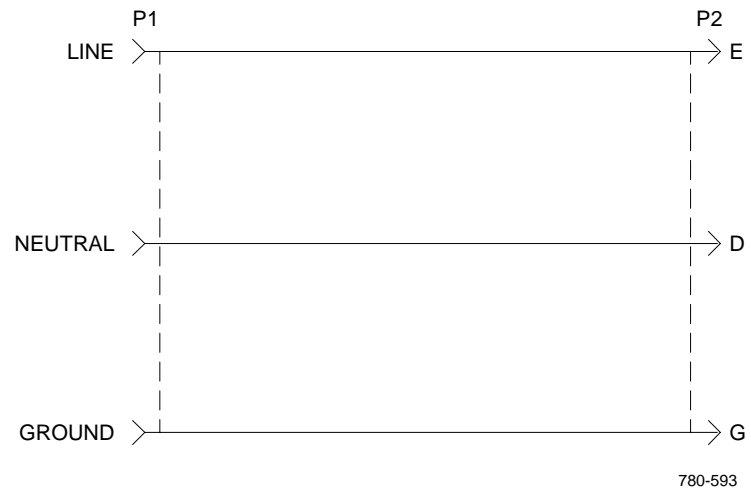
**E-2. INTERFACE CABINET ASSEMBLY (cont)**



780-592

Circuit Card Assembly Terminal Locations

**E-3. POWER CABLE ASSEMBLY**



Wiring Diagram





## APPENDIX F

### EXPENDABLE SUPPLIES AND MATERIALS LIST

#### F-1. SCOPE

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

#### F-2. EXPLANATION OF COLUMNS

a. **Column 1 - Item Number.** This column identifies the number assigned to the entry listing and is referenced in the initial setup to identify the materiel.

b. **Column 2 - Level.** This column identifies the lowest level of maintenance that requires the listed item.

O - Organizational Maintenance

F - Aviation Intermediate Maintenance

c. **Column 3 - National Stock Number.** This column lists the National Stock Number assigned to the item; use it to request or requisition the item.

d. **Column 4 - Description.** This column 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 (CAGE) code in parentheses, as applicable.

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

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	F	6810-00-753-4993	Alcohol, isopropyl, grade A, TT-I-735	oz
2	F	8020-00-264-3883	Brush, artist, H-B-118	ea
3	F	7920-00-044-9281	Cloth, cotton wiping, CCC-C-46C	ea
4	F	5970-01-340-0499	Insulation sleeving, electrical, heat shrinkable, M13231164-04	in
5	F	5970-01-163-1103	Insulation sleeving, electrical, heat shrinkable, M23053/4-304-0	in
6	F		Solder, electronic, SN63PB37WRMAP2, class 3	oz
7	F		Tape, adhesive, (06090) S1017-1x50	in



**APPENDIX G**

**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

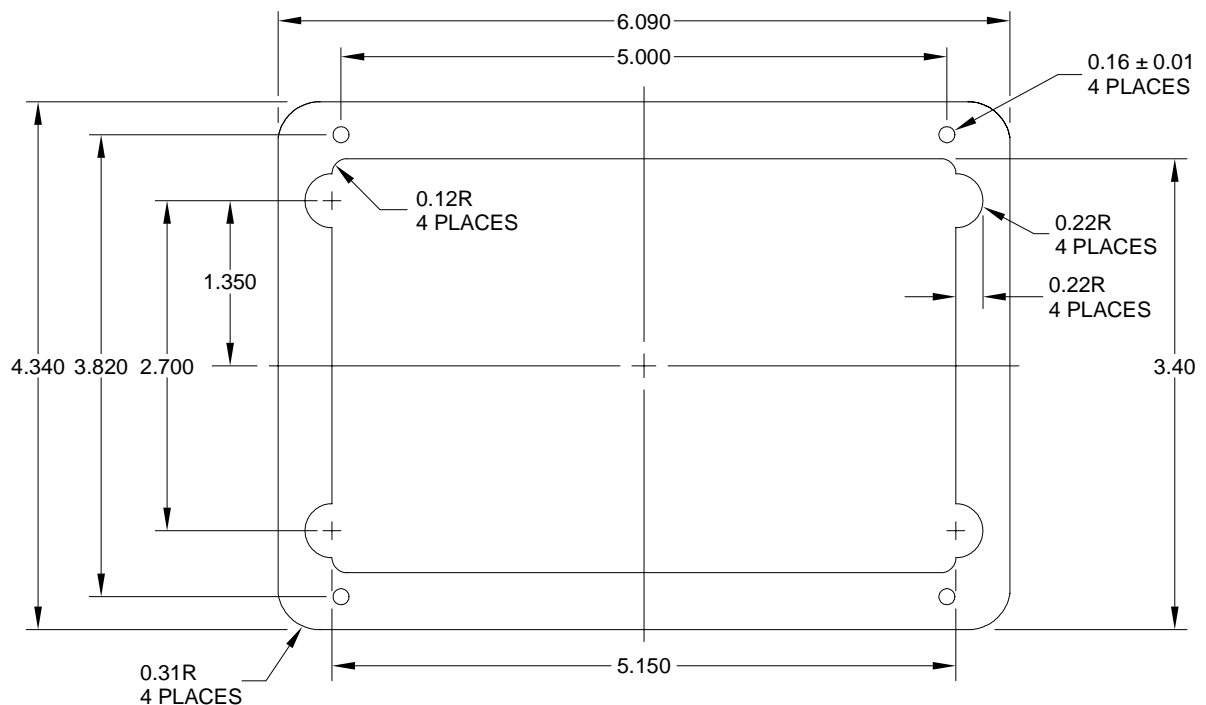
**Section I. INTRODUCTION**

**G-1. SCOPE**

This appendix includes complete instructions for making items authorized to be manufactured by AVIM personnel. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

**G-2. MANUFACTURED ITEMS PART NUMBER INDEX**

<u>Part Number</u>	<u>Nomenclature</u>	<u>Figure Number</u>
13231369-2	Neoprene Gasket	



NOTE:  
 FABRICATE GASKET USING NEOPRENE  
 CONFORMING TO MIL-S-6895, CLASS II,  
 GRADE 30, 0.062 INCH THICKNESS.

780-594



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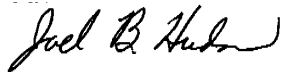
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**By Order of the Secretary of the Army:**

**Official:**

ERIC K. SHINSEKI  
*General, United States Army*  
*Chief of Staff*



JOEL B. HUDSON  
*Administrative Assistant to the*  
*Secretary of the Army*  
0119107

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To: [2028@redstone.army.mil](mailto:2028@redstone.army.mil)  
Subject DA Form 2028

1. **From:** Joe Smith
2. **Unit:** home
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
26. **Total:** 123
27. **Text:**

This is the text for the problem below line 27.

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WITH THIS PUBLICATION?



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 MMC, Br. , 432 PSD  
 ATTN: SP5 B. VAN ALSTINE  
 ORLANDO, FL. 32809

DATE SENT  
 31 DEC 91

PUBLICATION NUMBER  
 TM 1-1270-476-20

PUBLICATION DATE  
 31 AUGUST 91

PUBLICATION TITLE  
 AVIATION UNIT MAINTENANCE MANUAL  
 TARGET ACQUISITION DESIGNATION SIGHT  
 (TADS) ASSEMBLY AN/ASQ-170

BE EXACT . . . PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
2-14			Com

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Detailed Step No. 14 indicates (Accumetric A-105 primer) Should be changed to (Stauffer SWS-1001 Insulating primer)

**SAMPLE**

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER  
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**Redstone Arsenal, AL 35898-5230**

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Diagnostic Troubleshooting Aid

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PARA-  
GRAPH

FIGURE  
NO.

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Redstone Arsenal, AL 35898-5230**



## The Metric System and Equivalents

### Linear Measure

1 centimeter = 10 millimeters = 0.39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

### Liquid Measure

1 centiliter = 10 milliliters = 0.34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

### Weights

1 centigram = 10 milligrams = 0.15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = 0.035 ounce  
 1 dekagram = 10 grams = 0.35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

### Square Measure

1 sq. centimeter = 100 sq. millimeters = 0.155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = 0.386 sq. mile

### Temperature

$5/9 (^{\circ}\text{F}-32) = ^{\circ}\text{C}$   
 $212^{\circ}\text{ Fahrenheit} = 100^{\circ}\text{ Celsius}$   
 $90^{\circ}\text{ Fahrenheit} = 32.2^{\circ}\text{ Celsius}$   
 $32^{\circ}\text{ Fahrenheit} = 0^{\circ}\text{ Celsius}$   
 $9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}$

### Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = 0.06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	0.007062
feet	meters	0.305	centimeters	inches	0.394
yards	meters	0.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	0.621
square feet	square meters	0.093	square centimeters	square inches	0.155
square yards	square meters	0.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	0.405	square kilometers	square miles	0.386
cubic feet	cubic meters	0.028	square hectometers	acres	2.471
cubic yards	cubic meters	0.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	0.473	milliliters	fluid ounces	0.034
quarts	liters	0.946	liters	pints	2.113
gallons	liters	3.785	liters	pints	1.057
ounces	grams	28.349	liters	quarts	0.264
pounds	kilograms	0.454	grams	ounces	0.035
short tons	metric tons	0.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	0.11296	Newton-meters	pound-feet	0.738
			Kilo pascals	pounds per square inch	0.145

